Food balance sheets

A handbook

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Rome, 2001

Reprinted 2008

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FOREWORD

Timely and reliable statistical information is one of the most important prerequisites for the formulation of sound development plans and policies aimed at improving the efficiency of production and distribution of food and agricultural products in countries, thereby raising their standards of living.

Ever since its establishment in 1945, FAO has placed great emphasis on the proper development of comprehensive food and agricultural statistics as the only sound basis for the analysis of the food and nutrition situation and for action to improve it. The statistics of food balance sheets play an important role in this task. Food balance sheets provide comprehensive information on patterns, levels and trends of national diets.

The purpose of this Handbook is to provide member countries and interested institutions with the basic methodology regarding the preparation of food balance sheets. It is also intended for use in training activities of nationals from developing countries in the construction of food balance sheets.

After a brief historical background, the document discusses data sources, concepts and definitions regarding various elements of the food balance equation. It also gives numerical illustrations on how to prepare commodity balances. Furthermore, examples regarding applications and use of food balance sheet data in the analysis of national food situations, levels and trends are given.

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I. INTRODUCTION

1. HISTORICAL BACKGROUND OF FOOD BALANCE SHEETS

Food balance sheets present a comprehensive picture of the pattern of a country's food supply during a specified reference period. The first attempts at preparing food balance sheets date back to World War I. Food balance sheets were the major source of data when, in 1936, at the request of the League of Nations Mixed Committee on the Problem of Nutrition and its Sub-Committee on Nutritional Statistics, a systematic international comparison of food consumption data was prepared.

During World War II, the interest in food balance sheets increased considerably. The Inter-Allied Committee on Post-war Requirements used them in 1942/43 in their studies of post-war requirements in European countries and an even more detailed technique was developed and employed by a joint committee of experts from Canada, the United States of America and the United Kingdom in the report "Food Consumption Levels in the United States, Canada and the United Kingdom". During these years, food balance sheets were also constructed in Germany for the country itself as well as for the occupied countries. In the work of the International Emergency Food Council, which dealt with problems of food allocation and distribution in the period of worldwide food shortages after the war, food balance sheets played an important role.

From the outset, the Food and Agriculture Organization of the United Nations (FAO) has given considerable importance to furthering the development of food balance sheets, reflecting their usefulness in analyzing the food situation at the level of individual countries. At its Fourth Session in Washington in 1948, the FAO Conference recommended that governments be encouraged to develop their own food balance sheets and that FAO assist those governments that find it difficult to do so. It was also proposed that in future food balance sheets be published regularly for as many countries as possible.

In 1949, the *Handbook for the Preparation of Food Balance Sheets* was printed. In the same year, food balance sheets were published for 41 countries covering the period 1934-38 and 1947/48, with a supplement in 1950 giving 1948/49 data for 36 countries. In 1955, food balance sheets giving 1950/51 and 1951/52 data were published for 33 countries, together with revised data for the 1934-38 period. Supplements were issued in 1956 giving 1952/53 data for 30 countries, and in 1957 giving 1953/54 and 1954/55 data for 29 countries.

For methodological reasons, it was decided in 1957 to discontinue the publication of annual food balance sheets and to publish instead three-year average food balance sheets. The first set of which, for 30 countries, was issued in 1958, covering the period 1954-56; the second for 43 countries in 1963, covering the period 1957-59; the third for 63 countries in 1966, covering the period 1960-62 and the fourth in 1971 for 132 countries, covering the period 1964-66. In 1960, time series covering the periods 1935-39, 1948-50, 1951-53 and 1954-56 were published showing data for 32 countries on production, available supply, feed and manufacture, as well as *per caput* food supplies available for human consumption in quantity, caloric value and protein and fat content.

In 1977, it was possible to publish provisional 1972-74 average food balance sheets for 162 developed and developing countries. For the first time, tables were included showing for all countries, continents, economic classes and regions and the world, long-term series of *per caput* food supplies in terms of calories, protein and fat by major food groups for the average period 1961-63 and individual years 1964 to 1974. The following issue included 1975-77 average food balance sheets for 164 countries, together with long-term series of *per caput* food supplies and tables showing the conversion ratios applied and the various assumptions made in arriving at the published figures. For the first time in this series, the table of *per caput* food supplies also showed, in addition to calories, protein and fat, the supply by food groups of selected minerals (iron, calcium) and vitamins (retinol, thiamin, riboflavin, niacin, ascorbic acid).

Starting with the 1979-81 issue, three-year average food balance sheets were published in a standardized format; 146 countries were covered. The publication showing standardized food balance sheets for the average 1984-86 included, in addition to the food balance sheets for individual countries, tables showing long-term series of *per caput* supplies, by major food groups, in terms of product weight, calories, protein and fat. These tables were shown also for the world, developed and developing countries. The tables were based on information for more countries than those included in the publication, and covered almost 100 percent of the population in both developed and developing countries. The 1992-94 issue covered 175 countries and the 1994-96 issue about 180 countries.

Food balance sheets were the main source of data used in the assessment and appraisal of the world food situation which FAO made for the pre-war period in its *First World Food Survey* (1946), for the early post-war period in the *Second World Food Survey* (1952), for the late 1950s in its *Third World Food Survey* (1963), for the early 1970s in its *Fourth World Food Survey* (1977), for the 1970s and 1980s in the *Fifth World Food Survey* (1985) and, covering the two decades from 1969-71 to 1990-92, in the *Sixth World Food Survey* (1996) . Food balance sheets also provided a major source of information for establishing the statistical base of FAO's Indicative World Plan for Agricultural Development, for which purpose 1961-63 average food balance sheets were prepared for all the 64 developing countries included in the study.

In constructing the food balance sheets, both official and unofficial data available in the Statistics Division and other Units concerned in FAO have been used and missing data have been estimated on the basis of surveys and other information as well as technical expertise available in FAO. Comments on the previously published average food balance sheets and suggestions for their improvement received from countries have also been taken into account.

2. *NATURE OF FOOD BALANCE SHEETS*

To restate, food balance sheets present a comprehensive picture of the pattern of a country's food supply during a specified reference period. The food balance sheet shows for each food item - i.e. each primary commodity and a number of processed commodities potentially available for human consumption - the sources of supply and its utilization. The total quantity of foodstuffs produced in a country added to the total quantity imported and adjusted to any change in stocks that may have occurred since the beginning of the reference period gives the *supply* available during that period. On the *utilization* side a distinction is made between the quantities

exported, fed to livestock, used for seed, processed for food use and non-food uses, lost during storage and transportation, and food supplies available for human consumption at the retail level, i.e. as the food leaves the retail shop or otherwise enters the household. The *per caput* supply of each such food item available for human consumption is then obtained by dividing the respective quantity by the related data on the population actually partaking of it. Data on *per caput* food supplies are expressed in terms of quantity and - by applying appropriate food composition factors for all primary and processed products - also in terms of energy, protein and fat.

Annual food balance sheets tabulated regularly over a period of years will show the trends in the overall national food supply, disclose changes that may have taken place in the types of food consumed, i.e. the pattern of the diet, 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. As estimates of national aggregates, they are suitable for estimating the overall shortages and surpluses in a country. They are also useful in developing projections of future food supply needs or the future demand for food, in setting targets for agricultural production and trade and for establishing relationships between national food supplies, famine and malnutrition as well as evaluating national food and nutrition policies. The food balance sheets also provide a sound basis for the policy analysis and decision-making needed to ensure food security. For this reason, international organizations, governments, planners and researchers find them invaluable in determining whether a nation as a whole is moving towards meeting national dietary recommendations. 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, together with such other elements as income elasticity coefficients, projections of private consumption expenditure and population.

Conceptually, food balance sheets measure the food supply of the population. In reality, they are often unable to match practice with theory and, as a consequence, the statistics are often criticized for not meeting the expectations of data users. Food balance sheets measure food consumption from a food supply perspective. They do not give any indication of the differences that may exist in the diet consumed by different population groups, e.g. people of different socio-economic groups, ecological zones or geographical areas within a country. Neither do they provide information on seasonal variations in the total food supply. To obtain a complete picture, food consumption surveys showing 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. On the other hand, there are commodities for which production, trade and utilization statistics could give a better nationwide consumption estimate than the data derived from food consumption surveys.

Data obtained through household and food consumption surveys are often the preferred source of food consumption estimates for most analysts because they provide more information on food consumption than food balance sheets do. For example, because the surveys collect data from the people who are purchasing and eating the food, they can obtain information on the consumption characteristics of children, elderly people, males, females and on rural compared with urban populations. This type of information is not available from food balance sheets. In the absence of a comprehensive international data set from household surveys, however, the food balance sheets represent the only source of standardized data that permit international comparisons over time.

3. *SOURCES FOR BASIC INFORMATION*

Food balance sheets are assembled form a variety of sources. The quality of the balance sheets and their coverage vary considerably among countries and commodities. Inaccuracies and errors may be introduced at each stage of a balance sheet's construction. The user of these data must therefore bear in mind their limitations. 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 records 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. Even in the few, mainly developed, countries which possess uncommonly sophisticated reporting procedures, the available data do not always meet either the second or third condition. Therefore, in practice, the basic data are necessarily based on a large variety of sources. The main sources commonly used are discussed below.

Production and trade data are part of the ongoing national official statistics. They are based either on direct enquiries or records, or are estimated by Government agencies. Information on stock changes is available from marketing authorities and factories or from farmer stock surveys. Information on industrial uses are obtained from industrial/manufacturing censuses/surveys. Feed and seeding rates are obtained from cost of production surveys or are estimated by the Government agencies concerned. Losses occurring in industrial processing are also obtained from manufacturing surveys.

Since the basic data are obtained from different sources, they are subject to inconsistency. Their concepts are not likely to be the same as the food balance sheet concepts, since they were not primarily planned for that purpose. The time reference period may not be consistent throughout, or there may be some time lag between the available data. Furthermore, the data are often either incomplete or unreliable. Clearly, directly incorporating such data into the food balance sheet framework is almost impossible. Adjustments to the basic data and estimation/imputation of the missing data are necessary in order to maintain a certain degree of consistency, completeness and reliability of the resulting food balance sheets. In some cases, the exercise has to be based also on other external sources.

4. *CONCEPTUAL PROBLEMS RELATED TO THE PREPARATION OF FOOD BALANCE SHEETS*

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 subsistency 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 adapt the basic data to food balance sheets 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, certain kinds of food may not be covered by food balance sheets because they are not included in national production statistics. Meat, such as that of game, wild animals and insects, may be excluded 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.

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 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, have not been 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 estimate of the total population is also a part of the set of ongoing official statistics. The *per capita* 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, foreign 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 in preparing food balance sheets. Several twelve-month periods, such as July/June, October/September, April/March, have been proposed and were indeed also applied. However, none of these periods satisfactorily and uniformly covered the production of all agricultural commodities, their trade and domestic utilization. It can be assumed that there is no single twelve-month period which is fully suitable for recording supply and utilization for all products. It was therefore felt that, although the calendar year time-reference period (January-December) might not be a completely satisfactory solution, its advantage would appear to outweigh its disadvantages. The application of a calendar year time-reference period during which the bulk of the harvest takes place also helps in linking the agricultural statistics with those of the industrial and other sectors of the economy.

5. *ACCURACY OF FOOD BALANCE SHEETS*

The accuracy of food balance sheets, which are in essence derived statistics, is, of course, dependent 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, there are many gaps, particularly in the statistics of utilization for non-food purposes, such as feed, seed 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 is 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. Furthermore, 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 losses are based on expert opinion obtained in a country. Identification of major gaps in the available data might also stimulate the improvement of national statistics at the source.

Quality assurance is a series of processes to ensure that all information collected and published is reliable. The components of food balance sheets are complex transformations of data from a large number of sources based on sample surveys, censuses, administrative records and best estimates, and this complicates the task of assuring quality. The quality of data varies from one source to another and, in many cases, it has not been evaluated. The transformations themselves and the conversion factors used to estimate processed products and the nutritive content of the foods also influence data quality and complicate the task of quality assurance.

The usual approach to quality assurance is to integrate all the statistical information, the underlying concepts, definitions and methods in order to verify them through a series of vigorous consistency checks and comparisons to other related supplementary information. Consistency, however, is no guarantee of quality since consistent data is not necessarily accurate. One of the most valuable data verification techniques for appraising the quality of balance sheets is the unsophisticated method of comparing statistical aggregates against all available supplementary information.

Once estimates of the other components of the domestic supply have been made, the estimate of food available for human consumption is usually derived as a residual. Since the estimate of food available for human consumption is derived as a residual, its reliability would depend on the availability and accuracy of the other components on which it is based. In the case where the majority of the basic data are available and reliable, and the adjustments are based on sound judgement, the estimate of the food available for human consumption is likely to be reliable.

It stands to reason that where the basic data are incomplete and unreliable, an estimate of food available for human consumption is unlikely to be accurate. Furthermore, since it is derived as a residual, the error is not quantifiable and its direction is also unknown. In view of the frequent use of the estimate of food available for human consumption in various food and nutritional studies, it would be desirable if a more reliable and justifiable estimate of this component could be made available. At a minimum, this means the quantity of food available for human consumption would have to be estimated independently based on other existing statistical sources of information. One such source would be a household survey which collects quantities of food items consumed or acquired. Consideration of the survey data as the basic statistics pertaining to the food availability element does not, of course, necessarily imply using them directly as the estimates of food availability. They should rather be used as inputs or starting points in a process of adjustments that will have to take into account conceptual differences, judgements regarding data quality and also the consistency in relation to the inputs or estimates for the other elements of the food balance sheet. The use of the survey data in this manner should help to reduce the reliance on the residual or balancing approach in arriving at the food availability estimates, while also allowing more flexibility in handling the other elements for which the basic statistics are poor.

Nevertheless, food balance sheets, while often far from satisfactory in the proper statistical sense, do provide an approximate picture of the overall food situation in a country and can be useful for economic and nutritional studies, for preparing development plans and for formulating related projects.

II. CONCEPTS AND DEFINITIONS USED IN FOOD BALANCE SHEETS

1. COMMODITY COVERAGE

As already indicated, all potentially edible commodities should, in principle, be taken into account in preparing food balance sheets regardless of whether they are actually eaten or used for non-food purposes. The definition of a complete list of potentially edible commodities presents virtually insurmountable difficulties - both conceptual and statistical. For practical purposes, therefore, a pragmatic list of commodities will have to be adopted. Generally, food balance sheets are constructed for primary crops, livestock and fish commodities up to the first stage of processing in the case of crops and to the second (and sometimes the third) stage of processing in the case of livestock and fish products. The reason for the restriction on the higher stages of processing is the difficulty in obtaining data for all the varied forms of processed products, and even more difficult, in tracing the components of the processed composite products. The following list of commodities and their classification into major food groups is proposed for food balance sheet purposes. It should, however, be adjusted according to the availability of commodities in a given country.

LIST OF COMMODITIES CLASSIFIED BY MAJOR FOOD GROUPS

CEREALS AND PRODUCTS
Wheat
Rye
Barley
Oats
Maize
Rice
Mixed grains
Buckwheat
Sorghum
Millet
Quinoa
Other cereals

ROOTS, TUBERS AND PRODUCTS
Potatoes
Sweet potatoes
Cassava
Taro
Yams
Other roots and tubers

SUGARS AND SYRUPS
Sugar cane
Sugar beet
Sugar, refined
Sugar, non centrifugal
Molasses
Honey
Other sugars and syrups

PULSES
Beans, dry
Broad beans, dry
Peas, dry
Chick peas
Cow peas
Pigeon peas
Lentils
Vetches
Lupins
Other pulses

TREE NUTS
Almonds
Chestnuts
Areca nuts
Pistachios
Hazelnuts
Walnuts
Brazil nuts
Kola nuts
Cashew nuts
Other tree nuts

OILCROPS
Soybeans
Coconuts (incl. copra)
Oil palm fruit
Groundnuts
Olives
Rape and mustard seed
Sunflower seed
Cottonseed
Linseed
Hempseed
Sesame seed
Other oilcrops

VEGETABLES AND PRODUCTS
Beets
Carrots
Turnips
Rutabagas or swedes
Onions, green
Onions, dry
Artichokes
Tomatoes
Asparagus
Cabbage
Cauliflower
Celery
Kale
Lettuce
Spinach
Beans, green
Broad beans, green
Chilli peppers
Garlic
Cucumbers
Mushrooms
Eggplant
Peas, green
Pumpkins
Squash
Gourds
Okra
Radishes
Other vegetables

FRUIT AND PRODUCTS
Plantains
Bananas
Oranges
Lemons and limes
Grapefruit and pomelos
Tangerines, mandarins, clementines, satsumas
Other citrus fruit

LIST OF COMMODITIES CLASSIFIED BY MAJOR FOOD GROUPS (Continued)

FRUITS AND PRODUCTS (Cont.)
Melons
Watermelons
Apples
Apricots
Avocados
Cherries
Figs
Grapes
Mangoes

Papaya
Peaches
Pears
Persimmons
Pineapples
Plums
Quinces
Blueberries
Cranberries

Gooseberries
Raspberries
Strawberries
Kiwi
Other fruits, fresh

Dates
Figs, dried
Prunes
Currants
Raisins
Other dried fruits

STIMULANTS
Coffee
Cocoa beans
Tea
Mate

SPICES
Pepper
Pimento
Vanilla
Cloves
Other spices

ALCOHOLIC BEVERAGES
Wine
Beer
Beverages, fermented
Beverages, alcoholic

MEAT
Beef and veal
Buffalo meat
Pig meat
Mutton and lamb
Goat meat
Horse meat
Chicken meat
Goose meat
Duck meat

Turkey meat
Rabbit meat
Game meat
Offal

EGGS
Hen eggs
Other eggs

FISH AND FISHERIES PRODUCTS
Freshwater fish
Demersal fish
Pelagic fish
Crustaceans
Molluscs
Aquatic mammals meat
Aquatic plants

MILK AND CHEESE

Milk
Cow milk
Goat milk
Sheep milk
Buffalo milk
Skim milk
Evaporated, unsweetened, whole
Condensed, sweetened, whole
Evaporated, unsweetened, skim
Condensed, sweetened, skim
Dried, whole
Dried, Skim
Cream

Cheese
Hard cheese
Semi-soft cheese
Soft cheese

LIST OF COMMODITIES CLASSIFIED BY MAJOR GROUPS (Concluded)

OILS AND FATS

Vegetable oils
Rape and mustard seed oil
Sunflower seed oil
Cottonseed oil
Linseed oil
Hempseed oil
Sesame seed oil

Copra and coconut oil
Palm kernel oil
Palm oil
Soybean oil
Olive oil
Maize oil

Animal fats
Butter
Ghee
Other animal fats
Fish liver oil
Whale oil

MISCELLANEOUS
Infant food
Beverages, non-alcoholic
Ice cream
Other food preparations

Under each item, primary as well as derived commodities, up to the first stage of processing, are considered as appropriate, e.g. wheat, wheat flour (instead of bread), or milk, butter, ghee, skim milk, cheese (from whole milk and skim milk), dried and condensed milk (from whole milk or skim milk).

2. *SUPPLY AND UTILIZATION ELEMENTS*

1. **Production.** For primary commodities, production should relate to the total domestic production whether inside or outside the agricultural sector, i.e. including non-commercial production and production in kitchen gardens. Unless otherwise indicated, production is reported at the farm level for primary crops (i.e. excluding harvesting losses for crops) and livestock items and in terms of live weight (i.e. the actual ex-water weight of the catch at the time of capture) for primary fish items. Production of processed commodities relates to the total output of the commodity at the manufacture level (i.e. it comprises output from domestic and imported raw materials of originating products). Reporting units are chosen accordingly, e.g. cereals are reported in terms of grains and paddy rice. As a general rule, all data on meat are expressed in terms of carcass weight. Usually the data on production relate to that which takes place during the reference period. However, production of certain crops may relate to the harvest of the year

preceding the utilization period if harvesting takes place late in the year. In such instances, the production of a given year largely moves into consumption in the subsequent year.

In the sample Form II of the food balance sheet, located at the end of this document, a distinction is made between "output" and "input". The production of primary as well as of derived products is reported under "output". For derived commodities, the amounts of the originating commodity that are required for obtaining the output of the derived product are indicated under "input", and are expressed in terms of the originating commodity.

2. **Changes in Stocks**. In principle, this comprises changes in stocks occurring during the reference period at all levels from production to the retail stage, i.e. it comprises changes in government stocks, in stocks with manufacturers, importers, exporters, other wholesale and retail merchants, transport and storage enterprises, and in stocks on farms. In practice, though, the information available often relates only to stocks held by governments, and even this is, for a variety of reasons, not available for a number of countries and important commodities. It is because of this that food balance sheets are usually prepared as an average for several years as this is believed to reduce the degree of inaccuracy contributed by the absence of information on stocks. Increases in stocks of a commodity reduce the availability for domestic utilization. They are therefore indicated by the - sign and decreases in stocks by the + sign since they increase the available supply. In the absence of information on opening and closing stocks, changes in stocks are also used for shifting production from the calendar year in which it is harvested to the year in which it enters domestic utilization or is exported.

3. **Gross Imports.** In principle, this covers all movements of the commodity in question into the country as well as of commodities derived therefrom and not separately included in the food balance sheet. It, therefore, includes commercial trade, food aid granted on specific terms, donated quantities, and estimates of unrecorded trade. As a general rule, figures are reported in terms of net weight, i.e. excluding the weight of the container.

4. **Supply.** There are various possible ways to define "supply" and, in fact, various concepts are in use. The elements involved are production, imports, exports and changes in stocks (increases or decreases). There is no doubt that production, imports, and decreases in stocks are genuine supply elements. Exports and increases in stocks might, however, be considered to be utilization elements. Accordingly, the following possibilities exist for defining "supply".

(a) Production + imports + decrease in stocks = total supply.
(b) Production + imports + changes in stocks (decrease or increase) = supply available for export and domestic utilization.
(c) Production + imports - exports + changes in stocks (decrease or increase) = supply for domestic utilization.

Over the years, FAO has used all three concepts of "supply". In recent years concept (c) has been adopted when preparing and publishing food balance sheets in order to identify the quantity of the commodity in question which is available for utilization within the country.

5. **Gross Exports**. In principle, this covers all movements of the commodity in question out of the country during the reference period. The conditions specified for gross imports, under 3.

above, apply also to exports by analogy. A number of commodities are processed into food and feed items. Therefore, there is a need to identify the components of the processed material exported in order to arrive at a correct picture of supplies for food and feed in a given time-reference period.

6. **Feed**. This comprises amounts of the commodity in question and of edible commodities derived therefrom not shown separately in the food balance sheet (e.g. dried cassava, but excluding by-products, such as bran and oilcakes) that are fed to livestock during the reference period, whether domestically produced or imported.

7. **Seed**. In principle, this comprises all amounts of the commodity in question used during the reference period for reproductive purposes, such as seed, sugar cane planted, eggs for hatching and fish for bait, whether domestically produced or imported. Whenever official data are not available, seed figures can be estimated either as a percentage of production (e.g. eggs for hatching) or by multiplying a seed rate with the area under the crop of the subsequent year. In those cases where part of the crop is harvested green (e.g. cereals for direct feed or silage, green peas, green beans) an adjustment must be made for this area. Usually, the average amount of seed needed per hectare planted in any given country, does not greatly vary from year to year.

8. **Food Manufacture**. The amounts of the commodity in question used during the reference period for manufacture of processed commodities for which separate entries are provided in the food balance sheet either in the same or in another food group (e.g. sugar, fats and oils, alcoholic beverages) are shown under the column Food Manufacture. Quantities of the commodity in question used for manufacture for non-food purposes, e.g. oil for soap, are shown under the element Other Uses. The processed products do not always appear in the same food group. While oilseeds are shown under the aggregate Oilcrops, the respective oil is shown under the Vegetable Oils group; similarly, skim milk is in the Milk group, while butter is shown under the aggregate Animal Fats. Barley, maize, millet and sorghum are in the Cereals group, while beer made from these cereals is shown under the Alcoholic Beverages group. The same principle applies for grapes and wine.

9. **Waste**. This comprises the amounts of the commodity in question and of the commodities derived therefrom not further pursued in the food balance sheets, lost at all stages between the level at which production is recorded and the household, i.e. losses during storage and transportation. Losses occurring during the pre-harvest and harvesting stages are excluded (see note on "Production").

Technical losses occurring during the transformation of the primary commodities into processed products are taken into account in the assessment of respective extraction/conversion rates.

Post-harvest losses in most countries are substantial owing to the fact that most of the grain production is retained on the farm so as to provide sufficient quantities to last from one harvest to the next. Farm storage facilities in many countries tend to be primitive and inadequately protected from the natural competitors of man for food. Losses become even more serious in countries where agricultural products reach consumers in urban areas after passing through several marketing stages. In fact, one of the major causes of food losses in some countries is the lack of

adequate marketing systems and organization. Much food remains unsold because of the imbalances of supply and demand. This is particularly true of perishable foods, such as fresh fruit and vegetables. Post-harvest losses of fruit and vegetables of between 25 and 40 percent occur in many countries, mainly as a result of untimely harvesting and improper packing and/or transport.

The waste of both edible and inedible parts of the commodity occurring in the household, e.g. in the kitchen, also is excluded.

10. **Other uses.** In order not to distort the picture of the national food pattern, quantities of the commodity in question, consumed mainly by tourists, are included here (see also "12. *Per Caput* Supply") as well as the amounts of the commodity in question used during the reference period for the manufacture for non-food purposes (e.g. oil for soap). Also statistical discrepancies are included here. They are defined as an inequality between supply and utilization statistics. The food balance sheets are compiled using statistics from various sources. Where no official data are available, other sources of information may be used.

Many of the supply and utilization elements compiled from available information will not balance. Bringing together data from different sources would almost always result in an imbalance. Beyond the problem of data sources, imbalances usually fall into one of the following three situations: those occurring mainly in developed countries where there is no shortage of official statistics but the information is not internally consistent; cases in which the data are consistent but incomplete; and situations where data are both inconsistent and incomplete.

11. **Food**. This comprises the amounts of the commodity in question and of any commodities derived therefrom not further pursued in the food balance sheet that are available for human consumption during the reference period. The element food of maize, for example, comprises the amount of maize, maize meal and any other products derived therefrom, like cornflakes, available for human consumption.

The food element for vegetables comprises the amount of fresh vegetables, canned vegetables, and any other products derived therefrom. But the element food of milk relates to the amounts of milk available for human consumption as milk during the reference period, but not as butter, cheese or any other milk product provided for separately in the food balance sheet.

It is important to note that 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. during storage, in preparation and cooking (which affect vitamins and minerals to a greater extent than they do calories, protein and fat), as plate-waste, or quantities fed to domestic animals and pets, or thrown away.

12. ***Per Caput* Supply**. Under this heading estimates are provided of *per caput* food supplies available for human consumption during the reference period in terms of quantity, caloric value, and protein and fat content. *Per caput* food supplies in terms of quantity are given both in kilograms per year and grams per day, calorie supplies are expressed in kilo-calories (calories) per day, while supplies of protein and fat are provided in grams per day. It is proposed to retain the

traditional unit of calories for the time being until such time as the proposed "kilojoule" gains wider acceptance and understanding (1 calorie = 4.19 kilojoules).

Per caput supplies in terms of quantity are derived from the total supplies available for human consumption by dividing the quantities of the food element by the total population actually partaking of the food supplies during the reference period, i.e. the present in-area (*de facto*) population within the present geographical boundaries of the country in question at the mid-point of the reference period. Accordingly, nationals living abroad during the reference period are excluded but foreigners living in the country are included. Adjustments should be made wherever possible for part-time presence or absence, such as temporary migrants and tourists, and for special population groups not partaking of the national food supply such as aborigines living under subsistence conditions (if it has not been possible to include subsistence production in the food balance sheets) and refugees supported by special schemes (if it has not been possible to include the amounts provided by such schemes under imports).

The *per caput* supply figures in the food balance sheets represent only the average supply available for the population as a whole and do not necessarily indicate what is actually consumed by individuals. Even if the *per caput* food supply is taken as an approximation of *per caput* consumption, it is important to bear in mind that there could be considerable variation in both levels and patterns of consumption between individuals.

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 food composition factors for wheat flour depends, among other factors, on the water content, variety, and the degree of milling involved. The choice of the corresponding factors for cheese depends on whether the cheese is derived from whole milk, partly skimmed 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 national food composition tables. These tables give the nutritional composition of food per 100 grams of edible portion. As the quantity data of the food balance sheets are on an "as purchased" basis, i.e. as the food leaves the retail shop or otherwise enters the household, it is necessary that the nutritive composition in term of edible portion is converted into this basis as well. The conversion is made by applying waste/refuse factors to the nutritive composition in term of edible portion. The resulting *per caput* total nutritive values are usually expressed on a daily basis. In the absence of food composition tables prepared by appropriate national institutions, use can be made of FAO's food composition factors as shown in the appendix.

For calories, protein and fat, a grand total and its breakdown into components of vegetable and animal origin is shown at the beginning or the end of the food balance sheet.

3. *FORMATS OF FOOD BALANCE SHEETS*

Various formats which have been developed over the years still exist and can be used for the preparation and presentation of food balance sheets. The three "Sample Forms for Food

Balance Sheets" that are shown, have different headings for various columns that need some further explanations.

FORMAT I

Available supply represents the concept of supply available for domestic utilization.

Food (gross) is simply the balance of the available supply after feed, seed, food manufacture and waste have been deducted. It represents the quantities directly available to consumers before the application of extraction rates, if this is necessary.

Extraction rate applies chiefly to cereals and is used to effect a conversion of grains to flour and of paddy rice to milled rice. This column is also used to show the extraction of raw sugar from cane and sugar beets and of oil from oilseeds and so on. In addition to reflecting the input/output ratio between originating/parent commodity and processed commodity, the extraction rate also determines the choice of the appropriate food composition factors.

Food (net) represents the actual quantities of food directly available for human consumption after the application of extraction rates to the corresponding figures in the Food (gross) column.

Columns 18-20 show the food composition factors which have been applied when converting the quantities of daily *per caput* food supplies into energy, protein and fat content.

FORMAT II

The headings in this second format correspond to the description of the various elements in the foregoing section on "Supply and Utilization Elements".

Input and Output. For production, a distinction is made between "Input" and "Output". For derived commodities, amounts of the originating commodity required for obtaining the output of the derived product are indicated under "Input", expressed in terms of the originating commodity. The various factors used, i.e. milling rates, extraction rates, conversion or processing factors, carcass weights, milk yield, egg weights, etc., should indicate the average national rate at which these commodities are generally converted.

FORMAT III

This third format may be used when presenting a food balance sheet in standardized form.

Processed Trade (E-I) shows exports minus imports of processed commodities expressed in their primary/parent commodity equivalent and where "E" denotes exports and "I" denotes imports.

Stock changes indicate increases (+), or decreases (-), in stocks.

Food Manufacture shows amounts of the commodity in question used to manufacture processed commodities which are part of a separate food group (e.g. fats and oils, beverages).

Other uses comprises quantities used for the manufacture of non-food products, e.g. oil for soap. In order not to distort the picture of the national food pattern, quantities mainly consumed by tourists may be included here.

Food. In many cases, commodities are not consumed in the primary form in which they are presented in the standardized food balance sheets, e.g. cereals enter the household mainly in processed form, such as flour, meal, husked or milled rice. To take this fact into account, the caloric value and the protein and fat content shown against primary commodities in the standardized food balance sheet should be derived by applying the appropriate food composition factors to the quantities of the processed commodities and not by multiplying the quantities shown in the food balance sheet with the food composition factors relating to primary commodities.

FORMAT IV

This format is used when describing the procedures for the preparation of food balance sheets in the following section.

Whatever form is used, the unit of measurement (e.g. thousand metric tons or metric tons) should be stated. Equally important is also to indicate the cut-off date to which the figures shown in the food balance sheet refer.

Formats of Food Balance Sheets

Format I

Food Balance Sheet .....

Population..... **(year)** **.....**
(country)

(Thousand metric tons, unless otherwise specified)

Commodity	Production	Change in Stoc	Foreign Trade		Availabl	Disposal of available supply							Per caput supplies					Cal/ kg	% Prot	% Fat
			Gross Eport	Gross Import	Supply	Anima Feed	Seed	Food facture	Waste	Food groos	xtract. rate	Food net	Kg/ year	Gr/ day	Cal/ day	Prot/ day	Fat/ day			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
											%		Kg	Gr.	Cal	Gr.	Gr.	No	%	%

Format II

Food Balance Sheet

Population.....(thousand) **Country .....** **Year.....**

(Thousand metric tons, unless otherwise specified)

Commodity	Production		Change in Stock	Gross Import	Supply	Gross Export	Domestic utilization						Per caput consumption				
	Input	Output					Total	Feed	Seed	anufacture fo Food	Wast dustrial Use	Food	Kg/ year	Grams/ day	Cal./ day No	Prot./ day Gram	Fat/ day rams

Format III

Food Balance Sheet

Country ..... **Information available as of:.....** **Population.....**

Year.....

Commodity	Domestic supply						Domestic utilization						Per caput supply				
	Production	Imports	Change in stocks	Export	rocesse trade (E-I)	Total	Feed	Seed	Food manu-facture	Other uses	Waste	Food	Kilo-grams/ year	Per day			
														Grams	Calo-ries (No)	Prot. (Gr)	Fat (Gr)
	1000 metric tons																

Format IV

Food Balance Sheet

Country..... **Year.....** **Population ..... thousand**

thousand metric tons

Commodity	Supply					Domestic utilization						Food supply per caput				
	Production	Change in stocks	Imports	Export	vailabl supply	Feed	Seed	Food Manu-facture	Other uses	Waste	Food	Kg/ year	Grams day	alorie day Numbe	Protein day Grams	Fat/ day Grams
	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17

III. PROCEDURES FOR PREPARATION OF FOOD BALANCE SHEETS

1. INTRODUCTION

The following section presents several examples of how to prepare balances for commodities of the crop, livestock and fishery sections and also how ancillary and relevant information available elsewhere can be used to supplement data from official sources relating to production, external trade and utilization in preparing the balances.

The first step in this rather complex undertaking is to make a thorough search for statistical data and to compile them along with other information pertinent to the preparation of food balance sheets. In addition to data regarding production, trade and utilization of food and agricultural commodities available from official sources, a wealth of relevant information and technical expertise is often available from little tapped sources, such as marketing boards, commercial processing industries, extension workers, merchants, agricultural officers, transport enterprises and the like.

In the following illustration of how to prepare the balances, it is assumed that the information listed under *Assumptions* has been compiled from sources described above. Quantities are given in thousand metric tons and area in thousand hectares. This information will form the basis for the construction of the individual balances. In doing, so care must be taken that for every commodity the balance of the equation is always maintained. The elements of the individual commodity balance do not have any relation whatsoever to elements of balances for other commodities except the element *Food Manufacture*. The figure shown under this element corresponds to the quantity which has been used for the production of processed products shown separately in the food balance sheet.

2. CROP SECTOR

1. CEREALS

Assumptions

Wheat:

Production: 3790
Change in stocks: increase of 140 (information supplied by authorities concerned)
Exports: 359
Feed: 250 (estimate supplied by Ministry of Agriculture)
Seed: seeding rate has been reported to be generally in the order of 150 kgs/ha, area sown in subsequent year: 149000 ha
Waste: 5 percent of available supply (estimate based on information obtained from Marketing Boards and local merchants)

Wheat flour:

Extraction rate: 75 percent (as reported by milling industry)
Imports: 44

Exports: 73

Waste: 3 percent of available supply (estimate based on information obtained from transport and storage enterprises)

Food composition per 100 grams: 364 calories, 10.9% protein, 1.1% fat

Rice, paddy:

Production: 629

Seed: seeding rate has been reported to be generally in the order of 150 kgs/ha; area sown in subsequent year: 166000 ha

Waste: 3 percent of available supply (estimate based on information obtained from Marketing Board and local merchants)

Rice, milled:

Extraction rate: 67 percent (as reported by milling industry)

Change in stocks: decrease of 35 MT (information supplied by authorities concerned)

Exports: 77

Waste: 3 percent of available supply (see remarks for rice paddy)

Food composition for 100 grams: 360 calories, 6.7% protein, 0.7% fat

Barley:

Production: 84

Imports: 12

Feed: 23 (estimate obtained from Ministry of Agriculture)

Seed: seeding rate has been reported to be generally in the order of 90 kgs/ha area sown in subsequent year: 22000 ha

Waste: 3 percent of available supply (see remarks for rice paddy)

Pearl Barley:

Production: 20

Extraction rate: 55 percent (as reported by milling industry)

Food composition per 100 grams: 346 calories, 9.0% protein, 1.4% fat

Barley malt:

Production: 26

Extraction rate: 80 percent (as reported by the brewing industry, which indicated also that the input/output ratio from malt to beer is 1:6.5)

Construction of the Balances

Food Balance Sheet

Population 27650 thousand

thousand metric tons

Commodity	Supply					Domestic utilization						Food supply per caput				
	Production	Change in stocks	Imports	Exports	Available supply	Feed	Seed	Food Manu-facture	Other uses	Waste	Food	Kg/ year	Grams/ day	Calories/ day Number	Protein/ day Grams	Fat/ day Grams
	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17
Wheat	3790	-140		359	3291	250	224	2652		165						
Wheat Flour	1989		44	73	1960					59	1901	68.8	188.4	686	20.5	2.1
Rice Paddy	629				629		25	585		19						
Rice Milled	392	+35		77	350					11	339	12.3	33.6	121	2.3	0.2
Barley	84		12		96	23	2	68		3						
Pearl Barley	20				20						20	0.7	2.0	7	0.2	-
Malt of Barley	26			3	23			23								

Wheat

The data compiled for *Production* (3790), *Change in stocks* (-140), *Exports* (359) and *Feed* (250) are entered in the line for wheat in the food balance sheet in the respective columns. The quantity of wheat retained for *Seed* (224) can be estimated by multiplying the seeding rate with the area sown in the subsequent year. The figure for *Waste* is obtained as 5 percent of the *Available supply* (3291). Since there is no information as to direct food use of wheat, the balance is completed by allocating the residual to *Food Manufacture* which is the amount available for milling into flour (2652).

Wheat Flour

Wheat is generally consumed in the form of flour and/or products derived therefrom. Since there is no information available regarding the production of wheat flour this figure can be estimated by applying the extraction/milling rate of 75 percent to the quantity shown under *Food Manufacture* (2652) in the balance for wheat and entered in the column *Production* (1989). The extraction rate for flour should represent an overall-weighted average which takes account of flour used for producing different types of bread, cake or other flour products. The rate, however, does not only represent the input/output ratio from wheat to flour but also determines the food composition regarding energy and nutrients which changes according to the type of wheat (soft or hard) and the milling rate.

The data reported officially for *Imports* (44) and *Exports* (73) are entered in the respective columns. The quantity of losses occurring during transport and storage can be estimated as a percentage of the *Available supply* (1960) and shown in the column *Waste* (59). The total amount of wheat flour available for human consumption (1901), shown in the column *Food* is the residual of the equation.

Procedure to calculate the *Per Caput Food Supply*

Step 1: To determine the annual *per caput* supply of wheat flour (68.8), the figure shown in the column *Food* (1901) should be divided by the population number (27650).

Step 2: To obtain the daily *per caput* supply in terms of grams/day (188.4), the amount of the annual *per caput* supply of wheat flour obtained in Step 1 (68.8) should be divided by 365.

Step 3: To arrive at the daily *per caput* supply of flour in terms of calories (686), protein (20.5) and fat (2.1), the quantity of the daily *per caput* supply of wheat flour in terms of grams obtained in Step 2 (188.4) should be multiplied by the food composition factors (364 calories, 10.9% protein, 1.1% fat) listed above under *Assumptions*.

Rice Paddy

The production figure is entered in the column *Production* (629). The quantity for *Seed* (25) estimated on the basis of multiplying the seeding rate (150) with the area sown in the subsequent year (165000) is shown in the column *Seed*. The same procedure is followed to obtain

the estimate to be shown for *Waste* (19). Since there is generally no direct food use of paddy rice the residual of the equation is allocated to *Food Manufacture* (585).

Rice Milled

Production (392) of milled rice again can be estimated by multiplying the amount shown under *Food Manufacture* in the balance for rice paddy (585) with the extraction rate (67%). The figures for *Change in stocks* (+35) and *Imports* (77) are entered in the respective columns. The amount of losses can be estimated as a percentage (3%) of the *Available supply* (350) and shown under *Waste* (11). The quantity of milled rice available for human consumption is the residual of the equation and entered in the column *Food* (339).

Figures for *Food supply per caput* (12.3, 33.6, 121, 2.3, 0.2): see procedure for wheat flour.

Barley

The official production figure is entered under *Production* (84), the quantity imported under *Imports* (12) and the estimate for animal feed use of barley as reported by the Ministry of Agriculture under *Feed* (23). The quantity to be shown under *Seed* (2) is obtained by multiplying the seeding rate (90) with the area sown in the subsequent year (22000 ha). The amount of barley lost during storage and transport can be estimated as a percentage (3%) of *Available supply* (96) and shown in the column *Waste* (3). There is no information regarding direct food use of barley.

A certain amount of barley, however, is further processed: production of pearled barley and malt has been reported. The quantity of barley required to produce these commodities can be estimated on the basis of the extraction rates reported by the milling and brewing industry: around 36000 MT of barley would be needed for the *Production* of pearled barley (20) and about 32000 MT of barley for the production of malt. It follows that 68000 MT should be shown under *Food Manufacture*. There is no information regarding losses/waste. The residual of the equation amounts to 3. This figure represents about 3 percent of the *Available supply* (96) and compares well with information regarding losses as reported for other cereals and could therefore be accepted as an estimate for *Waste* (3).

Pearl Barley

The official production figure is entered in the column *Production* (20). There being no reports regarding other supply and utilization elements it must be assumed that production enters human consumption i.e. *Food* (20).

Figures for *Food supply per caput* (0.7, 2.0, 7, 0.2): see procedure for wheat flour.

Malt/Barley

The official figures for *Production* (26) and for *Exports* (3) are entered in the respective columns. The remaining quantity of malt can be assumed to be used for the production of beer and should be shown under *Food Manufacture* (23).

2. ROOTS AND TUBERS

Assumptions

Potatoes:

Production: 4365

Exports: 347

Feed: 650 (information obtained from Ministry of Agriculture and commercial feed processing industries)

Seed: seeding rate has been reported to be generally in the order of 1500 kgs/ha, area planted in the subsequent year is not known. Therefore the area harvested (256000 ha) for *Production* (4365) could be used instead to arrive at a meaningful estimate for the amount of potatoes to be set aside for planting at the next harvest

Waste: 13 percent of available supply (estimate based on information supplied by extension workers, Ministry of Agriculture and food processing industry)

Food composition for 100 grams: 67 calories, 1.6% protein, 0.1% fat

Cassava:

Production: 3117

Feed: 23 (estimate supplied by Ministry of Agriculture)

Waste: 15 percent of available supply (estimate based on information obtained from agricultural officers and extension workers)

Food composition for 100 grams: 109 calories, 0.9% protein, 0.2 fat

Cassava flour:

Production: 44 (estimate obtained from food processing industry

Exports: 15

Food composition for 100 grs: 338 calories, 1.5% protein, 0.6% fat

Cassava starch:

Production: 24 (estimate obtained from food processing industry; starch is used exclusively for non-food uses)

Construction of the Balances

Food Balance Sheet

Population 27650 thousand

thousand metric tons

Commodity	Supply					Domestic utilization						Food supply per caput				
	Production	Change in stocks	Imports	Exports	Available supply	Feed	Seed	Food Manu-facture	Other uses	Waste	Food	Kg/ year	Grams/ day	Calories/ day Number	Protein/ day Grams	Fat/ day Grams
	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17
Potatoes	4365			347	4018	650	384			522	2462	89.0	243.9	163	3.9	0.2
Cassava	3117				3117	23		1860		468	766	27.7	75.8	83	0.7	0.2
Cassava Flour	441			15	426						426	15.4	42.2	143	0.6	0.3
Cassava Starch	24			1	23				23							

Potatoes

The figures for *Production* (4365), *Exports* (347) and *Animal feed* (650) are entered in the balance for potatoes in the respective columns. The quantity of potatoes used for seed can be estimated by multiplying the seeding rate (1500 kgs/ha) with the area (256000 ha). The figure for *Waste* (522) is obtained as 13 percent of the *Available supply* (4018). There are no reports about other uses of potatoes (e.g. distilling into alcohol). The residual of the equation can therefore be taken as the amount of potatoes available for human consumption and should be shown under *Food* (2461).

Figures for *Food supply per caput* (89.0, 243.9, 171, 4.1, 0.2): see procedure for wheat flour.

Cassava

The figures for *Production* (3117) and *Feed* (23) are entered in the respective columns of the balance for cassava. *Waste* (468) has been calculated as 15 percent of *Available supply* (3117). The figure shown for *Food Manufacture* (1860) is a derived figure. Generally the input/output ratio from cassava to flour and starch is 4:1. On the basis of this relationship the figure shown under *Food Manufacture* (1860) has been estimated (1764 of cassava for production of flour of cassava and 96 of cassava for production of cassava starch). The figure shown under *Food* (468) is the remainder of the equation.

Figures for *Food supply per caput* (27.7, 75.8, 83, 0.7, 0.2): see procedure for wheat flour.

Cassava Flour

The *Production* (441) and *Export* (15) figures are entered in the respective columns. The residual of the equation can be assumed to be the amount of flour available for human consumption and should be shown under *Food* (426).

Figures for *Food supply per caput* (15.4, 42.2, 143, 0.6, 0.3): see procedure for wheat flour.

Cassava Starch

Again, *Production* (24) and *Export* (1) figures are shown in the respective columns. Since starch is exclusively used for non-food purposes the figure shown for *Available supply* (23) is repeated under *Other Uses* (23).

3. SUGARS AND SYRUPS

Assumptions

Sugar cane:

Production: 5000

Food: less than 1 percent is used as direct food according to extension workers and sugar industry

Food composition for 100 grs.: 30 calories, 0.2% protein, 0.0% fat

Sugar beet:

Production: 3100

Raw Sugar: Production: 765 of which 360 from sugar cane and 465 from sugar beet. Sugar industry reported extraction of raw sugar from cane to be around 11 percent and from sugar beet about 15 percent

Export: 22

Feed: 45 (information obtained from sugar industry)

Waste: 3% of available supply (percentage supplied by sugar industry)

All raw sugar is further processed into refined sugar

Sugar, refined:

Extraction rate: 92 percent.

Increases in stocks: - 45

Waste: 2 percent of available supply (information obtained from sugar industry)

Exports: 12

Food composition for 100 grs: 387 calories, 0% protein, 0% fat

Non-centrifugal sugar:

Extraction rate: 10 percent

Waste: 5 percent of available supply (information obtained from extension workers and local merchants)

Food composition for 100 grs: 259 calories, 0% protein, 0% fat

Syrups:

Production: 38

Imports: 1

Food composition for 100 grams: 310 calories, 0% protein, 0% fat

Molasses:

Extraction rate: 4.5 percent

Feed: 6

Sugar industry reported that Molasses are distilled into alcohol at an extraction rate of 24 percent)

Construction of the Balances

Food Balance Sheet

Population 27650 thousand

thousand metric tons

Commodity	Supply					Domestic utilization						Food supply per caput				
	Production	Change in stocks	Imports	Exports	Available supply	Feed	Seed	Food Manu-facture	Other uses	Waste	Food	Kg/ year	Grams/ day	Calories/ day Number	Protein/ day Grams	Fat/ day Grams
	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17
Sugar Cane	5000				5000			4960			40	1.4	4.0	1	-	-
Sugar Beet	3100				3100			3100								
Sugar, Raw	765		22		787	45		718		24						
Sugar Refined	661	-45		12	604					12	592	21.4	58.7	227	-	-
Sugar Non Centrifugal	137				137					7	130	4.7	12.9	45	0.1	-
Syrups	38		1		39						39	1.4	3.9	12	-	-
Molasses	287				287	6		281								

Sugar Cane

The official production figure is entered in the column *Production* (5000). The figure shown under *Food Manufacture* (4960) has been estimated. It represents the amount of sugar cane required for the production of raw (centrifugal) sugar (3272), syrups (318) and non-centrifugal sugar (1370). The remainder of the balance for sugar cane (40) is entered in the *Food* column and as such compares well with information obtained that less than 1 percent of sugar cane production is sucked directly.

Sugar Beet

The official production figure is entered in the column *Production* (3100). Since there are no reports about trade or specific domestic utilization it must be assumed that all production is processed into raw sugar and should be repeated under *Food Manufacture* (3100).

Sugar, Raw

Raw Sugar has been produced from both sugar cane and sugar beet: 360 is derived from sugar cane and 465 from sugar beet. Applying the extraction rates which were given by the sugar industry for raw sugar from sugar cane (11 percent) and from sugar beet (15 percent) 3272 of sugar cane and all the sugar beet (3100) is required for the production of raw sugar (765). The quantities reported for *Imports* (22) and *Animal feed* (45) are entered in the respective columns. *Waste* (24) has been calculated as 3 percent of the *Available supply* (787). The remaining raw sugar is further processed into refined sugar and shown under *Food Manufacture* (718).

Sugar, Refined

Production has been calculated as 92 percent of the quantity of raw sugar available for refining (718) and is shown under *Production* (661). *Change in stocks* (-45) as reported by the

sugar industry and official *Exports* (12) are entered in the respective columns. *Waste* (12) has been estimated as 2 percent of *Available supply* (604). The remainder of the balance represents the quantity of refined sugar available for human consumption and is shown under *Food* (592).

Figures for *Food supply per caput* (21.4, 58.7, 22.7): see procedure for wheat flour.

Sugar, Non-centrifugal

Production (137) has been estimated as 10 percent of the quantity of sugar cane (1370) that remains when the amounts of cane required for the *Production* of raw sugar (3272) and syrups (318) have been deducted from the quantity of sugar cane available for processing (4960). *Waste* (7) has been estimated as 5 percent of *Available supply* (137) and *Food* (130) is the remainder.

Figures for *Food supply per caput* (4.7, 12.9, 45, 0.1): see procedure for wheat flour.

Syrups

The figures reported for *Production* (38) and *Imports* (1) are entered in the respective columns. *Food* (39) is the remainder of the equation.

Figures for *Food supply per caput* (1.4, 3.9, 12, -, -): see procedure for wheat flour.

Molasses

Molasses is generally a by-product of the manufacturing of sugar cane (3272) and sugar beet (3100) into raw sugar. *Production* (288) can be estimated applying the extraction rate (4,5 percent) reported by the sugar industry. The amount of molasses which was reported to be used for animal feed is shown under *Feed* (6) and the remainder entered in the column *Food Manufacture* (281) since molasses is further processed into distilled alcohol.

4. PULSES, TREE NUTS

Construction of the Balances

In general, no specific procedures, which would need further explanations, have to be observed when preparing the balances for these commodities. The statistics available for elements of supply and domestic utilization are entered in the respective columns and for missing elements estimates must be prepared on the basis of pertinent information collected earlier from various sources. In most cases the quantity of the commodity in question available for human consumption is derived as the residual of the equation.

Figures for *per* caput Food *supply* can then be obtained following the procedure as described for wheat flour.

5. OILCROPS

Assumptions

Groundnuts in shell:

Production: 360

Exports: 4

Seed: seeding rate has been reported to be generally in the order of 80 kgs/ha; area planted in the subsequent year 250000 ha

Manufacture: oil industry informed that around 290000 MT were processed into shelled groundnuts

Waste: 8 percent of *Available supply* (information obtained from agricultural officers and the oil industry)

Food composition per 100 grams: 414 calories, 18.7% protein, 35.9% fat

Groundnuts, shelled:

Shelling rate is generally 65 percent

Exports: 28

Oil industry informed that a quantity of about 78 thousand MT was crushed into oil at an extraction rate of 45 percent

Waste: 1 percent of available supply (information obtained from oil industry)

Food composition per 100 grams: 567 calories, 25.7% protein, 49.2% fat

Olives:

Production: 2024

Exports: 30

Food composition per 100 grams: 175 calories, 1.3% protein, 17.5% fat

Construction of the Balances

Food Balance Sheet

Population 27650 thousand

thousand metric tons

Commodity	Supply					Domestic utilization						Food supply per caput				
	Production	Change in stocks	Imports	Exports	Available supply	Feed	Seed	Food Manufacture	Other uses	Waste	Food	Kg/ year	Grams/ day	Calories/ day Number	Protein/ day Grams	Fat/ day Grams
	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17
Groundnuts In Shell	360			4	356		20	290		28	18	0.7	1.8	7	0.3	0.6
Groundnuts Shelled	188			28	160			78		2	80	2.9	7.9	45	2.0	3.9
Olives	2024			30	1994			1953			41	1.5	4.1	7	0.1	0.7

Groundnuts in Shell

The figures for *Production* (360), *Exports* (4) and *Food Manufacture* (290) are entered in the respective columns. The quantity to be shown under *Seed* (20) is obtained by multiplying the seeding rate (80 kgs/ha) with the area reported to have been sown in the subsequent year (250000 ha). The amount of groundnut in shell lost during transport and storage can be estimated as 8 percent of the *Available supply* (356) and then be shown under *Waste* (28). The residual of the

equation represents the quantity available for human consumption and can be entered in the column *Food* (18).

Figures for *per caput Food supply* (0.7, 1.8, 7, 0.3, 0.6): see procedure for wheat flour.

Groundnuts, Shelled

Production (188) is an estimate. It has been derived by applying the shelling rate (65 percent) to the figure shown for groundnuts in shell in the column *Food Manufacture* (290). The quantity which has been reported by the oil industry to have been crushed into oil is entered in the column *Food Manufacture* (78). *Waste* (2) has been estimated as 1 percent of the *Available supply* (160). The amount of shelled groundnuts available for human consumption can be obtained as the residual of the equation and shown in the column *Food* (80).

Figures for *Food supply per caput* (2.9, 7.9, 45, 2.0, 3.9): see procedure for wheat flour.

Olives

The figures for *Production* (2024) and *Exports* (30) are entered in the respective columns. The amount of olives which were crushed into oil can be estimated on the basis of the reported production of olive oil (293) and extraction rate 15 %) and then be shown under *Food Manufacture* (1953). The residual of the equation represents the quantity of olives available for direct human consumption and should be inserted under *Food* (41).

Figures for *Food supply per caput* (1.5, 4.1, 7, -, 0.7): see procedure for wheat flour.

6. FRUIT, VEGETABLES

As in the case of pulses and tree nuts, there are generally no specific procedures which would need detailed explanations to be observed and the remark made above for pulses and tree nuts refer also to commodities of these groups.

However, in view of their different uses grapes merit a more detailed treatment.

Assumptions

Grapes:

Production: 1980
Exports: 12
Waste: 10 percent of supply available for human consumption (estimate obtained from merchants)
Food composition per 100 grams: 53 calories, 0.5% protein, 0.4% fat

Raisins:

Production: 142 (information obtained from manufacturers)
Extraction rate: 25 percent (information obtained from manufacturers)

Change in stocks: increase 3 (information obtained from manufacturers)
Exports: 67
Waste:5% of available supply
Food composition per 100 grams: 299 calories, 3.2% protein, 0.5% fat

Construction of the Balances

Food Balance Sheet

Population 27650 thousand

thousand metric tons

Commodity	Supply					Domestic utilization						Food supply per caput				
	Production	Change in stocks	Imports	Exports	Available supply	Feed	Seed	Food Manu-facture	Other uses	Waste	Food	Kg/ year	Grams/ day	Calories/ day Number	Protein/ day Grams	Fat/ day Grams
	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17
Grapes	1980			12	1968			1768		20	180	6.5	17.8	9	0.1	0.1
Raisins	142	-3		67	72					4	68	2.5	6.7	20	0.2	-

Grapes

The figures for *Production* (1980) and *Exports* (12) are entered in the respective columns. The amount of grapes which was used for the production of raisins and wine is an estimate and is shown under *Food Manufacture* (1768). It has been calculated as follows: the input/output ratio for raisins is 4:1 (extraction rate for raisins is 25 percent) i.e. 568 had to be processed to obtain 142 raisins. The extraction rate for wine is 70 percent, i.e. 1200 grapes were required to produce 840 wine. *Waste* (20) has been calculated as 10 percent of the quantity available after deducting from the *Available supply* (1968) the amount shown for *Food Manufacture* (1768). The residual of the equation represents the quantity of fresh grapes available for direct human consumption and should be shown under *Food* (180).

Figures for *Food supply per caput* (6.5, 17.8, 9, 0.1, 0.1): see procedure for wheat flour.

Raisins

The figures for *Production* (142), *Changes in stocks* (-3) and *Exports* (67) are entered in their respective columns. *Waste* (4) is 5 percent of *Available supply* (72) and the residual of the balance represents the quantity available for direct human consumption and is shown under *Food* (68).

Figures for *Food supply per caput* (2.5, 6.7, 20, 0.2, -): see procedure for wheat flour.

7. ALCOHOLIC BEVERAGES

Assumptions

Beer:

Production: 150
Exports: 18
Input/output ratio from barley malt to beer: 1:6.5 (information are obtained from brewing industry
Food composition for 100 grams: 49 calories, 0.5% protein, 0% fat

Wine:

Production: 840
Extraction rate: 70 (information obtained from vineries)
Change in stocks: decrease 4 (information obtained from vineries)
Imports: 3
Exports: 54
Waste: 1% of available supply (information obtained from vineries)
Food composition per 100 grams: 68 calories, 0% protein, 0% fat

Distilled alcohol:

Exports: 9
Food composition for 100 grams: 295 calories, 0% protein, 0% fat

Construction of the Balances

Food Balance Sheet

Population 27650 thousand

thousand metric tons

Commodity	Supply					Domestic utilization						Food supply per caput				
	Production	Change in stocks	Imports	Exports	Available supply	Feed	Seed	Food Manu-facture	Other uses	Waste	Food	Kg/ year	Grams/ day	Calories/ day Number	Protein/ day Grams	Fat/ day Grams
	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17
Beer	150			18	132						132	4.8	13.1	6	0.1	-
Wine	840	+4	3	54	793					8	785	28.4	77.8	53	-	-
Distilled alcohol	67			9	58						58	2.1	5.7	17	-	-

Beer

Production (150) has been estimated on the basis of the reported input/output ratio malt to beer of 1:6.5. Deducting from this quantity the *Exports* (18) the figure for *Available supply* (132) and *Food* (132) is obtained because there are no reports about other uses of beer.

Figures for *Food supply per caput* (6, 0.1, - , -, -): see procedure for wheat flour.

Wine

The figures reported for *Production* (840), *Change in stocks* (4), *Imports* (3) and *Exports* (54) are entered in the respective columns. *Waste* (8), has been calculated as 1 percent of the *Available supply* (793) and *Food* (785) is the residual of the equation.

Figures for *Food supply per caput* (28.4, 77.8, 53, -, -): see procedure for wheat flour.

Distilled Alcohol

Distilled alcohol is obtained by distilling 281 molasses. The figure for *Production* (67) is obtained by applying an extraction rate of 7 percent to *Food Manufacture* shown for molasses (296). Both the figures for *Production* (67) and *Exports* (9) are entered in the respective columns. Since there is no information available regarding other uses of alcohol the figures for *Available supply* and *Food* are identical (58).

Figures for *Food supply per caput* (2.1, 5.7, 17, -, -): see procedure for wheat flour.

8. VEGETABLE OILS

Assumptions

Groundnut oil:

Exports: 5
Extraction rate: 45 percent
Oil industry informed also that around 4 thousand MT were used for non-food purposes
Food composition per 100 grams: 884 calories, 0.0% protein, 100% fat

Olive oil:

Production: 293 (as reported by the oil industry)
Extraction rate: 15 percent (information supplied by oil industry)
Change in stocks: increase 22 (as reported by the oil industry)
Exports: 18
Other uses: 2 (reported by the oil industry to have been used for production of soap)
Waste: 1 percent of available supply (information supplied by oil industry)
The oil industry informed also that annual *per caput* consumption is generally around 9 kilograms
Food composition per 100 grams: 884 calories, 0% protein, 100% fat

Construction of the Balances

Food Balance Sheet

Population 27650 thousand

thousand metric tons

Commodity	Supply					Domestic utilization						Food supply per caput				
	Production	Change in stocks	Imports	Exports	Available supply	Feed	Seed	Food Manu-facture	Other uses	Waste	Food	Kg/ year	Grams/ day	Calories/ day Number	Protein/ day Grams	Fat/ day Grams
	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17
Groundnut Oil	35	-7		5	23				4		19	0.7	1.9	17	-	1.9
Olive Oil	293	-22		18	253				2	2	249	9.0	24.7	218	-	24.7

Groundnut Oil

Production has been estimated as 45 percent of the quantity of shelled groundnuts which have been crushed into oil (78). The figures for *Production* (35), *Change in stocks* (-7), *Exports* (5) and *Other uses* (4) are entered in their respective columns. *Food* (19) is the remainder of the equation.

Figures for *Food supply per caput* (0.7, 1.9, 17, -, 1.9): see procedure for wheat flour.

Olive Oil

The figures for *Production* (293), *Changes in stocks* (-22), *Exports* (18) and *Other uses* (2) are entered in their respective columns. *Waste* (2) has been calculated as 1 percent of the *Available supply* (253) and *Food* (249) is the residual of the balance . This agrees with the figure for annual *per caput* consumption (9 kgs) reported by the oil industry.

Figures for *Food supply per caput* (9.0, 24.7, 218, -, 24.7): see procedure for wheat flour.

3. *LIVESTOCK SECTOR*

1. MEAT

Assumptions

Beef and Veal:

Production: 490
Imports: 2
Exports: 32
Waste: 2 percent of available supply (information obtained from slaughterhouses, storage and transport enterprises)
Food composition per 100 grams: 225 calories, 14.7% protein, 18.0% fat

Cattle Offal:

Production: slaughterhouses informed that edible offal isabout 10 percent of carcass weight of cattle
Exports: 5
Other uses: meat processing industry informed that around 4000 MT were processed into pet food
Food composition per 100 grams: 105 calories, 18.4% protein, 2.5% fat

Pig Meat:

Production: 340
Imports: 1
Exports: 76
Waste: 2 percent (information obtained from slaughterhouses, storage and transport enterprises)
Food composition per 100 grams: 326 calories, 11.0% protein, 31.0% fat

Pig Offal:

Production: slaughterhouses informed that edible offal is about 6 percent of carcass weight of pigs

Other Uses: meat processing industry informed that around 3000 MT were utilized for non-food purposes i.e. pet food and pharmaceutical products

Food composition per 100 grams: 113 calories, 18.3% protein, 3.5% fat

According to information published in reports on household food consumption annual *per caput* consumption of meat varies between 25 and 30 kilograms.

Construction of the Balances

Food Balance Sheet

Population 27650 thousand

thousand metric tons

Commodity	Supply					Domestic utilization						Food supply per caput				
	Production	Change in stocks	Imports	Exports	Available supply	Feed	Seed	Food Manu-facture	Other uses	Waste	Food	Kg/ year	Grams/ day	Calories/ day Number	Protein/ day Grams	Fat/ day Grams
	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17
Beef and Veal	490		2	32	460					9	451	16.3	44.7	101	6.6	8.0
Offal of Cattle	49			5	44				5		39	1.4	3.9	4	0.7	0.1
Pigmeat	340		1	76	265					5	260	9.4	25.8	84	2.8	8.0
Offal of Pigs	20				20				3		17	0.6	1.7	2	0.3	0.1

Beef and Veal

The figures compiled for *Production* (490), *Imports* (2) and *Exports* (32) are entered in the respective columns. *Waste* (9) can be estimated as 2 percent of *Available supply* (460). Since there is no information regarding other domestic utilization of beef and veal, the residual of the balance must be assumed to be available for direct human consumption.

Figures for *Food supply per caput* (16.3, 44.7, 101, 6.6, 8.0): see procedure for wheat flour.

Cattle Offal

Production (49) has been estimated as 10 percent of the production of beef and veal (490). *Exports* (5) and the quantity processed into pet food shown under *Other uses* (5), are entered in the respective columns and the amount available for human consumption *Food* (39) is obtained as the residual of the balance.

Figures for *Food supply per caput* (1.4, 3.9, 4, 0.7, 0.1): see procedure for wheat flour.

Pig Meat

The figures compiled for *Production* (340), *Imports* (1) and *Exports* (76) are entered in the respective columns. *Waste* (5) can be estimated as 2 percent of *Available supply* (265). The rest of the balance is available for human consumption and shown under *Food* (260).

Figures *Food supply per caput* (9.4, 25.8, 84, 2.8, 8.0): see procedure for wheat flour.

Pig Offal

Production (20) has been estimated as 6 percent of the production of pig meat (340). The quantity processed into pet food and pharmaceutical products is shown under *Other uses* (3). The amount available for human consumption, *Food* (17), can be obtained as the residual of the equation.

Figures for *Food supply per caput* (0.6, 1.7, 2, 0.3, 0.1): see procedure for wheat flour.

2. MILK

Assumptions

Cow milk:

Production: 1800 (Ministry of Agriculture)
Imports: 15
Waste: 3 percent of the quantity of whole milk entering the distribution channel i.e. *Available supply* minus *Food Manufacture*
Food composition per 100 grams: 61 calories, 3.3% protein, 3.3% fat.

Skim milk:

Extraction rate: 95 percent (as reported by dairy industry)
Waste: 3 percent of available supply (as reported by dairy industry)

Cheese:

Production of whole milk cheese: 85 (as reported by dairy industry)
Production of skim milk cheese: 59 (as reported by dairy industry)
Extraction rate: for whole milk cheese: 12 percent (as reported by dairy industry)
for skim milk cheese: 16 percent (as reported by dairy industry)
Stock changes: decrease of whole milk cheese 3 (as reported by the dairy industry)
Increase of skim milk cheese: 2 (as reported by dairy industry)
Exports: whole milk cheese: 5 (as reported by dairy industry)
Skim milk cheese: 30 (as reported by dairy industry)
Food composition per 100 grams: whole milk cheese: 387 calories, 25% protein, 31% fat. Skim milk cheese: 247 calories, 46% protein, 4% fat

Skim milk, Dry:

Production: 16 (as reported by dairy industry)
Stock changes: increase of 4 (as reported by dairy industry)
Exports: 3
Extraction rate: 10 percent (as reported by dairy industry)
Food composition per 100 grams: 362 calories, 36.2% protein, 0.8% fat

Construction of Balances

Food Balance Sheet

Population 27650 thousand

thousand metric tons

Commodity	Supply					Domestic utilization						Food supply per caput				
	Production	Change in stocks	Imports	Exports	Available supply	Feed	Seed	Food Manufacture	Other uses	Waste	Food	Kg/ year	Grams/ day	Calories/ day Number	Protein/ day Grams	Fat/ day Grams
	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17
Cow Milk	1800		15		1815			1268		16	531	19.2	52.6	32	1.7	1.7
Skim milk	532				532			530		2						
Skim Milk Dry	16	-4		3	9						9	0.3	0.9	3	0.3	-
Cheese (Whole Milk)	85	+3		5	83						83	3.0	8.2	32	2.1	2.5
Cheese (Skim Milk)	59	-2		30	27						27	1.0	2.7	7	1.2	0.1

Cow Milk

The figures compiled for *Production* (1800) and *Exports* (15) are entered in the respective columns. The figure shown for *Food Manufacture* (1268) has been estimated. On the basis of an extraction rate of 12 percent around 708000 MT of whole milk are required for the production of whole milk cheese (85). For the production of butter (28) 560000MT of whole milk are required applying an extraction rate of 5 percent. The amount for *Waste* (16) has been calculated as 3 percent of 547 i.e. the quantity entering the distribution of fresh cow milk. The amount remaining then for human consumption is shown in column *Food* (531).

Figures for Food supply *per caput* (19.2, 52.6, 32, 1.7, 1.7): see procedure for wheat flour.

Skim Milk

The figure for *Production* (504) has been estimated. Dairy industry has informed that in the process of butter production skim milk represents around 95 percent of the quantity of whole milk used for the production of butter (560). On the basis of an extraction rate of 9 percent around 133 are needed for the production of dry skim milk (16). For the production of skim milk cheese (59) approximately 369 of skim milk are required applying an extraction rate of 16 percent. The balance of the equation is shown under *Waste* (2).

Skim Milk, Dry

The figures reported for *Production* (16), *Change in stocks* (-4) and *Exports* (3) are entered in the respective columns. The remainder of the equation represents the quantity of dry skim milk available for human consumption, i.e. *Food* (9).

Figures for *Food supply per caput* (0.3, 0.9, 3, 0.3, -): see procedure for wheat flour.

Cheese, Whole Milk

The figures compiled for *Production* (85), *Change in stocks* (3) and *Exports* (5) are entered in the respective columns. There is no information regarding further uses of whole milk cheese and therefore *Food* (83) can be taken to be equal to *Available supply* (83).

Figures for *Food supply per caput* (3.0, 8.2, 32, 2.1, 2.5): see procedure for wheat flour.

Cheese, Skim Milk

The figures for *Production* (59), *Change in stocks* (-2) and *Exports* (30) are entered in the respective columns. There being no information regarding further uses of skim milk cheese *Food* (27) can be taken to be equal to *Available supply* (27).

Figures for *Food supply per caput* (1.0, 2.7, 7, 1.2, 0.1): see procedure for wheat flour.

3. EGGS

Assumptions

Hen eggs:

Production: 140 (information supplied by the Ministry of Agriculture)
Imports: 13
Exports: 2
Seed: Ministry of Agriculture indicated that around 7 percent of production are usually used for reproduction (hatching)
Waste: 10 percent of the quantity of hen eggs entering the distribution channel (information obtained from transport enterprises and merchants)
Food composition for 100 grams: 139 calories, 10.7% protein, 9.8% fat

Construction of the Balances

Food Balance Sheet

Population 27650 thousand

thousand metric tons

Commodity	Supply					Domestic utilization						Food supply per caput				
	Production	Change in stocks	Imports	Exports	Available supply	Feed	Seed	Food Manu-facture	Other uses	Waste	Food	Kg/ year	Grams/ day	Calories/ day Number	Protein/ day Grams	Fat/ day Grams
	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17
Hen Eggs	140		13	2	151		10			14	127	4.6	12.6	17	1.3	1.2

The figures for *Production* (140), *Imports* (13) and *Exports* (2) are entered in the respective columns. The amount of eggs used for *Seed* – hatching - (10) has been estimated as 7 percent of *Production* (140). *Waste* (14) has been estimated as 10 percent of the quantity of eggs entering distribution channels (141) i.e. *Available supply* (151) minus *Seed* (10). The residual of the equation represents the quantity of hen eggs available for direct human consumption, *Food* (127).

Figures for *Food supply per caput* (4.6, 12.6, 17, 1.3, 1.2): see procedure for wheat flour.

4. ANIMAL OILS AND FATS

Assumption

Cattle fat:

Production: slaughterhouses informed that edible cattle fats constitute about 3 percent of carcass weight of cattle

Food composition per 100 grams: 847 calories, 2.0% protein, 93.0% fat

Pig fat:

Production: slaughterhouses informed that about 10 percent of the carcass weight of pigs are edible pig fat, about 12000 MT were reported to have been processed into lard

Food composition per 100 grams: 712 calories, 4.7% protein, 76.7% fat

Lard:

Extraction rate: 80 percent of pig fat

Imports: 2

Food composition per 100 grams: 902 calories, 0% protein, 100% fat

Butter:

Production: 28 (as reported by dairy industry)

Extraction rate: 5 percent (as reported by dairy industry)

Imports: 5

Food composition per 100 grams: 717 calories, 0.9% protein, 81.1% fat

Construction of the Balances

Food Balance Sheet

Population 27650 thousand

thousand metric tons

Commodity	Supply					Domestic utilization						Food supply per caput				
	Production	Change in stocks	Imports	Exports	Available supply	Feed	Seed	Food Manu-facture	Other uses	Waste	Food	Kg/ year	Grams/ day	Calories/ day Number	Protein/ day Grams	Fat/ day Grams
	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17
Fat of Cattle	15				15						15	0.5	1.5	13	-	1.4
Fat of Pigs	34				34			12			22	0.8	2.2	16	0.1	1.7
Lard	10		2		12						12	0.4	1.2	11	-	1.2
Butter	28		5		33						33	1.2	3.3	24	-	2.7

Cattle Fat

Production (15) has been estimated as 3 percent of the production of beef and veal (490). There is no information regarding further utilization. It can therefore be assumed that all cattle fat moves into human consumption and is therefore shown in the column *Food* (15).

Figures for *Food supply per caput* (0.5, 1.5, 13, -, 1.4): see procedure for wheat flour.

Pig Fat

Production (34) has been estimated as 10 percent of the production of pig meat (340). The quantity which was processed into lard is shown in the column *Food Manufacture*(12). The amount available for human consumption is obtained as the residual of the equation and shown under *Food* (22).

Figures for *Food supply per caput* (0.8, 2.2, 16, 0.1, 1.7): see procedure for wheat flour.

Lard

The figure for *Production* (10) has been obtained by applying the extraction rate (80 percent) to the quantity of pig fat reported to have been processed into lard (12). *Imports* (2) are entered in the respective column. Since there is no information regarding further utilization of lard it can be assumed that the quantity shown for *Available supply* (12) is available for human consumption and therefore shown also as *Food* (12).

Figures for *Food supply per caput* (0.4, 1.2, 11, -, 1.2): see procedure wheat flour.

Butter

The figures for *Production* (28) and *Imports* (5) are entered in the respective columns. There being no information regarding further uses of butter, *Food* (33) can be taken to be equal to *Available supply* (33).

Figures for *Food supply per caput* (1.2, 3.3, 24, -, 2.7): see procedure for wheat flour.

4. FISHERY SECTOR

1. FRESHWATER FISH

Assumptions

Freshwater fish:
Production (catch): 7
Imports: 1
Food composition per 100 grams: 69 calories, 10.9% protein, 2.5% fat

Freshwater fish canned
Imports: 7
Exports: 1
Food composition per 100 grams: 161 calories, 19.8% protein, 8.4% fat

Demersal fish:
Production (catch): 100
Imports: 14

Exports: 4
Other uses: 2 (fishery processing industry informed that around 2000 MT were used for pharmaceutical purposes)
Food composition per 100 grams: 42 calories, 8.3% protein, 0.8% fat

Demersal fish fillet:
Production: 40 (information supplied by fishery processing industry)
Imports: 18
Exports: 8
Extraction rate: 40 percent (information supplied by fishery processing industry)
Food composition per 100 grams: 90 calories, 17.9% protein, 1.6% fat

Pelagic fish:
Production (catch): 45
Exports: 9
Other uses: 3 (fishery processing industry informed that about 3000 MT were used for pharmaceutical purposes)
Food composition for 100 grams: 86 calories, 12.6% protein, 3.6% fat

Pelagic fish, canned:
Production: 7 (information supplied by fishery processing industry)
Imports: 40
Exports: 3
Extraction rate: 67 percent (information supplied by fishery processing industry)
Food composition per 100 grams: 185 calories, 20.8% protein, 10.2% fat

Pelagic fish, cured:
Exports: 6
Extraction rate: 75 percent (information supplied by fishery processing industry)

Crustaceans:
Production (catch): 15
Exports: 1
Food composition per 100 grams: 47 calories, 9.3% protein, 0.5% fat

Crustaceans, canned:
Imports: 8
Exports: 2
Food composition per 100 grams: 98 calories, 19.8% protein, 1.1% fat

Molluscs:
Production (catch): 24
Imports: 1
Exports: 4
Food composition per 100 grams: 15 calories, 2.3% protein, 0.2% fat

Molluscs, canned:
Production: 2 (information supplied by fishery processing industry)
Imports: 1
Extraction rate: 15 percent (information supplied by fishery processing industry)
Food composition per 100 g rams: 98 calories, 14.9% protein, 2.6% fat

Construction of the Balances

Food Balance Sheet

Population 27650 thousand

thousand metric tons

Commodity	Supply					Domestic utilization						Food supply per caput				
	Production	Change in stocks	Imports	Exports	Available supply	Feed	Seed	Food Manufacture	Other uses	Waste	Food	Kg/ year	Grams/ day	Calories/ day Number	Protein/ day Grams	Fat/ day Grams
	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17
Freshwater Fish	7		1		8						8	0.3	0.8	1	0.1	-
Freshwater Canned			7	1	6						6	0.2	0.6	1	0.1	0.1
Demersal Fish	100		14	4	110			100	2		8	0.3	0.8	-	0.1	-
Demersal Fillet	40		18	8	50						50	1.8	5.0	4	0.9	0.1
Pelagic Fish	45			9	36			18	3		15	0.5	1.5	1	0.2	0.1
Pelagic Canned	7		40	3	44						44	1.6	4.4	8	0.9	0.4
Pelagic Cured	6			6												
Crustaceans	15			1	14						14	0.5	1.4	1	0.1	-
Crustaceans Canned			8	2	6						6	0.2	0.6	1	0.1	-
Molluscs	24		1	4	21			13			8	0.3	0.8	-	-	-
Molluscs Canned	2		1		3						3	0.1	0.3	-	-	-

Freshwater Fish

The figures compiled for *Production* (catch) (7) and *Imports* (1) are entered in their respective columns. The element *Food* (8) is equal to *Available supply* (8), there being no information about further uses of freshwater fish.

Figures for *Food supply per caput* (0.3, 0.8, 1, 0.1, -): see procedure for wheat flour.

Freshwater Fish, Canned

The figures compiled for *Imports* (7) and *Exports* (1) are entered in the respective columns. *Food* (6) is equal to *Available supply* (6).

Figures for *Food supply per caput* (0.2, 0.6, 1, 0.1, -): see procedure for wheat flour.

Demersal Fish

The figures compiled for *Production* (catch) (100), *Imports* (14) and *Exports* (4) are entered in the respective columns. The figure for *Food Manufacture* (100) has been estimated as the amount of fresh demersal fish required to produce 40 filleted fresh demersal fish on the basis of an extraction rate of 40 percent. *Food* (8) is the residual of the equation.

Figures for *Food supply per caput* (0.3, 0.8, -, 0.1, -): see procedure for wheat flour.

Demersal Fish Fillet

The figures available for *Production* (40), *Imports* (18) and *Exports* (8) are entered in the respective columns. The amount obtained for *Available supply* (50) is equal to *Food* (50), since there is no information regarding further uses of filleted demersal fish.

Figures for *Food supply per caput* (1.8, 5.0, 4, 0.9, 0.1): see procedure for wheat flour.

Pelagic Fish

The figures obtained for *Production* (catch) (45), *Exports* (9) and *Other uses* (3) are entered in the respective columns. The figure for *Food Manufacture* (18) has been estimated. Based on the known extraction rate (67 percent) around 10 pelagic fish are required for the production of canned pelagic fish. There are no reports about the production of cured pelagic fish. However, *Exports* (6) have been reported and in the absence of an offsetting quantity of imports they have decreased the national supply of pelagic fish. In order to account for this fact the figure shown for *Food Manufacture* should also include the fresh fish equivalent of the exported cured pelagic fish. At the reported extraction rate of 75 percent this would amount to 8. The residual of the equation represents the quantity available for direct human consumption, *Food* (15).

Figures for *Food supply per caput* (0.5, 1.5, 1, 0.2, 0.1): see procedure for wheat flour.

Pelagic Fish, Canned

The figures compiled for *Production* (7), *Imports* (40) and *Exports* (3) are entered in the respective columns. The amount obtained for *Available supply* (44) is equal to *Food* (44), since there is no information available regarding further uses of canned pelagic fish.

Figures for *Food supply per caput* (1.6, 4.4, 8, 0.9, 0.4): see procedure for wheat flour.

Pelagic Fish, Cured

The procedure to estimate *Production* (6) has been described already above when dealing with fresh pelagic fish. The figure for *Exports* (6) is then entered in the respective column and this finishes the equation.

Crustaceans

The figures compiled for *Production* (catch) (15) and *Exports* (1) are entered in the respective columns. *Available supply* (14) equals *Food* (14) since there is no information regarding further uses of crustaceans.

Figures for *Food supply per caput* (0.5, 1.4, 1, 0.1, -): see procedure for wheat flour.

Crustaceans, Canned

The figures for *Imports* (8) and *Exports* (2) are entered in the respective columns. The figure obtained for *Available supply* (6) can be repeated also for *Food* (6) since there are no reports about further uses of canned crustaceans.

Figures for *Food supply per caput* (0.2, 0.6, 1, 0.1, -): see procedure for wheat flour.

Molluscs

The figures compiled for *Production* (catch) (24), *Imports* (1) and *Exports* (4) are entered in the respective columns. The amount shown for *Food Manufacture* (13) represents the fresh mollusc equivalent for the production of canned molluscs at an extraction rate of 15 percent. The quantity of molluscs available for direct human consumption is the remainder of the balance and should be shown under *Food* (8).

Figures for *Food supply per caput* (0.3, 0.8, -, -, -): see procedure for wheat flour.

Molluscs, Canned

The figure for *Production* (2) and *Imports* (1) are entered in the respective columns. The quantity obtained for *Available Supply* (3) can also be shown for *Food* (3) since are no reports regarding further uses of canned molluscs.

Figures for *Food supply per caput* (0.1, 0.3, -, -, -): see procedure for wheat flour.

IV. APPLICATIONS AND USES FOR FOOD BALANCE SHEETS DATA

1. STANDARDIZATION OF FOOD BALANCE SHEETS

The utilization of all the information which was assembled for the construction of a food balance sheet 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 capita* 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 standardizing the detailed food balance sheet. Standardization can be achieved by showing only primary commodities, i.e. processed commodities are converted into their originating primary commodity equivalent. Because the statistical information for processed commodities is mostly limited to trade, the commodity list can be confined to primary commodities - except for sugar, oils, fats and alcoholic beverages. Whenever possible, trade in processed commodities is 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.

The section that follows describes the various steps to be taken in the standardization process.

Illustration I shows the information referring to cereals and milk in a detailed food balance sheet.

Illustration II shows the first step: bringing processed products back to their originating commodities, i.e. flour to cereals, skim milk to cow milk. For this purpose, calories and nutrients from processed products are simply added to the calorie and nutrient values of the primary commodity.

The "input" to the processed commodity - Wheat, hard (1064); Wheat, soft (708); Other cereals (1259) and Skim milk (150)- is subtracted from the quantities shown under "Manufacture for food". This should eliminate the data under the latter. If more than one processed product results from the originating commodity, then each input is subtracted. In the case of by-products, just one subtraction is necessary cancelling all processing inputs.

The data of other entries concerning the processed products with the exception of "food" (i.e. in this example trade, feed, waste) are added to the equation of the originating commodity after multiplication by the reciprocal of the extraction rate.

Wheat, hard:

Extraction rate (wheat/flour)		85%	
Reciprocal			118%
Waste			
Wheat			91
Wheat flour	18		
Wheat equivalent of flour (18 x 118%)			21
Total waste (wheat equivalent)			112

Wheat, soft:

Extraction rate (wheat/flour)		80%	
Reciprocal			125%
Imports			
Wheat			400
Wheat flour	45		
Wheat equivalent of flour	(40 x 125%)		56
Total imports (wheat equivalent)			456
Waste			
Wheat			57
Wheat flour	12		
Wheat equivalent of flour	(12 x 125%)		15
Total waste (wheat equivalent)			72

Other cereals:

Extraction rate (other cereals/flour)		80%	
Reciprocal			125%
Imports			
Other cereals flour		35	
Other cereals equivalent of flour	(35 x 125%)		44
Waste			
Other cereals		175	
Other cereals flour		73	
Other cereals equivalent of flour	(73 x 125%)		91
Total waste (other cereals equivalent)			266

Cow milk:

Extraction rate (milk/skim milk)		96%
Reciprocal		104%
Feed		
Skim milk	36	
Milk equivalent of skim milk	(36 x 104%)	38
Waste		
Cow milk		21
Skim milk	10	
Milk equivalent of skim milk	(10 x 104%)	10
Total waste (milk equivalent)		31

The "food" data of the original/parent commodity is now recalculated using the new values of its equation. One equation for the primary commodity now replaces the two former equations. The above procedure involves one subtraction, some multiplications and final additions.

In Illustration III a further reduction of the number of equations in the standardization process can be achieved by aggregating the equations for commodities of similar nutritive values, such as wheat and other cereals into cereals, and cow, goat and sheep milk into milk, etc. This procedure requires simply adding the equations of the commodities concerned which reduces a very long list of commodities to a workable size for input into econometric models.

Illustration IV. While there are practically no difficulties in standardizing the equations for individual commodities or groups of commodities of similar nutritive values (Illustrations II and III) some conceptual problems arise in calculating the aggregate equation for the whole food balance sheet. Such an aggregate is a useful tool for many types of analysis. It enables the calculation of ratios, such as the ratio of production to total supply or imports to total supply, which are helpful in assessing self-sufficiency or import-dependence. The calculation of shares of the different components over total utilization allows the assessment of trends of domestic utilization versus exports, for example.

The first problem in calculating the aggregate equation concerns the elimination of intermediate consumption and double-counting, particularly when there exist processed commodities originating from the same parent commodity (e.g. skim milk and butter) which belong by their very nature to different food groups, e.g. skim milk to the food group "Milk" and butter to the food group "Oils and fats". The appropriate procedure has already been described and need not be repeated here (see Illustration II). The second problem is related to the selection of the unit to be used for the conversion of the elements of the various commodities into homogeneous values. These can be monetary values or nutritive values. In the first case, prices are used as conversion factors, in the second, the nutrient content per weight.

Food Balance Sheet

Population 14.000 (thousand) Country ..... Year.....

(Thousand metric tons, unless otherwise specified)

Commodity	Production		Change in Stocks	Gross Import	Supply	Gross Export	Domestic utilization							Per caput consumption				
	Input	Output					Total	Feed	Seed	Manufacture for		Waste	Food	Kg/ year	Grams/ day	Cal./ day No	Prot./ day Grams	Fat/ day Grams
										Food	Industrial Use							
ILLUSTRATION I																		
Wheat, hard		1300			1300		1300		145	1064		91						
Wheat, hard/flour	1064	904			904		904					18	886	63.3	173.4	607	23.2	2.4
Wheat, soft		410		400	810		810		45	708		57						
Wheat, soft/flour	708	566		45	611		611					12	599	42.8	117.2	409	11.5	1.5
Other cereals		2500			2500	80	2420	750	236	1259		175						
Other cereals/flour	1259	1007		35	1042		1042					73	969	69.2	189.6	639	18.4	3.6
Cow milk		400		13	413		413			150		21	242	17.3	47.4	31	1.7	1.7
Cow milk/skim milk	150	144			144		144	36				10	98	7	19.2	7	0.7	0.1
Goat milk		22			22		22					11	11	0.8	2.2	2	0.1	0.1
Sheep milk		18			18		18					9	9	0.6	1.8	2	0.1	0.1
Total																1697	55.7	9.5
ILLUSTRATION II																		
Wheat, hard		1300			1300		1300		145			112	1043			607	23.2	2.4
Wheat, soft		410		456	866		866		45			72	749			409	11.5	1.5
Other cereals		2500		44	2544	80	2464	750	236			266	1212			639	18.4	3.6
Cow milk		400		13	413		413	38				31	344			38	2.4	1.8
Goat milk		22			22		22					11	11			2	0.1	0.1
Sheep milk		18			18		18					9	9			2	0.1	0.1
Total																1697	55.7	9.5
ILLUSTRATION III																		
Wheat		1710		456	2166		2166		190			184	1792			1016	34.7	3.9
Other cereals		2500		44	2544	80	2464	750	236			266	1212			639	18.4	3.6
Cereals total		4210		500	4710	80	4630	750	426			450	3004			1655	53.1	7.5
Cow milk		400		13	413		413	38				31	344			38	2.4	1.8
Goat + sheep milk		40			40		40					20	20			4	0.2	0.2
Milk total		440		13	453		453	38				51	364			42	2.6	2
Total																1697	55.7	9.5
ILLUSTRATION IV																		
Wheat		969.5		258.6	1228.1		1228.1		107.7			104.3	1016.1			1016	34.7	3.9
Other cereals		1317.5		23.2	1340.7	42.2	1298.5	395.2	124.4			140.2	638.7			639	18.4	3.6
Cow milk		44.0		1.4	45.4		45.4	4.2				3.4	37.8			38	2.4	1.8
Goat + sheep milk		8.0			8.0		8.0					4.0	4.0			4	0.2	0.2
Total		2339.0		283.2	2622.2	42.2	2580.0	399.4	232.1			251.9	1696.6			1697	55.7	9.5

In the example below, caloric factors are used to convert the standardized equations of wheat, other cereals, cow milk and goat and sheep milk into homogeneous values which can then be added in order to obtain the aggregate of these commodities.

After having standardized the equations of the various commodities (see Illustration III) the number of calories for the newly-defined commodities are divided by the new "food" quantities in order to arrive at an endogenous calorie conversion factor. Needless to say, in the unstandardized detailed food balance sheet (Illustration I) these factors came from an external food composition table. Each element in the equation can now be converted into calories. The calculations for the various commodities are illustrated below.

				Metric Tons		Calories
Wheat						
Calories	1016	= 0.567	x 1710	(production)	=	969.5
Food	1792		456	(imports)	=	258.6
			2166	(supply)	=	1228.1
			190	(seed)	=	107.7
			184	(waste)	=	104.3
			1792	(food)	=	1016.1
Other cereals						
Calories	639	=O.527	x 2500	(production)	=	1317.5
Food	1212		44	(imports)	=	23.2
			2544	(supply)	=	1340.7
			80	(exports)	=	42.2
			2464	(total)	=	1298.5
			750	(feed)	=	395.2
			236	(seed)	=	124.4
			266	(waste)	=	140.2
			1212	(food)	=	638.7
Cow milk						
Calories	38	= 0.110 x	400	(production)	=	44.0
Food	344		13	(imports)	=	1.4
			413	(supply)	=	45.4
			38	(feed)	=	4.2
			31	(waste)	=	3.4
			344	(food)	=	37.8

Goat milk and sheep milk

Calories	4	= 0.200 x	40 (production)	=	8.0
Food	20		40 (supply)	=	8.0
			20 (waste)	=	4.0
			20 (food)	=	4.0

The sums of each column (production, trade, feed, seed, manufacture, waste and food) represent the caloric value (in terms of kilocalories/*caput*/day) of the respective elements of all the commodities shown in Illustration I.

2. *IMPORT DEPENDENCY RATIO (IDR)*

In the course of analysing the food situation of a country, an important aspect is to know how much of the available domestic food supply has been imported and how much comes from the country's own production. The IDR answers this question. It is defined as

$$IDR = \frac{\text{Imports}}{\text{production + imports - exports}} \times 100$$

The complement of this ratio to 100 would represent that part of the domestic food supply that has been produced in the country itself. There is, however, a caveat to be kept in mind: these ratios hold only if imports are mainly used for domestic utilization and are not re-exported.

Based on the figures contained in Illustration III above, the IDR for wheat, other cereals, cow milk, total cereals and total milk would be calculated as follows:

Wheat:

$$IDR = \frac{456}{1710 + 456 - 0} \times 100 = 21.05\%$$

Other cereals:

$$IDR = \frac{44}{2\,500 + 44 - 80} \times 100 = 1.79\%$$

Cow milk:

$$IDR = \frac{13}{400 + 13 - 0} \times 100 = 3.15\%$$

Total cereals:

$$IDR = \frac{500}{4\,210 + 500 - 80} \times 100 = 10.80\%$$

Total milk:

$$IDR = \frac{13}{440 + 13 - 0} \times 100 = 2.87\%$$

Based on these calculations, it can be concluded that around 80% of the domestic supply of wheat, 98% of other cereals, 97% of cow milk, 89% of all cereals and 97% of all milk come from domestic production.

Using the figures shown in Illustration IV, the IDR for the aggregate of cereals and milk, including processed products derived therefrom, would be:

$$IDR = \frac{283.2}{2339.0 + 283.2 - 42.2} \times 100 = 10.98\%$$

indicating that almost 90% of the domestic supply of this aggregate was produced in the country.

3. SELF-SUFFICIENCY RATIO (SSR)

The self-sufficiency ratio expresses the magnitude of production in relation to domestic utilization. It is defined as:

$$SSR = \frac{\text{Production}}{\text{Production} + \text{imports} - \text{exports}} \times 100$$

Again, as in the case of the IDR, the SSR can be calculated for individual commodities, groups of commodities of similar nutritional values and, after appropriate conversion of the commodity equations, also for the aggregate of all commodities.

Using the figures shown in Illustrations III and IV, the self-sufficiency ratio would be determined as follows.

Wheat:

$$SSR = \frac{1710}{1710 + 456 - 0} \times 100 = 78.95\%$$

Other cereals:

$$SSR = \frac{2\,500}{2\,500 + 44 - 80} \times 100 = 101.46\%$$

Cow milk:

$$SSR = \frac{400}{400 + 13 - 0} \times 100 = 96.85\%$$

Total cereals:

$$SSR = \frac{4\,210}{4\,210 + 500 - 80} \times 100 = 90.93\%$$

Total milk:

$$SSR = \frac{440}{440 + 13 - 0} \times 100 = 97.13\%$$

Based on the figures shown in Illustration IV, the SSR for the aggregate of cereals and milk, including processed products derived therefrom, would be:

$$SSR = \frac{2\,339.0}{2\,339.0 + 283.2 - 42.2} \times 100 = 90.66$$

indicating that around 90% of the country's supply of cereals and milk originates from the country's own production.

In the context of food security, the SSR is often taken to indicate the extent to which a country relies on its own production resources, i.e. the higher the ratio the greater the self-sufficiency. While the SSR can be the appropriate tool when assessing the supply situation for individual commodities, a certain degree of caution should be observed when looking at the overall food situation. In the case, however, where a large part of a country's production of one commodity, e.g. other cereals, is exported, the SSR may be very high but the country may still

have to rely heavily on imports of food commodities to feed the population. This is easily demonstrated by increasing in Illustration I both production and export figures of the commodity "other cereals" by 1000 MT. The elements for production and exports in the equation for "total cereals and milk" in Illustration IV would change to 2869.2 and 569.2, respectively. The SSR and IDR would then change as follows:

$$SSR = \frac{2\,866.0}{2\,866.0 + 283.2 - 569.2} \times 100 = 111.09\%$$

$$IDR = \frac{283.2}{2\,866.0 + 283.2 - 569.2} \times 100 = 10.98\%$$

It follows that, in spite of a very high self-sufficiency rate, the country imports about 11% of its supply of the aggregate "Cereals and Milk" with only about 90% of its domestic supply coming from the country's own production.

These explanations have been given to show that the self-sufficiency rate (as defined above) cannot be the complement to 100 of the import dependency rate, or vice-versa.

4. ANALYSIS OF THE PATTERN OF PER CAPUT FOOD SUPPLY

Food balance sheets contain the basic information which is useful in analyzing a country's food supply situation. The section below provides a few examples regarding the analysis of the pattern of *per caput* food supplies for the world.

Table 1 shows the daily *per caput* food supply by product group in terms of calories, protein and fat over the 30-year period 1961 to 1995. The figures in Table 2 are based on Table 1 and show the percent contribution of the various product groups to the daily *per caput* food supplies. Table 3 shows the trends and changes of the pattern of the *per caput* food supplies. Table 4 shows the annual *per caput* supply of the various product groups in terms of kilograms together with their indices.

In reviewing the tables, it becomes clear that over the 30-year period the daily *per caput* food supply increased steadily. By the mid-nineties the energy supply was about 20 percent and the protein supply 16 percent higher than at the beginning of the sixties. The fat content of the diet rose by almost 50 percent over this period.

Examining the share of vegetable and animal products in total food supply, it can be observed that their contribution remained fairly stable: for energy at a ratio of 5 to 1, and for protein at 2 to 1. In the case of fat, however, some noteworthy shifts can be observed during the period under observation. While the share of vegetable fat in the total fat supply increased steadily, the contribution of animal fat dropped.

Cereals evidently are the major source of energy and protein. They alone contribute about half of the supply of both energy and protein. Since the beginning of the sixties, the daily *per caput* supply of energy rose by about 20 percent and that of protein by about 15 percent. It is interesting to note the important role of cereals as a source of fat in the diet, which is often not fully recognized. Almost 10 percent of *per caput* fat supplies are derived from cereals.

Starchy roots play a minor role in the world's diet, contributing about 5 percent to the energy and 3 percent to the protein supply. Their consumption has dropped by more than a quarter during the period under observation.

Sugar, syrups and honey are mainly a source of energy, and in recent years provided around 9 percent of the total calorie supply. Consumption of these products increased steadily from the early sixties and in 1995 was in terms of quantity a quarter higher than at the beginning of the period under observation.

Pulses, tree nuts and oilcrops are an important source of protein. In recent years, they contribute 9 percent to the overall protein supply, 7 percent to the supply of fat and less than 5 percent of the total energy supply. However, a considerable shift took place regarding the consumption pattern: while *per caput* food supplies of pulses decreased by one third, supplies of tree nuts and oilcrops increased by more than a quarter in quantitative terms.

Vegetable oils and animal fats are the major sources of fat. Nevertheless, they contribute less than half of the total *per caput* fat supply, indicating the considerable amount of invisible fat from other product groups in the diet. The considerable shift that took place from animal fats to fats of vegetable origin during the last decades is worth noting.

Vegetables and fruits are usually considered as sources of minerals and vitamins. It should, however, not be overlooked that they also provide energy, protein and small amounts of fat. About 5 percent of calories and protein are derived from these product groups. At the world level they contribute to twice as many calories as eggs and fish together. Their contribution to the protein supply is as large as that of fish and twice that of eggs, and their contribution to the fat supply is as large as that of fish.

Meat consumption increased considerably over the period of observation and was in 1995 about 60 percent higher than in the early sixties. In recent years meat contributes 7 percent of calories, 17 percent of protein and 22 percent of fat.

Eggs are important mainly as a source of protein and fat. They contribute around 3 percent of the total protein, and fat supply is around 3 percent. Their annual *per caput* supply increased steadily during the period of observation and in 1995 is 60 percent higher than at the beginning of the period under observation.

Milk is, after meat, with around 10 percent, the second largest source of animal protein. It is also important for its fat and calorie content: around 10 percent of fat and 4 percent of calories are derived from milk.

Fish is important mainly as a source of protein. While it contributes almost 6 percent to the overall protein supply, only 1 percent of the calorie supply is derived from fish. However, it is worth noting that its consumption in terms of quantity has almost doubled since the early sixties.

TABLE 1 WORLD DAILY PER CAPUT FOOD SUPPLY

CALORIES (Number)

Products Group	1961	1965	1970	1975	1980	1985	1990	1995
GRAND TOTAL	**2257**	**2369**	**2425**	**2422**	**2528**	**2634**	**2698**	**2718**
VEGETABLE PRODUCTS	**1919**	**2016**	**2064**	**2055**	**2141**	**2229**	**2282**	**2284**
CEREALS	1138	1204	1224	1223	1280	1346	1377	1351
ROOTS AND TUBERS	183	182	186	175	157	139	134	137
SUGAR, SYRUPS, HONEY	195	210	223	220	237	241	243	235
PULSES	89	85	72	63	58	59	58	60
TREE NUTS OILCRP EXCL OIL	44	45	49	47	44	50	53	61
VEG OILS AND FATS	111	128	141	150	180	202	222	229
VEGETABLES EXCL MELONS	43	38	38	39	41	45	49	56
FRUIT INCL MELONS	55	59	61	61	64	66	67	74
STIMULANTS	4	5	5	5	5	5	5	6
SPICES	4	4	5	5	5	6	6	6
ALCOHOLIC BEVERAGES	53	58	64	68	72	70	69	70
ANIMAL PRODUCTS	**338**	**353**	**361**	**367**	**387**	**405**	**417**	**434**
MEAT AND OFFAL	114	129	136	144	160	168	184	197
EGGS	18	18	20	20	22	24	25	29
MILK AND PROD EXCL BUTTR	116	113	112	112	113	118	115	117
ANIMAL OILS AND FATS	71	71	69	66	68	68	64	61
FISH FOOD	18	20	21	23	23	25	27	28

PROTEIN (Grams)

GRAND TOTAL	**62.4**	**64.1**	**64.7**	**64.9**	**66.5**	**69.3**	**71.0**	**72.5**
VEGETABLE PRODUCTS	**42.9**	**43.6**	**43.3**	**42.6**	**43.2**	**45.0**	**45.8**	**46.2**
CEREALS	28.7	29.9	30.1	30.1	31.3	32.7	33.4	32.8
ROOTS AND TUBERS	2.6	2.6	2.6	2.4	2.2	2.0	1.9	2.0
SUGAR SYRUPS HONEY	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
PULSES	5.5	5.4	4.5	4.0	3.7	3.7	3.6	3.7
TREE NUTS OILCRP EXCL OIL	2.1	2.1	2.5	2.3	2.2	2.4	2.4	2.8
VEG OILS AND FATS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VEGETABLES EXCL MELONS	2.3	2.0	2.0	2.1	2.2	2.4	2.6	3.0
FRUIT INCL MELONS	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.9
STIMULANTS	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
SPICES	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
ALCOHOLIC BEVERAGES	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
ANIMAL PRODUCTS	**19.5**	**20.5**	**21.4**	**22.3**	**23.2**	**24.3**	**25.2**	**26.3**
MEAT AND OFFAL	8.5	9.3	9.8	10.3	11.1	11.4	12.1	12.7
EGGS	1.4	1.4	1.5	1.6	1.7	1.8	1.9	2.2
MILK AND PROD EXCL BUTTER	6.7	6.5	6.6	6.7	6.8	7.1	6.9	7.0
ANIMAL OILS AND FATS	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
FISH FOOD	2.7	3.1	3.3	3.5	3.4	3.7	4.0	4.2

FAT (Grams)

GRAND TOTAL	**47.4**	**50.9**	**53.1**	**54.1**	**59.2**	**63.7**	**67.4**	**70.1**
VEGETABLE PRODUCTS	**22.7**	**24.9**	**26.6**	**27.4**	**30.7**	**33.9**	**36.6**	**38.0**
CEREALS	5.1	5.2	5.4	5.3	5.4	5.6	5.8	5.6
ROOTS AND TUBERS	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3
SUGAR SYRUPS HONEY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PULSES	0.6	0.6	0.5	0.4	0.4	0.4	0.4	0.4
TREE NUTS OILCRP EXCL OIL	3.0	3.1	3.3	3.2	3.0	3.6	3.8	4.4
VEG OILS AND FATS	12.6	14.5	15.9	17.0	20.4	22.8	25.1	25.9
VEGETABLES EXCL MELONS	0.4	0.3	0.3	0.3	0.4	0.4	0.4	0.5
FRUIT INCL MELONS	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4
STIMULANTS	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3
SPICES	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2
ALCOHOLIC BEVERAGES	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0
ANIMAL PRODUCTS	**24.7**	**26.0**	**26.4**	**26.8**	**28.5**	**29.9**	**30.8**	**32.1**
MEAT AND OFFAL	8.5	9.9	10.4	11.0	12.4	13.2	14.6	15.8
EGGS	1.2	1.3	1.4	1.4	1.5	1.6	1.7	2.0
MILK AND PROD EXCL BUTTER	6.4	6.2	6.1	6.1	6.1	6.5	6.4	6.5
ANIMAL OILS AND FATS	7.9	8.0	7.7	7.3	7.6	7.6	7.2	6.8
FISH FOOD	0.6	0.7	0.8	0.9	0.8	0.9	1.0	1.0

TABLE 2 WORLD DAILY PER CAPUT FOOD SUPPLY

PERCENT CONTRIBUTION OF CALORIES

Products Group	1961	1965	1970	1975	1980	1985	1990	1995
GRAND TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
VEGETABLE PRODUCTS	**85.0**	**85.1**	**85.1**	**84.8**	**84.7**	**84.6**	**84.6**	**84.0**
CEREALS	50.4	50.8	50.5	50.5	50.6	51.1	51.0	49.7
ROOTS AND TUBERS	8.1	7.7	7.7	7.2	6.2	5.3	5.0	5.0
SUGAR SYRUPS HONEY	8.7	8.8	9.2	9.1	9.4	9.2	9.0	8.6
PULSES	3.9	3.6	3.0	2.6	2.3	2.2	2.1	2.2
TREE NUTS OILCRP EXCL OIL	1.9	1.9	2.0	1.9	1.7	1.9	2.0	2.2
VEG OILS AND FATS	4.9	5.4	5.8	6.2	7.1	7.7	8.2	8.4
VEGETABLES EXCL MELONS	1.9	1.6	1.6	1.6	1.6	1.7	1.8	2.1
FRUIT INCL MELONS	2.4	2.5	2.5	2.5	2.5	2.5	2.5	2.7
STIMULANTS	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
SPICES	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
ALCOHOLIC BEVERAGES	2.4	2.4	2.6	2.8	2.8	2.7	2.6	2.6
ANIMAL PRODUCTS	**15.0**	**14.9**	**14.9**	**15.2**	**15.3**	**15.4**	**15.4**	**16.0**
MEAT AND OFFAL	5.0	5.5	5.6	5.9	6.3	6.4	6.8	7.3
EGGS	0.8	0.8	0.8	0.8	0.9	0.9	0.9	1.1
MILK AND PROD EXCL BUTTER	5.1	4.7	4.6	4.6	4.5	4.5	4.3	4.3
ANIMAL OILS AND FATS	3.1	3.0	2.9	2.7	2.7	2.6	2.4	2.2
FISH FOOD	0.8	0.8	0.9	1.0	0.9	0.9	1.0	1.0

PERCENT CONTRIBUTION OF PROTEIN

GRAND TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
VEGETABLE PRODUCTS	**68.8**	**68.0**	**66.9**	**65.6**	**65.0**	**64.9**	**64.5**	**63.7**
CEREALS	46.0	46.6	46.5	46.4	47.1	47.2	47.0	45.2
ROOTS AND TUBERS	4.2	4.1	4.0	3.7	3.3	2.9	2.7	2.8
SUGAR SYRUPS HONEY	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
PULSES	8.8	8.4	7.0	6.2	5.6	5.3	5.1	5.1
TREE NUTS OILCRP EXCL OIL	3.4	3.3	3.9	3.5	3.3	3.5	3.4	3.9
VEG OILS AND FATS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VEGETABLES EXCL MELONS	3.7	3.1	3.1	3.2	3.3	3.5	3.7	4.1
FRUIT INCL MELONS	1.1	1.1	1.1	1.1	1.2	1.2	1.1	1.2
STIMULANTS	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
SPICES	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
ALCOHOLIC BEVERAGES	0.3	0.3	0.3	0.5	0.5	0.4	0.4	0.4
ANIMAL PRODUCTS	**31.3**	**32.0**	**33.1**	**34.4**	**34.9**	**35.1**	**35.5**	**36.3**
MEAT AND OFFAL	13.6	14.5	15.1	15.9	16.7	16.5	17.0	17.5
EGGS	2.2	2.2	2.3	2.5	2.6	2.6	2.7	3.0
MILK AND PROD EXCL BUTTER	10.7	10.1	10.2	10.3	10.2	10.2	9.7	9.7
ANIMAL OILS AND FATS	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
FISH FOOD	4.3	4.8	5.1	5.4	5.1	5.3	5.6	5.8

PERCENT CONTRIBUTION OF FAT

GRAND TOTAL	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
VEGETABLE PRODUCTS	**47.9**	**48.9**	**50.1**	**50.6**	**51.9**	**53.2**	**54.3**	**54.2**
CEREALS	10.8	10.2	10.2	9.8	9.1	8.8	8.6	8.0
ROOTS AND TUBERS	0.8	0.8	0.8	0.7	0.5	0.5	0.4	0.4
SUGAR SYRUPS HONEY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PULSES	1.3	1.2	0.9	0.7	0.7	0.6	0.6	0.6
TREE NUTS OILCRP EXCL OIL	6.3	6.1	6.2	5.9	5.1	5.7	5.6	6.3
VEG OILS AND FATS	26.6	28.5	29.9	31.4	34.5	35.8	37.2	36.9
VEGETABLES EXCL MELONS	0.8	0.6	0.6	0.6	0.7	0.6	0.6	0.7
FRUIT INCL MELONS	0.6	0.6	0.6	0.6	0.7	0.6	0.6	0.6
STIMULANTS	0.4	0.4	0.4	0.4	0.3	0.5	0.4	0.4
SPICES	0.4	0.2	0.4	0.4	0.3	0.3	0.3	0.3
ALCOHOLIC BEVERAGES	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.0
ANIMAL PRODUCTS	**52.1**	**51.1**	**49.7**	**49.5**	**48.1**	**46.9**	**45.7**	**45.8**
MEAT AND OFFAL	17.9	19.4	19.6	20.3	20.9	20.7	21.7	22.5
EGGS	2.5	2.6	2.6	2.6	2.5	2.5	2.5	2.9
MILK AND PROD EXCL BUTTR	13.5	12.2	11.5	11.3	10.3	10.2	9.5	9.3
ANIMAL OILS AND FATS	16.7	15.7	14.5	13.5	12.8	11.9	10.7	9.7
FISH FOOD	1.3	1.4	1.5	1.7	1.4	1.4	1.5	1.4

TABLE 3 WORLD DAILY PER CAPUT FOOD SUPPLY

INDICES OF CALORIES (1961 = 100)

Products Group	1961	1965	1970	1975	1980	1985	1990	1995
GRAND TOTAL	**100.0**	**104.9**	**107.4**	**107.3**	**112.0**	**116.7**	**119.5**	**120.4**
VEGETABLE PRODUCTS	**100.0**	**105.0**	**107.6**	**107.1**	**111.5**	**116.1**	**118.9**	**119.0**
CEREALS	100.0	105.8	107.5	107.5	112.4	118.3	121.0	118.8
ROOTS AND TUBERS	100.0	99.2	101.4	95.7	85.6	76.0	73.2	74.8
SUGAR SYRUPS HONEY	100.0	107.2	114.3	112.7	121.4	123.5	124.2	120.3
PULSES	100.0	95.9	80.7	71.5	65.3	66.4	65.1	67.6
TREE NUTS OILCRP EXCL OIL	100.0	103.2	111.6	106.4	99.8	114.3	120.0	138.0
VEG OILS AND FATS	100.0	115.5	126.8	135.0	162.2	181.4	199.5	205.9
VEGETABLES EXCL MELONS	100.0	88.2	86.8	90.5	93.5	103.9	112.0	129.1
FRUIT INCL MELONS	100.0	106.0	110.1	109.8	115.8	120.3	122.1	134.1
STIMULANTS	100.0	111.9	109.5	109.5	109.5	119.0	128.6	131.0
SPICES	100.0	95.3	109.3	107.0	118.6	134.9	137.2	146.5
ALCOHOLIC BEVERAGES	100.0	108.1	119.1	127.9	134.3	131.5	130.0	131.5
ANIMAL PRODUCTS	**100.0**	**104.4**	**106.8**	**108.6**	**114.6**	**119.9**	**123.3**	**128.5**
MEAT AND OFFAL	100.0	113.8	120.0	126.8	140.9	148.1	161.8	173.9
EGGS	100.0	102.9	112.0	115.4	122.9	134.3	140.6	164.6
MILK AND PROD EXCL BUTTR	100.0	96.8	96.5	96.5	96.8	101.6	99.2	100.5
ANIMAL OILS AND FATS	100.0	100.3	97.7	92.4	95.8	96.1	90.6	85.8
FISH FOOD	100.0	113.1	122.3	133.1	130.9	141.7	151.4	158.9

INDICES OF PROTEIN (1961 = 100)

GRAND TOTAL	**100.0**	**102.7**	**103.7**	**104.0**	**106.6**	**111.1**	**113.8**	**116.2**
VEGETABLE PRODUCTS	**100.0**	**101.6**	**100.9**	**99.3**	**100.7**	**104.9**	**106.8**	**107.7**
CEREALS	100.0	104.2	104.9	104.9	109.1	113.9	116.4	114.3
ROOTS AND TUBERS	100.0	100.0	100.0	92.3	84.6	76.9	73.1	76.9
SUGAR SYRUPS HONEY	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PULSES	100.0	98.2	81.8	72.7	67.3	67.3	65.5	67.3
TREE NUTS OILCRP EXCL OIL	100.0	100.0	119.0	109.5	104.8	114.3	114.3	133.3
VEG OILS AND FATS	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
VEGETABLES EXCL MELONS	100.0	87.0	87.0	91.3	95.7	104.3	113.0	130.4
FRUIT INCL MELONS	100.0	100.0	100.0	100.0	114.3	114.3	114.3	128.6
STIMULANTS	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
SPICES	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
ALCOHOLIC BEVERAGES	100.0	100.0	100.0	150.0	150.0	150.0	150.0	150.0
ANIMAL PRODUCTS	**100.0**	**105.1**	**109.7**	**114.4**	**119.0**	**124.6**	**129.2**	**134.9**
MEAT AND OFFAL	100.0	109.4	115.3	121.2	130.6	134.1	142.4	149.4
EGGS	100.0	100.0	107.1	114.3	121.4	128.6	135.7	157.1
MILK AND PROD EXCL BUTTER	100.0	97.0	98.5	100.0	101.5	106.0	103.0	104.5
ANIMAL OILS AND FATS	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
FISH FOOD	100.0	114.8	122.2	129.6	125.9	137.0	148.1	155.6

INDICES OF FAT (1961 = 100)

GRAND TOTAL	**100.0**	**107.4**	**112.0**	**114.1**	**124.9**	**134.4**	**142.2**	**147.9**
VEGETABLE PRODUCTS	**100.0**	**109.7**	**117.2**	**120.7**	**135.2**	**149.3**	**161.2**	**167.4**
CEREALS	100.0	102.0	105.9	103.9	105.9	109.8	113.7	109.8
ROOTS AND TUBERS	100.0	100.0	100.0	100.0	75.0	75.0	75.0	75.0
SUGAR SYRUPS HONEY	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
PULSES	100.0	100.0	83.3	66.7	66.7	66.7	66.7	66.7
TREE NUTS OILCRP EXCL OIL	100.0	103.3	110.0	106.7	100.0	120.0	126.7	146.7
VEG OILS AND FATS	100.0	115.1	126.2	134.9	161.9	181.0	199.2	205.6
VEGETABLES EXCL MELONS	100.0	75.0	75.0	75.0	100.0	100.0	100.0	125.0
FRUIT INCL MELONS	100.0	100.0	100.0	100.0	133.3	133.3	133.3	133.3
STIMULANTS	100.0	100.0	100.0	100.0	100.0	150.0	150.0	150.0
SPICES	100.0	50.0	100.0	100.0	100.0	100.0	100.0	100.0
ALCOHOLIC BEVERAGES	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
ANIMAL PRODUCTS	**100.0**	**105.3**	**106.9**	**108.5**	**115.4**	**121.1**	**124.7**	**130.0**
MEAT AND OFFAL	100.0	116.5	122.4	129.4	145.9	155.3	171.8	185.9
EGGS	100.0	108.3	116.7	116.7	125.0	133.3	141.7	166.7
MILK AND PROD EXCL BUTTER	100.0	96.9	95.3	95.3	95.3	101.6	100.0	101.6
ANIMAL OILS AND FATS	100.0	101.3	97.5	92.4	96.2	96.2	91.1	86.1
FISH FOOD	100.0	116.7	133.3	150.0	133.3	150.0	166.7	166.7

TABLE 4 WORLD YEARLY PER CAPUT FOOD SUPPLY

KILOGRAMS / YEAR

PRODUCTS GROUP	1961	1965	1970	1975	1980	1985	1990	1995
VEGETABLE PRODUCTS	**363.6**	**367.5**	**377.1**	**376.8**	**382.4**	**394.3**	**401.7**	**417.4**
CEREALS	116.5	123.0	125.0	124.9	130.5	137.2	140.3	137.6
ROOTS AND TUBERS	73.0	71.5	72.5	68.1	60.8	54.7	52.1	52.8
SUGAR SYRUPS HONEY	21.5	23.1	24.4	23.9	25.5	26.7	27.2	27.1
PULSES	9.4	9.1	7.6	6.8	6.2	6.3	6.2	6.4
TREE NUTS OILCRP EXCL OIL	7.4	7.3	7.7	7.2	6.8	7.7	8.0	9.4
VEG OILS AND FATS	4.9	5.6	6.2	6.5	7.8	8.7	9.6	9.8
VEGETABLES EXCL MELONS	60.4	53.8	53.5	55.8	57.3	64.2	69.1	78.2
FRUIT INCL MELONS	41.9	43.5	45.5	46.0	48.6	51.5	51.9	58.2
STIMULANTS	1.6	1.7	1.7	1.7	1.7	1.7	1.8	1.7
SPICES	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.7
ALCOHOLIC BEVERAGES	26.5	28.4	31.5	33.8	34.9	33.1	32.8	32.9
ANIMAL PRODUCTS	**91.4**	**91.3**	**92.6**	**94.7**	**95.8**	**99.8**	**102.3**	**107.5**
MEAT AND OFFAL	21.0	23.0	24.5	25.8	28.2	29.3	31.6	33.6
EGGS	4.5	4.6	5.0	5.2	5.5	6.0	6.3	7.3
MILK AND PROD EXCL BUTTER	55.2	52.1	50.9	50.9	49.2	50.6	49.8	51.0
ANIMAL OILS AND FATS	3.6	3.6	3.6	3.5	3.6	3.7	3.5	3.0
FISH FOOD	6.6	7.3	8.1	8.8	8.8	9.7	10.6	11.9

INDICES OF KILOGRAMS / YEAR (1961 = 100)

VEGETABLE PRODUCTS	**100.0**	**101.1**	**103.7**	**103.6**	**105.2**	**108.4**	**110.5**	**114.8**
CEREALS	100.0	105.6	107.3	107.3	112.1	117.8	120.5	118.1
ROOTS AND TUBERS	100.0	98.0	99.3	93.3	83.3	74.9	71.3	72.4
SUGAR SYRUPS HONEY	100.0	107.5	113.4	111.1	118.8	124.1	126.5	126.4
PULSES	100.0	96.2	80.8	71.7	65.6	66.7	65.2	67.6
TREE NUTS OILCRP EXCL OIL	100.0	98.3	104.1	96.5	91.5	104.5	108.2	127.4
VEG OILS AND FATS	100.0	115.1	126.4	134.5	160.9	179.5	196.5	202.1
VEGETABLES EXCL MELONS	100.0	89.0	88.5	92.4	94.8	106.3	114.4	129.5
FRUIT INCL MELONS	100.0	103.9	108.7	109.9	116.1	122.9	123.8	139.0
STIMULANTS	100.0	106.8	106.1	105.6	106.7	110.5	115.3	109.5
SPICES	100.0	96.1	109.6	108.2	117.6	134.3	134.6	143.3
ALCOHOLIC BEVERAGES	100.0	106.9	118.6	127.3	131.4	124.7	123.5	124.1
ANIMAL PRODUCTS	**100.0**	**99.9**	**101.3**	**103.7**	**104.9**	**109.3**	**112.0**	**117.6**
MEAT AND OFFAL	100.0	109.9	116.8	123.1	134.6	139.7	150.7	160.3
EGGS	100.0	102.9	111.9	115.5	123.4	134.3	140.5	162.8
MILK AND PROD EXCL BUTTER	100.0	94.4	92.1	92.2	89.1	91.5	90.1	92.4
ANIMAL OILS AND FATS	100.0	100.9	99.5	96.7	101.6	102.5	96.9	84.7
FISH FOOD	100.0	111.2	123.2	133.7	132.8	147.3	160.7	180.6

ANNEXES

Food composition in terms of the retail weight ("as purchased") in 100 grams
For international use

ITEM	CALORIES kcal	PROTEIN Grams	FAT Grams
CEREALS AND PRODUCTS			
WHEAT	334	12.2	2.3
FLOUR OF WHEAT	364	10.9	1.1
BRAN OF WHEAT	213	12.1	3.1
MACARONI	367	11.0	1.1
GERM OF WHEAT	382	29.1	10.7
BREAD	249	8.2	1.2
BULGUR WHOLEMEAL	345	12.3	2.0
PASTRY	369	7.4	17.0
WHEAT STARCH	362	0.5	0.3
WHEAT GLUTEN	380	95.0	0.0
RICE PADDY	280	6.0	1.4
RICE HUSKED	357	7.5	1.8
RICE MILLED	360	6.7	0.7
RICE BROKEN	360	6.7	0.7
RICE FLOUR	366	6.4	0.8
RICE GLUTEN	380	95.0	0.0
RICE STARCH	362	0.5	0.3
BRAN OF RICE	276	13.3	15.8
BARLEY	332	11.0	1.8
POT BARLEY	348	9.6	1.1
BARLEY PEARLED	346	9.0	1.4
BARLEY FLOUR AND GRITS	343	9.2	1.7
MALT OF BARLEY	368	13.1	1.9
MALT EXTRACTS	367	6.0	0.0
MAIZE	356	9.5	4.3
GERM OF MAIZE	373	11.1	38.5
FLOUR OF MAIZE	363	8.4	1.2
MAIZE GLUTEN	380	95.0	0.0
STARCH OF MAIZE	362	0.5	0.3
POP CORN	356	9.5	4.3
RYE	319	11.0	1.9
FLOUR OF RYE	341	9.0	1.8
OATS	385	13.0	7.5
OATS ROLLED	384	16.0	6.3
MILLET	340	9.7	3.0
FLOUR OF MILLET	340	9.7	3.0
SORGHUM	343	10.1	3.3
FLOUR OF SORGHM	343	10.1	3.3
BUCKWHEAT	330	11.0	2.0
FLOUR OF BUCKWHEAT	344	6.4	1.2
QUINOA	342	12.0	5.0
FONIO	338	8.0	3.0
FLOUR OF FONIO	355	9.0	2.2
TRITICALE	327	11.6	2.1
FLOUR OF TRITICALE	341	11.4	2.1
CANARY SEED	388	16.0	6.0
MIXED GRAIN	340	8.0	1.5
FLOUR OF MIXED GRAIN	364	10.0	1.1
CEREALS NES	340	8.0	1.5
WAFERS	439	9.2	13.1
FLOUR OF CEREALS	364	10.0	1.1
BREAKFAST CEREALS	389	7.4	0.7
CEREALS PREPARED NES	364	10.0	1.1
MIXES AND DOUGHS	393	6.2	12.0
FOOD PREPARATIONS FLOUR	377	7.5	2.7
ROOTS, TUBERS AND PRODUCTS			
POTATOES	67	1.6	0.1
FLOUR OF POTATOES	349	8.5	0.4
POTATOES FROZEN	73	1.2	0.0
POTATO STARCH	362	0.5	0.3
POTATO TAPIOCA	362	0.5	0.3
SWEET POTATOES	92	0.7	0.2
CASSAVA	109	0.9	0.2
FLOUR OF CASSAVA	338	1.5	0.6
CASSAVA TAPIOCA	362	0.5	0.3
CASSAVA DRIED	255	2.8	0.7
CASSAVA STARCH	362	0.5	0.3
YAUTIA (COCOYAM)	109	1.7	0.3
TARO (COCOYAM)	86	1.5	0.2
YAMS	101	1.3	0.2
ROOTS, TUBERS NES	91	1.6	0.2
FLOUR OF ROOTS AND TUBERS	282	5.0	0.6
ROOTS, TUBERS DRIED	282	5.0	0.6
SUGAR AND SYRUPS			
SUGAR CANE	30	0.2	0.0
SUGAR BEETS	70	1.3	0.1
SUGAR CROPS NES	390	0.0	0.0
SUGAR, CENTRIFUGAL RAW	373	0.0	0.0
SUGAR REFINED	387	0.0	0.0

ITEM	CALORIES kcal	PROTEIN Grams	FAT Grams
SUGAR, NONCENTRIFUGAL	351	1.0	0.0
MOLASSES	232	0.0	0.0
MAPLE SUGAR	348	0.0	0.0
SUGAR AND SYRUP NES	310	0.0	0.0
SUGAR CONFECTIONERY	310	0.0	0.0
SUGARS FLAVOURED	310	0.0	0.0
GLUCOSE AND DEXTROSE	368	0.0	0.0
LACTOSE	387	0.0	0.0
ISOGLUCOSE	318	0.0	0.0
FRUCTOSE CHEMICAL	375	0.0	0.0
OTHER FRUCTOSE	298	0.3	0.0
MALTOSE CHEMICAL	375	0.0	0.0
HONEY	298	0.4	0.0
PULSES			
BEANS, DRY	341	22.1	1.7
BROAD BEANS DRY	343	23.4	2.0
PEAS, DRY	346	22.5	1.8
CHICK-PEAS	358	20.1	4.5
COW PEAS DRY	342	23.4	1.8
PIGEON PEAS	343	20.9	1.7
LENTILS	346	24.2	1.8
BAMBARA BEANS	365	17.7	6.3
VETCHES	325	31.5	1.9
LUPINS	390	40.0	13.0
PULSES NES	340	22.0	2.0
FLOUR OF PULSES	340	22.0	2.0
TREENUTS			
BRAZIL NUTS	315	6.9	31.8
CASHEW NUTS	252	7.7	20.6
CHESTNUTS	158	1.8	1.7
ALMONDS	236	8.0	20.9
WALNUTS	289	6.4	27.8
PISTACHIOS	289	10.3	24.2
KOLANUTS	349	9.0	2.0
HAZELNUTS	291	6.0	28.8
ARECANUTS	245	4.9	4.4
BRAZILNUT SHELLED	656	14.3	66.2
CASHEW NUTS SHELLED	574	15.3	46.4
ALMONDS SHELLED	589	20.0	52.2
WALNUTS SHELLED	642	14.3	61.9
HAZELNUTS SHELLED	632	13.0	62.6
NUTS NES	262	7.0	25.0
PREPARED NUTS	615	15.5	56.2
SOYBEANS	335	38.0	18.0

ITEM	CALORIES kcal	PROTEIN Grams	FAT Grams
CAKE OF SOYA BEANS	261	46.0	5.0
SOYA SAUCE	56	5.5	0.5
SOYA PASTE	114	11.0	5.8
SOYA CURD	58	6.3	3.1
GROUNDNUTS IN SHELL	414	18.7	35.9
GROUNDNUTS SHELLED	567	25.7	49.2
CAKE OF GROUNDNUTS	363	41.7	7.6
GROUNDNUTS PREPARED	580	26.8	49.2
PEANUT BUTTER	589	24.3	50.0
COCONUTS	184	1.7	17.4
COCONUTS DESICCATED	660	6.9	64.5
COPRA	636	6.0	61.4
OIL PALM FRUIT	158	0.3	13.2
PALM KERNELS	514	7.3	43.4
OLIVES	175	1.3	17.5
OLIVES,PRESERVED	109	1.1	11.1
KARITE NUTS	579	6.8	49.0
SUNFLOWER SEED	308	12.3	26.8
RAPESEED	494	19.6	45.0
SAFFLOWER	314	9.7	30.3
SESAME SEED	573	17.7	49.7
CAKE OF SESAME SEED	376	40.7	3.4
MUSTARD SEED	469	24.9	28.8
FLOUR OF MUSTARD SEED	469	26.4	36.3
POPPY SEED	533	18.0	44.7
MELONSEED	400	18.2	33.9
COTTONSEED	253	17.3	17.9
LINSEED	498	18.0	34.0
OILSEEDS NES	387	14.7	31.7
FLOUR/MEAL OF OILSEEDS	393	37.2	15.6
VEGETABLES AND PRODUCTS			
CABBAGES	19	1.0	0.1
ARTICHOKES	20	1.1	0.1
ASPARAGUS	12	1.6	0.1
LETTUCE	12	1.1	0.2
SPINACH	16	2.1	0.3
CASSAVA LEAVES	53	5.8	1.1
TOMATOES	17	0.8	0.2
TOMATO JUICE	17	0.8	0.1
TOMATO JUICE CONCENTRATED	76	3.4	0.4
TOMATO PASTE	84	3.8	0.9
TOMATOES PEELED	19	0.9	0.2
CAULIFLOWER	9	0.8	0.1
PUMPKINS, SQUASH, GOURDS	19	0.9	0.1
CUCUMBERS, GHERINKS	13	0.5	0.1

ITEM	CALORIES kcal	PROTEIN Grams	FAT Grams
EGGPLANTS	21	0.9	0.1
CHILLIES, PEPPERS,GREEN	25	1.1	0.3
ONIONS,SHALLOTS, GREEN	24	1.7	0.1
ONIONS, DRY	31	1.1	0.2
GARLIC	130	5.5	0.4
LEEKS	37	0.7	0.1
BEANS, GREEN	50	3.0	0.4
PEAS, GREEN	31	2.1	0.2
BROAD BEANS,GREEN	23	2.3	0.1
STRING BEANS	27	1.6	0.1
CARROTS	38	0.9	0.2
OKRA	31	1.6	0.3
GREEN CORN	56	2.1	0.8
SWEET CORN FROZEN	54	1.8	0.4
SWEET CORN PREPARED	77	2.3	0.6
MUSHROOMS	24	2.0	0.4
MUSHROOMS CANNED	24	1.9	0.3
MUSHROOMS DRIED	296	9.6	1.0
VEGETABLES NES FRESH	22	1.4	0.2
VEGETABLES NES DRIED	176	11.2	1.6
VEGETABLES NES CANNED	36	1.4	0.3
VEGETABLES NES JUICE	19	0.6	0.1
VEGETABLES DEHYDRATED	341	6.6	1.3
VEGETABLES PREPARED BY VINEGAR	29	1.4	1.3
VEGETABLES PREPARED NES	38	2.1	0.3
VEGETABLES FROZEN	71	3.3	0.5
VEGETABLES PROVISIONALLY PRESERVED	65	3.3	0.3
VEGETABLES PREPARED OR PRES.FROZEN	54	2.4	0.4
HOMOGENIZED VEGETABLES PREPARED	41	1.2	0.5
FRUITS AND PRODUCTS			
BANANAS	60	0.7	0.3
PLANTAINS	75	0.8	0.3
ORANGES	34	0.7	0.1
ORANGE JUICE	42	0.6	0.1
ORANGE JUICE CONCENTRATED	159	2.4	0.2
TANGERINES, MANDARINES, CLEMENTINES	32	0.5	0.1
TANGERINES JUICE	43	0.5	0.2
LEMONS AND LIMES	15	0.6	0.2
LEMON JUICE	22	0.5	0.3
LEMON JUICE CONCENTRATED	116	2.3	0.9
GRAPEFRUIT AND POMELO	16	0.3	0.1
GRAPEFRUIT JUICE	39	0.5	0.1
GRAPEFRUIT JUICE CONCENTRATED	146	2.0	0.5
CITRUS FRUIT NES	26	0.5	0.2
CITRUS FRUIT NES JUICE	47	0.6	0.2
CITRUS FRUIT NES JUICE CONCENTRATED	157	2.1	0.5
APPLES	48	0.1	0.3
APPLES JUICE	47	0.1	0.1
APPLES JUICE CONCENTRATED	166	0.5	0.4
PEARS	54	0.4	0.4
QUINCES	35	0.2	0.1
APRICOTS	45	1.3	0.4
SOUR CHERRY	45	0.9	0.3
CHERRIES	65	1.1	0.9
PEACHES AND NECTARINES	33	0.5	0.1
PLUMS	52	0.7	0.6
PLUM JUICE	71	0.6	0.0
PLUM JUICE CONCENTRATED	215	2.0	0.1
STONE FRUIT NES	52	0.9	0.3
POME FRUIT NES	48	0.4	0.3
CAROBS	111	1.6	0.5
STRAWBERRIES	28	0.6	0.4
RASPBERRIES	47	0.9	0.5
GOOSEBERRIES	44	0.9	0.6
CURRANTS	59	1.4	0.3
BLUEBERRIES	55	0.7	0.4
CRANBERRIES	47	0.4	0.2
BERRIES NES	49	1.0	0.7
GRAPES	53	0.5	0.4
GRAPE JUICE	61	0.6	0.1
WATERMELONS	17	0.3	0.2
MELONS	17	0.4	0.1
FIGS	73	0.8	0.3
MANGOES	45	0.4	0.2
MANGO JUICE	62	0.3	0.4
MANGO PULP	65	0.5	0.3
AVOCADOS	119	1.5	11.3
PINEAPPLES	26	0.2	0.2
PINEAPPLES CANNED	78	0.4	0.1
PINEAPPLES JUICE	56	0.3	0.1
PINEAPPLES JUICE CONCENTRATED	179	1.3	0.1
PERSIMMONS	82	0.6	0.3
CASHEWAPPLE	43	0.8	0.6
KIWI	52	0.9	0.4
PAPAYAS	26	0.4	0.1
FRUIT TROPICAL NES	41	0.5	0.7
FRUIT NES FRESH	45	0.5	0.5
FRUIT NES JUICE	48	0.5	0.1
FRUIT NES PREPARED	36	0.5	0.2
FLOUR OF FRUIT	346	3.9	1.8
FRUIT,NUTS,FRUIT PEEL PRESERVED BY SUGAR	212	0.6	0.0

ITEM	CALORIES kcal	PROTEIN Grams	FAT Grams
FRUIT COOKED HOMOGENIZED	59	0.3	0.0
Dried fruits			
APRICOTS DRIED	238	3.7	0.5
PLUMS DRIED	208	2.3	0.5
RAISINS	299	3.2	0.5
FIGS DRIED	253	3.0	1.2
DATES	156	1.5	0.4
FRUIT TROPICAL NES DRIED	267	2.8	0.6
FRUIT NES DRIED	267	2.8	0.6
STIMULANTS			
COFFEE GREEN	47	6.7	0.0
COFFEE ROASTED	56	8.0	0.0
COFFEE SUBSTITUTES	56	8.0	0.0
COFFEE EXTRACTS	129	4.0	0.0
CHICORY ROOTS	60	1.1	0.2
COCOA BEANS	414	4.0	40.0
COCOA PASTE	472	1.7	44.0
COCOA BUTTER	711	0.0	85.0
COCOA POWDER	261	17.3	19.0
CHOCOLATE PRODUCTS NES	393	4.2	35.7
TEA	40	10.0	0.0
EXTRACT TEA	18	4.5	0.0
TEA NES	40	10.0	0.0
MATE	40	10.0	0.0
SPICES			
PEPPER WHITE/LONG/BLACK	276	10.7	2.7
PIMENTO	318	12.0	17.3
CINNAMON	261	3.9	3.2
CLOVES	323	6.0	20.1
NUTMEG	525	5.8	36.3
ANISE	345	15.8	14.9
GINGER	347	9.1	6.0
SPICES NES	337	11.3	15.5
ALCOHOLIC BEVERAGES			
WHEAT FERMENTED BEVERAGE	60	1.9	0.3
RICE FERMENTED BEVERAGE	133	0.3	0.0
BEER BARLEY	49	0.5	0.0
BEER MAIZE	40	0.4	0.0
BEER MILLET	40	0.4	0.0
BEER SORGHUM	40	0.4	0.0
FERMENTED BEVERAGES, CIDER ETC.	47	0.1	0.0
MUST OF GRAPES	61	0.6	0.1
WINE	68	0.0	0.0
VERMOUTHS AND SIMILAR	137	0.1	0.0
BEVERAGES DIST. ALCOHOL	295	0.0	0.0
MEAT AND PRODUCTS			
BEEF BONELESS	150	18.5	7.9
BEEF DRIED SALTED SMOKED	203	34.3	6.3
MEAT EXTRACTS	238	16.0	8.9
BEEF SAUSAGES	313	11.7	28.4
BEEF PREPARATIONS	233	25.0	14.0
BEEF CANNED	233	25.0	14.0
HOMOGENIZED MEAT PREPARED	110	13.7	5.7
LIVER PREPARATIONS	315	13.6	2.8
OFFALS OF CATTLE	105	18.4	2.5
BUFFALO MEAT	77	11.3	3.1
OFFALS OF BUFFALO	105	18.4	2.5
MUTTON AND LAMB	263	13.5	22.8
OFFALS OF SHEEP	117	14.6	5.7
GOAT MEAT	123	14.0	7.0
OFFALS OF GOATS	117	14.6	5.7
PIGMEAT	326	11.0	31.0
PORK	220	13.4	18.0
BACON - HAM OF PIGS	362	13.1	34.1
PIG MEAT SAUSAGES	417	11.7	40.3
PIG MEAT PREPARATIONS	239	16.1	18.8
OFFALS OF PIGS	113	18.3	3.5
CHICKEN MEAT	122	12.3	7.7
CHICKEN MEAT CANNED	165	21.8	8.0
OFFAL OF CHICKENS	125	18.0	3.9
FAT LIVER PREPARATIONS	462	11.4	43.8
DUCK MEAT	291	8.3	28.3
OFFALS LIVER DUCKS	136	18.7	4.6
GOOSE MEAT	301	12.9	27.2
OFFALS LIVER GEESE	133	16.4	4.3
TURKEY MEAT	126	16.1	6.3
OFFALS LIVER TURKEYS	137	20.0	4.0
PIGEONS OTHER BIRDS	226	14.2	18.3
POULTRY MEAT	185	17.1	12.4
HORSEMEAT	85	15.5	2.0
OFFALS OF HORSES	105	18.4	2.5
MEAT OF ASSES	94	15.0	3.0
MEAT OF MULES	94	15.0	3.0
MEAT OF CAMELS	174	12.7	13.2
OFFALS OF CAMELS	105	18.4	2.5
RABBIT MEAT	118	17.0	5.0

ITEM	CALORIES kcal	PROTEIN Grams	FAT Grams
MEAT OF OTHER RODENTS	81	16.2	1.4
MEAT OF OTHER CAMELIDS	143	14.6	9.0
OFFALS OF OTHER CAMELIDS	105	18.4	2.5
GAME MEAT	104	18.0	3.0
MEAT NES	126	16.4	6.0
MEAT NES DRIED	250	55.4	1.5
MEAT PREPARED NES	242	20.6	16.9
OFFALS NES	105	18.4	2.5
SNAILS NOT SEA	42	6.3	0.5
EGGS			
HEN EGGS	139	10.7	9.8
EGGS LIQUID HEN	158	12.1	11.2
EGGS DRY HEN	594	45.8	41.8
EGG ALBUMINE	49	10.1	0.0
EGGS EXCLUDING HEN EGGS	163	11.3	12.1
FISH AND FISHERIES PRODUCTS			
FRESHWATER DIADROMOUS FISH FRESH	69	10.9	2.5
FRESHWATER DIADROMOUS FISH FILLET	127	20.3	4.5
FRESHWATER DIADROMOUS FISH CURED	199	31.3	7.2
FRESHWATER DIADROMOUS FISH CANNED	161	19.8	8.4
FRESHWATER DIADROM. FISH PREPARED NES	262	26.9	15.0
DEMERSAL FISH FRESH	42	8.3	0.8
DEMERSAL FISH FILLET	90	17.9	1.6
DEMERSAL FISH CURED	186	37.9	1.9
DEMERSAL FISH CANNED	173	25.0	6.3
DEMERSAL FISH PREPARED NES	320	25.0	23.5
PELAGIC FISH FRESH	86	12.6	3.6
PELAGIC FISH FILLET	141	20.2	6.0
PELAGIC FISH CURED	156	26.4	4.5
PELAGIC FISH CANNED	185	20.8	10.2
PELAGIC FISH PREPARED NES	318	44.2	13.6
MARINE FISH NES FRESH	64	10.3	2.2
MARINE FISH NES FILLET	115	19.0	3.8
MARINE FISH NES CURED	169	32.1	3.2
MARINE FISH NES CANNED	179	22.9	8.2
MARINE FISH PREPARED NES	132	17.5	5.0
CRUSTACEANS FRESH	47	9.3	0.5
CRUSTACEANS FROZEN	91	18.4	0.8
CRUSTACEANS CURED	149	25.4	1.3
CRUSTACEANS CANNED	98	19.8	1.1
CRUSTACEANS PREPARED NES	113	19.5	1.8
MOLLUSCS FRESH	15	2.3	0.2
MOLLUSCS FROZEN	71	10.5	1.2
MOLLUSCS CURED	345	49.4	4.7

ITEM	CALORIES kcal	PROTEIN Grams	FAT Grams
MOLLUSCS CANNED	98	14.9	2.6
CEPHALOPODS FRESH	66	13.5	0.7
CEPHALOPODS FROZEN	74	15.1	0.9
CEPHALOPODS CURED	341	61.6	6.2
CEPHALOPODS CANNED	137	20.8	2.8
CEPHALOPODS PREPARED NES	130	20.8	1.5
AQUATIC MAMMALS MEAT	136	21.0	5.0
AQUATIC MAMMALS PREPARED NES	156	20.6	7.5
AQUATIC ANIMALS NES FRESH	30	4.0	0.2
AQUATIC ANIMALS NES CURED	33	5.5	0.1
AQUATIC ANIMALS PREPARED NES	168	11.5	3.8
AQUATIC PLANTS	54	2.8	0.6
AQUATIC PLANTS DRIED	215	16.4	0.9
AQUATIC PLANTS PREPARED NES	312	1.3	1.2
MILK AND CHEESE			
COW MILK, WHOLE FRESH	61	3.3	3.3
STANDARDIZED MILK	48	3.3	1.5
CREAM, FRESH	195	2.7	19.3
WHOLE COW MILK EVAPORATED	134	6.8	7.6
WHOLE COW MILK CONDENSED	321	7.9	8.7
WHOLE COW MILK DRY	496	26.3	26.7
SKIM MILK OF COWS	35	3.4	0.2
SKIM MILK EVAPORATED	78	7.6	0.2
SKIM MILK CONDENSED	271	10.0	0.2
SKIM MILK DRY	362	36.2	0.8
BUTTERMILK CURDLED	75	3.0	5.2
BUTTERMILK DRY	387	34.3	5.8
YOGHURT	61	3.5	3.3
YOGHURT CONCENTRATED	82	4.7	1.5
RECONSTITUTED MILK	61	1.8	3.4
CHEESE WHOLE COW MILK	387	25.0	31.0
CHEESE SKIM COW MILK	247	46.0	4.0
WHEY CHEESE	72	12.4	1.0
PROCESSED CHEESE	103	12.5	4.5
WHEY FRESH	26	0.8	0.2
WHEY CONDENSED	26	0.9	0.3
WHEY DRY	346	12.3	0.8
CASEIN	427	100.0	0.0
BUFFALO MILK	97	3.8	6.9
SKIM MILK OF BUFFALO	41	4.3	0.1
CHEESE BUFFALO MILK	269	16.9	22.0
SHEEP MILK	94	5.9	6.0
CHEESE SHEEP MILK	310	23.2	22.8
SKIM MILK OF SHEEP	48	6.1	0.4
GOAT MILK	69	3.6	4.1

ITEM	CALORIES kcal	PROTEIN Grams	FAT Grams
CHEESE GOAT MILK	280	16.0	15.0
SKIM MILK OF GOAT	35	3.4	0.2
CAMEL MILK	73	3.8	4.5
OILS AND FATS			
VEGETABLE OILS			
OIL OF RICE BRAN	884	0.0	100.0
OIL OF MAIZE	884	0.0	100.0
OIL OF SOYABEANS	884	0.0	100.0
OIL OF GROUNDNUTS	884	0.0	100.0
OIL OF COCONUTS	884	0.0	100.0
PALM OIL	884	0.0	100.0
OIL OF PALM KERNELS	884	0.0	100.0
OLIVE OIL	884	0.0	100.0
BUTTER OF KARITE NUTS	711	0.0	85.0
OIL OF CASTOR BEANS	884	0.0	100.0
OIL OF SUNFLOWER SEED	884	0.0	100.0
OIL OF RAPESEED	884	0.0	100.0
OIL OF OLIVE RESIDUES	884	0.0	100.0
TUNG OIL	884	0.0	100.0
OIL OF SAFFLOWER	884	0.0	100.0
OIL OF SESAME SEED	884	0.0	100.0
OIL OF MUSTARD SEED	884	0.0	100.0
OIL OF POPPY SEED	884	0.0	100.0
STILLINGIA OIL	884	0.0	100.0
OIL OF KAPOK	884	0.0	100.0
OIL OF COTTON SEED	884	0.0	100.0
OIL OF LINSEED	884	0.0	100.0
OIL OF HEMPSEED	884	0.0	100.0
OIL OF VEGETABLE ORIGIN NES	884	0.0	100.0
MARGARINE	720	0.6	81.0
OILS BOILED	902	0.0	100.0
OILS HYDROGENATED	720	0.6	81.0
ANIMALS FATS			
FAT OF CATTLE	847	2.0	93.0
CATTLE BUTCHER FAT	847	2.0	93.0
BUTTER OF COW MILK	717	0.9	81.1
GHEE FROM COW MILK	873	0.3	99.1
FAT OF BUFFALO	847	2.0	93.0
BUTTER OF BUFFALO MILK	717	0.9	81.1
GHEE FROM BUFFALO MILK	873	0.3	99.1
FAT OF SHEEP	902	0.0	100.0
BUTTER OF SHEEP MILK	716	0.6	81.0
FAT OF GOATS	847	2.0	93.0
BUTTER OF GOAT MILK	717	0.9	81.1
FAT OF PIGS	712	4.7	76.7
PIG BUTCHER FAT	712	4.7	76.7
LARD	902	0.0	100.0
FAT OF POULTRY	629	3.7	68.0
FAT OF POULTRY RENDERED	901	0.0	99.8
FAT OF CAMELS	847	2.0	93.0
FAT OF OTHER CAMELIDS	847	2.0	93.0
ANIMAL OILS AND FATS NES	902	0.0	100.0
TALLOW	884	0.0	100.0
FATS PREPARATION NES	720	0.6	81.0
FRESHWATER DIADROMOUS FISH BODY OIL	902	0.0	100.0
FRESHWATER DIADROMOUS FISH LIVER OIL	902	0.0	100.0
DEMERSAL FISH BODY OIL	902	0.0	100.0
DEMERSAL FISH LIVER OIL	902	0.0	100.0
PELAGIC FISH BODY OIL	902	0.0	100.0
PELAGIC FISH LIVER OIL	902	0.0	100.0
MARINE FISH NES BODY OIL	902	0.0	100.0
MARINE FISH L221NES LIVER OIL	902	0.0	100.0
AQUATIC MAMMALS OILS	902	0.0	100.0
MISCELLANOUS			
INFANT FOOD	368	15.2	2.9
BEVERAGES NON-ALCOHOLIC	39	0.0	0.0
ICE CREAM	149	2.0	6.7
FOOD PREPARATIONS	41	1.2	0.5

Annex II

CONCEPTS, DEFINITIONS AND CLASSIFICATION

CROP STATISTICS

I. INTRODUCTION

1. The FAO constitution confers on the Organization the mandate to "collect, analyse, interpret and disseminate information relating to nutrition, food and agriculture". The importance of this task was emphasized recently by the Review of FAO's Goals and Operations, which considered information as one of the three primary functions of the Organization.

2. The FAO Statistics Division (ESS) performs five main activities to carry out this constitutional mandate.

a) **Collection** of countries' data on agricultural statistics, primarily from questionnaires submitted by Member Countries and from national publications; then from international publications and reports issued by boards and associations. All that supplemented with information received through correspondence with Governments and consultations with regional officers and field experts.

b) **Selection** of the data collected after careful analysis and scrutiny. Since data received by FAO originate from various sources - sometimes with conflicting figures - their selection is of paramount importance. In general, data received need a systematic check for quality and consistency through cross-reference checking.

c) **Filling-in gaps** when necessary.

d) **Processing** and storage of the data selected.

e) **Dissemination** of data through yearbooks, census reports, bulletins and other publications as well as electronic means such as the Web site on Internet, FAOSTAT, PC diskettes and CD Rom, either in plain form or in the form of statistical indicators showing trends and comparisons on various topics, such as Food Balance Sheets, Index Numbers, Economic Accounts for Agriculture, etc.

3. Assembling and tabulating this enormous mass of data in internationally comparable form, present many problems arising from differences found in countries' data as regards concepts, definitions, coverage and classifications. These differences need to be settled to achieve the maximum possible degree of international comparability.

From the early sixties to the present day, particular attention has been given to these problems at various international and regional meetings and seminars, such as those promoted

by ESS in collaboration with UN Economic Commissions, the Inter American Statistical Institute, the Conference of European Statisticians, the FAO Statistics Advisory Committee of Experts, etc. Advice, suggestions and recommendations emanating from these meetings and seminars are reflected in the text that follows on problems of definitions and classifications of commodities and commodity groups.

II. PRIMARY CROPS

1. **Primary crops** are those which come directly from the land and without having undergone any real processing, apart from cleaning. They maintain all the biological qualities they had when they were still on the plants.

2. Certain primary crops can be aggregated, with their actual weight, into totals offering meaningful figures on area, yield, production and utilization; for example, cereals, roots and tubers, nuts, vegetables and fruits. Other primary crops can be aggregated only in terms of one or the other component common to all of them. For example, primary crops of the oil-bearing group can be aggregated in terms of oil or oil cake equivalent.

3. Primary crops are divided into temporary and permanent crops. **Temporary crops** are those which are both sown and harvested during the same agricultural year, sometimes more than once; **permanent crops** are sown or planted once and, then, occupy the land for some years and need not be replanted after each annual harvest.

III. TEMPORARY PRIMARY CROPS: CONCEPTS, COVERAGE AND GENERAL RECOMMENTATIONS

1.1 **Concept of area**. Crop area is a surface of land on which a crop is grown. In general, the area measured for cadastral purposes includes, in addition to the area cultivated, headlands, ditches and other non-cultivated areas. Such an area can be called **gross** area as against the **net** area which includes only the portion of the gross area actually cultivated. For various reasons, e.g. natural calamities or economic considerations, certain areas planted or sown with a given crop are not harvested or are harvested before the crop reaches maturity. Hence the need for the concept of area to be sub-divided into sown or planted area and harvested area.

It has been recommended that countries report net area sown and net area harvested. Countries which normally do not present data for harvested area were requested to show these figures, at least when the harvested area differs significantly from the normally-reported area. Depending on the date of enumeration, it could be possible that sown and harvested area are practically identical. Sown area data are necessary to estimate quantities used for seeding purposes; harvested area, to provide reliable and accurate yield and production data.

1.2 **Coverage of area**. In certain countries, the unit of enumeration is the holding; in other countries, administrative units (commune, village, etc.) When the enumeration unit is the holding, a criterion of the minimum size is generally introduced for the inclusion in the

enumeration, e.g. a minimum size of area or economic criteria. In such cases, the smallholdings' area risks being completely disregarded. This is particularly so with regard to horticultural crops, which are cultivated outside agricultural holdings, in kitchen gardens and similar small plots.

It was recommended that area data should cover the entire area devoted to each crop, including, when necessary, estimates for small areas not covered in the current annual area surveys. This can be made by conducting special enquiries at appropriate intervals.

1.3 **Associated or mixed cropping**. **Associated crops** are those sown interplanted with other temporary or permanent crops, for example, beans and maize. This way of cultivation is widely used in many African countries, particularly for food crops. Sometimes the area covered by crops grown in association with others is reported to be about the same as if the crops were sown alone. In this case the entire area of the plot could be attributed to each of the crops grown in association. Otherwise, it is recommended that area for each one of the associated crops be estimated in such a way that figures relate to that part of the area the particular crop would have covered if it had been grown alone. The criteria for area allocation to specific crops in mixed cropping are, *inter alia*, quantities of seed used, plant density, yield obtained, eye estimates. When this allocation is not possible, countries should report separately for crops grown alone and for crops grown associated with others.

1.4 **Successive cropping**. **Successive crops** or **catch crops** are those which are sown and harvested on the same piece of land previously occupied by another crop, or even by the same crop, during the same agricultural year. It has been recommended that the area of crops growing under this condition be accounted for in the total crop area, conducting, if necessary, *ad hoc* surveys for that purpose.

1.5 **Shifting cultivation**. This is a peculiar land utilization method practised generally in remote and not easily accessible areas in certain African countries. A particular piece of land is cultivated for some years and then, when productivity decreases, it becomes more convenient to open up a new piece of land and abandon the exhausted one. Naturally, the crops grown in this sort of itinerant agriculture, are most probably excluded from the regular agricultural surveys. Some rough estimates may be undertaken when such crops are important at national level.

1.6 **Cultivation under glass or protective cover**. Area data or crops growing in these conditions should be reported by all countries, preferably separated from field and garden crops.

2.1 **Concept of yield and production**. In certain countries, estimates of crop production are obtained by multiplying the average yield per unit of area by the corresponding crop area harvested. Other countries estimate production on the basis of information gathered from various sources, including declarations of producers, deliveries to marketing boards, administrative records, etc. In the first case, production figures are derived from yield and area, while in the second case, yields are derived from production and area figures.

Three main concepts of production (and yield) are used by countries. **Biological production** refers to the production still on the plants. **Production actually harvested** excludes harvesting losses and production not harvested for various reasons. Thirdly, the **marketed production**, or production for sale, excludes own consumption by farmers and perhaps some post-harvest losses. It is recommended that countries report primarily production in terms of harvested production, and when this is not possible that they indicate clearly the concept adopted in reporting production (and yield) figures.

2.2 **Coverage of yield and production**. It is recommended that the coverage of yield and production data be total and complete, similar to the coverage of area figures (see 1.1 above). They should, therefore, include field crops and garden crops; main, secondary and successive crops; crops grown alone and associated with others; in the open and under glass. They should include crops for sale as well as crops used by farmers for own consumption as food, feed, seed, etc.

IV. TEMPORARY PRIMARY CROPS: DEFINITION, CLASSIFICATION AND SPECIFIC RECOMMENDATIONS

1. **Cereals**. This is, by far, the most important group of crops. Carbohydrates, mainly starches, are the dominant nutrient element in cereal crops. They also contain a modest amount of protein and little fat. Moisture content is low.

1.1 **Definition**. Cereals are annual plants, generally of the gramineous family, yielding grains used for food, feed, seed and industrial purposes, e.g. ethanol. They exclude legumes, such as pulses, but include rice, canary seed, buckwheat and triticale. It has been recommended that the denomination of "cereal crops" be limited to crops harvested for dry grain only, excluding, therefore, crops harvested green for forage, silage, grazing, etc.; and, in the case of maize, harvested green, also for food.

1.2 **Classification**. Cereals shoud be classified individually according to the *genus* to which they belong. However, when two or more genera are sown and harvested together as a mixture, they should be classified as "mixed grains" and reported in one single figure.

1.3 **Recommendations**. It is recommended that countries report production figures in terms of clean, dry grains, in the form these are usually marketed. The only exception is rice, which should be reported in terms of paddy rice, although it was suggested that countries report also, when available, figures for brown rice and milled rice.

It was suggested that the moisture content of the production figures be made available by the countries.

Another recommendation stated that countries report, wherever possible, separate data for durum wheat and other hard wheat, hybrid maize and hybrid sorghum as part of the total wheat, total maize and total sorghum, the same goes for winter and spring crops.

2. **Pulses**. These protein-rich crops no longer have the importance as human food that they did at one time. In addition to their value as food and feed stuffs, pulses are also important in cropping systems for their ability to produce nitrogen and thus increase the fertility of the soil.

2.1 **Definition**. Pulses are annual leguminous crops yielding grains or seeds used for food, feed and sowing purposes.

The denomination "pulses" should be limited to crops harvested for dry grain only, excluding, therefore, crops harvested green for forage, used for grazing or as green manure, and also crops harvested green for food (green beans, green peas, etc.), which are considered vegetables. They exclude those used mainly for extraction of oil, e.g. soybeans. Also excluded from this group should be those leguminous crops whose seeds are used exclusively for sowing purposes, such as alfalfa and clover.

2.2 **Classification**. Although the botanical classification of pulses is somewhat controversial, it was suggested that data on at least the following genera be collected and reported separately by the countries:

Phaseolus spp. (beans)
Vicia faba (broad beans)
Lens esculenta (lentils)
Cicer arietinum (chick peas)
Pisum spp. (peas)
Cajanus cajan (pigeon peas)
Vigna sinensis (cow peas)
Vicia sativa (vetch)
Lupinus spp. (lupins)
Vigna spp. (black gram, green gram, mung, etc.)

2.3 **Recommendations**. Production data should be reported in terms of dry clean weight, excluding the weight of the pods.

3. **Roots and tubers**. These crops contain mainly starch. Their water content is very high.

3.1 **Definition**. These plants grow generally as annual crops and yield roots, tubers, rhizomes, corms and stems which are used largely for human food, either as such or in processed form, but also for animal feed. In certain countries, they are used to manufacture starch and alcohol.

The denomination "roots and tubers" excludes those crops which are cultivated mainly for feed (mangels, swedes), or for processing into sugar (sugar beets), or which are generally classified as "roots, bulb and tuberous vegetables" (onions, beets). It does include the starchy pith and flour which are derived therefrom and which are contained in the trunk of the sago palm, and in the stem of the Abyssinian banana (*Musa ensete*).

Propagation of root crops is carried out in various ways, depending on the various crops. For potatoes, for example, a live tuber or seed is required for planting the following

season; for yams, only a part of the live tuber, and for cassava, pieces of the stalk (not the root).

3.2 **Classification**. Roots and tubers are classified by genera. Potatoes grown specifically for seed and potatoes grown for industrial (non-food) purposes should be reported separately, when such crops are important. Countries are advised to report early/new potatoes and other potatoes, separately .

3.3 **Recommendations**. The production of root crops (and related yield) should be reported in terms of clean weight, i.e. the weight of the product free of earth and mud.

Particular attention is to be given to coverage of the data (total) and the concept of production (harvested).

4. **Sugar crops**. Contrary to cereals, pulses and root crops, the main component of sugar crops is not starch but simple monosaccharides (glucose and fructose) and particularly disaccharides (sucrose or saccharose). The protein and fat content is negligible.

4.1 **Definition**. Sugar crops are those crops cultivated primarily for the manufacture of sugar, secondarily for the production of alcohol (food and non-food) and ethanol. There are two main sugar crops: sugar beets and sugar cane. Sugar cane is a perennial grass (replanted at certain intervals using pieces of the cane stalks); sugar beets are an annual crop, propagated by the seed of the flowers. In certain countries, sugar cane is eaten raw in significant quantities. Both sugar cane and sugar beets are used for feed.

Sugar and syrups are also produced in North America from the sap of certain species of maple trees and, in a few countries, from maize and sorghum which are primarily cereal crops, except sweet sorghum when it is cultivated explicitly for making syrup.

4.2 **Classification**. Sugar beets cultivated explicitly as a fodder crop, and red or garden beets, which are grown and classified as vegetable crops, should be excluded from the denomination of "sugar crops"; the same goes for both sugar cane and sugar beets, when cultivated explicitly for alcohol making or ethanol.

4.3 **Recommendations**. Production of sugar beets and sugar cane should relate to the stage when they are sent to the sugar factories, i.e. reasonably clean and free from tops and leaves.

5. **Oil-bearing crops (Temporary only)**.

5.1 **Definition**. Temporary oil-bearing crops are usually called oilseeds. These are annual plants whose seeds are used mainly for extraction of culinary and industrial oils, excluding essential oils. These crops could be consumed raw as well. Some temporary oil crops are rich in protein content, particularly soybeans, but when processed into oil, the proteins go with the cake which is fed to animals.

As in the case of cereals and pulses, the denomination of "oilseed" should be limited to crops harvested for the dry seed only, excluding crops harvested green and used for food or feed, or used for grazing and green manure.

The oil content of oilseeds varies widely from one to the other. It can be as low as 17 percent (soybeans) and as high as 50 percent (sesame seed).

5.2 **Classification**. Oilseeds are classified according to the genera to which they belong. Although rape and mustard seeds belong to the same genus, it seems advisable that they are treated as two distinct oilseed crops.

There are some oilseed crops which are also fibre crops, i.e. from the same plant both seeds and fibres are harvested and utilized by industry. These crops are: cotton, cultivated for both seeds and fibres; flax and hemp, which in some countries are cultivated for seeds only and in other countries for both seed and fibre; certain crops being cultivated mainly for fibre and others mainly for seed. As an example, most linseed comes from crops cultivated for seed only.

Area figures of crops yielding both seeds and fibres could go either with the oilseed group or with the fibre group. If they are included in both groups, particular attention is required to avoid double counting.

Production figures for fibres and seeds are always reported separately for flax and hemp. In the case of cotton, certain countries report fibres and seeds separately while others report fibres and seeds together in one single figure reported as seed cotton or unginned cotton.

Both cotton seed and cotton lint (but not seed cotton) are considered by FAO to be primary crops and are classified in the oil crops and fibre crops groups. This is because seed cotton is a mixture of both food (seed) and non-food (fibre).

5.3 **Recommendations**. Production of oilseeds should always relate to the quantities actually harvested, whatever use is made of them after harvest.

Groundnut data should be reported in terms of groundnuts in the shell; other oilseeds, in terms of the weight of the seeds.

6. Fibre crops (Temporary only)

6.1 **Definition**. Fibre crops are annual crops yielding vegetable fibres, mostly soft fibres, which are utilized by the textile industry to produce first thread and yarn, and, from these, innumerable fabrics or manufactures. The primary fibre crops are cotton, jute and flax.

6.2 **Classification**. As mentioned previously (5.2), fibre crops also yield seeds which are utilized for sowing purposes, and in certain cases are processed into oil and cakes (cotton seed, linseed).

6.3 **Recommendations**. Area data for each fibre crop should cover all areas from which the fibres have been harvested.

Specific problems relating to fibre crops are to be solved as follows:

- yield and production of cotton should be reported in terms of seed cotton or unginned cotton and/or in terms of cotton lint, excluding linters and waste. Linters are short fibres attached to the cotton seeds after ginning, used for padding, and as a source of cellulose.

- yield and production of flax and hemp should be reported in terms of dry straw, retted, and/or (preferably) in terms of scutched and hackled fibres, including tow. Hemp grown for other purposes, e.g. paper making, should be excluded.

- yield and production of jute and jute-like fibres should be reported, preferably in terms of dry fibres as they are generally marketed, and/or in terms of dry stems.

7. **Vegetables**. Vegetables are made up of 70 to 95 percent of the total weight of water. They are, therefore, very low in dry matter and accordingly in nutrients. Vegetables also contain minerals and vitamins, which are partly lost during cooking and processing. Moreover, the "refuse", i.e. those parts of the vegetables which are discarded before consumption or processing, is quite substantial, accounting for up to 50 percent of their total weight as harvested for leguminous vegetables, and for artichokes and watermelons. Refuse includes tops, stems, seeds, rind, peel, pods, damaged and withered leaves and parts that are high in cellulose. Owing to the highly perishable nature of vegetables, waste also tends to be rather high.

7.1 **Definition**. Vegetables are plants cultivated both as field crops and garden crops, both in the open and under glass.

Certain gramineous and leguminous plants which, if harvested for the dry grain, are classified among cereals and pulses, belong to this group as far as they are harvested green for the green grains and/or for the green pods (e.g. green maize, green peas, green beans, string beans, etc.).

Moreover, only those vegetables which are cultivated principally for human consumption belong to this group. Consequently, vegetables grown principally for animal feed should be excluded, as should vegetables cultivated for seed.

This group includes also melons and watermelons which some countries classify as fruit crops. As with all other vegetables, melons and watermelons are temporary crops, while fruit crops are permanent crops.

7.2 **Classification**.

Vegetables are grouped according to botanic characteristics as follows: leafy or stem vegetables (e.g. cabbage); fruit-bearing vegetables (e.g. melons); flower vegetables (e.g.

cauliflowers); root, bulb and tuberous vegetables (e.g. onion); leguminous vegetables (e.g. green peas); other vegetables (e.g. green maize and mushrooms).

Since vegetables grown under protective cover are becoming increasingly important, it is desirable that area, yield and production data for covered crops be collected and reported separately from those of vegetables grown in the open.

7.3 **Recommendations**. Area and production of vegetables of little importance in the context of total area and production of vegetables, for example, less than 1 percent each of them, could be reported together in one single figure.

Countries should report both total area and total production of individual vegetable crops and, as separate items whenever possible, estimate that portion of each crop produced mainly for sale as distinct from that produced mainly for consumption by producers.

General recommendations on mixed and successive cropping as well as coverage of area and production data, are particularly applicable to vegetable crops.

8. **Tobacco**

8.1 **Definition**. Any of a genus of plants, *Nicotiana*, cultivated for their leaves. Tobacco is consumed primarily through smoking, and less extensively through chewing or sniffing. *N. tabacum* is by far the most important species. The main active element of tobacco leaves is alkaloid nicotine, a highly toxic substance.

8.2 **Classification**. Although tobacco crops are classified by countries according to varieties and/or according to the different ways in which leaves are dried, cured and prepared, it would be sufficient for countries to report separate figures for *N. tabacum* and for other low quality tobacco species, if any.

8.3 **Special recommendations**. Tobacco yield and production figures should refer to farm sales weight, i.e. the weight of the leaves leaving the farm for tobacco factories. The leaves are usually drier than at harvest, though not fully dry.

9. **Fodder crops (Temporary and permanent)**. Fodder crops are those cultivated explicitly or primarily for feeding animals. By extension, natural grasslands and pastures, whether somewhat cultivated or not, are also included in this category.

Fodder crops may be classified as temporary or as permanent crops; the former are cultivated and harvested like any other crop, the latter relate to land used permanently (five years or more) for herbaceous forage crops, either cultivated or growing wild (wild prairie or grazing land). They may include some areas of forest lands that are used for grazing.

Temporary crops grow in artificial meadows which are normally used very intensively, with various cuttings per year. They contain three major groups of fodder: grasses, including cereals harvested green; legumes, including pulses harvested green; and root crops that are cultivated for fodder. All can be fed to animals as green feed; as hay, i.e. crops harvested dry or

left to dry if harvested green; or as silage products. Silage or ensilage is a method of preservation of green fodder through fermentation to retard spoiling.

V. PERMANENT PRIMARY CROPS: CONCEPTS, COVERAGE AND GENERAL RECOMMENDATIONS

Much of what has already been said about temporary primary crops under item III, applies to permanent crops as well. Peculiarities of permanent crops are highlighted in the paragraphs that follow.

1. **Concept of area**. A peculiarity of permanent crops is that most countries report number of trees or plants in addition to, or instead of, the area planted. This is particularly so as regards plants growing outside compact plantations, which are either interplanted with other crops or are scattered. Both area and number of trees are also divided into productive or bearing and non-productive or non-bearing areas or trees. In most cases, non-bearing refers to young plants that are not yet bearing.

   It is recommended that countries report primarily the area or number of trees actually harvested or the bearing area/trees actually harvested and, secondarily, the total planted area or number or trees. Countries reporting differently should define the concept behind the published figures.

2. **Coverage of area.** As is the case for temporary crops, reported area, or number of trees, should cover the entire area or the total number of trees. Estimates should be made, when necessary, to cover small areas and/or scattered trees which might be neglected by annual area surveys.

   It is recommended that countries which collect current data for commercial areas only should also conduct periodic surveys of the area or number of trees in small allotments and family gardens, or which are scattered.

3. **Interplanted crops and scattered trees**. It is **recommended** that the area of permanent crops interplanted and scattered be added to the area of compact plantations by estimating the area that such crops would have covered had they been growing in compact plantations. When such estimates are not possible, countries should report separately area figures for compact plantations and for interplanted crops, as well as for the number of scattered trees.

VI. PERMANENT PRIMARY CROPS: DEFINITION, CLASSIFICATION AND SPECIFIC RECOMMENDATIONS

1. **Fruits and berries**.

1.1 **Definition**. Fruit crops are those yielding fruits and berries which generally are characterized by their sweet taste and their high content of organic acid and pectin.

Apart from strawberries, all fruits and berries are permanent crops, mainly trees, bushes and shrubs, but also vines and palms. Fruits and berries are generally found in great numbers attached to the branches or stalks or trunks of the plants, in most cases singly, in other cases grouped in bunches and clusters (e.g. bananas and grapes). Commercial crops are cultivated in well ordered orchards and compact plantations, but significant quantities are also collected from scattered plants, either cultivated or growing spontaneously.

Bananas, plantains, grapes, dates and carobs are considered fruit crops by FAO, while nuts, olives, coconuts, melons and water melons are not considered fruit crops.

1.2 **Classification**. Fruits are broadly classified as either sub-tropical/tropical fruits, or fruits of the temperate zones. These are sometimes classified as pome fruits (with seeds/pips contained in rather light endocarp, e.g. apples and pears) and stone fruits (with seed/kernel enclosed in hard woody shells surrounded by the pulp or mesocarp, e.g. peaches and plums). Grapes, dates, figs and some other fruit crops are not part of any sub-group, while berries and citrus comprise independent groups.

In principle, fruit crops should be classified according to the genus and species to which they pertain with related data reported separately. In certain cases, a further distinction by variety of the same species may be very useful.

1.3 **Recommendations**. As far as fruit crops are concerned, it is recommended that countries report separately area figures for commercial orchards or compact plantations and for interplanted crops, as well as the number of scattered trees in instances when it is not possible to arrive at a single total area figure in terms of pure stand equivalent.

It is further recommended that separate data on area and number of trees in new plantings should be an integral part of current statistics on fruits. It is considered desirable that countries report the density or planting space of various fruit crops in commercial orchards. It is also suggested that fruit crops be classified by variety.

It is worth emphasizing that fruit crops are grown outside agricultural holdings and commercial orchards to a greater degree than are other crops. It is necessary, therefore, to evaluate periodically how much of the production comes from non-commercial crops.

With especial regard to bananas, production should be reported in terms of weight, not in terms of numbers of bunches. The weight should include the weight of single bananas or the weight of banana hands, excluding, therefore, the weight of the central stalk of the bunches.

Finally, the gathering of wild plants, particularly berries, should be recorded separately from the production of cultivated crops.

2. **Nuts**

2.1 **Definition**. Nuts are tree crops yielding dry fruits or kernels. They are characterized by their woody shells or hard husks which are generally covered by a thick, fleshy/fibrous outer husk which is removed at harvesting time.

The weight of the shells or husks ranges from as little as 20 percent for chestnuts to as much as 70 percent in the case of cashew nuts of the total weight of unshelled/unhusked nuts.

2.2 **Classification**. In the FAO classification, only those nuts used mainly as dessert or as table nuts are included. Nuts mainly used for flavouring beverages are excluded, as are masticatory and stimulant nuts and nuts used mainly for the extraction of oil or butter. Therefore, areca/betel nuts, cola nuts, illipe nuts, karite nuts, coconuts, tung nuts, oil palm nuts, etc. are excluded.

2.3 **Recommendations**. Production data should relate to the weight of the nuts in the shell, or in the husk, without counting the weight of the outer husks.

Gathering of wild plants, particularly chestnuts, walnuts and hazelnuts, should be recorded separately from the production of cultivated crops.

3. **Oil-bearing crops (Permanent only)**

3.1 **Definition**. Permanent oil-bearing crops are perennial plants whose seeds (kapok), fruits or mesocarp (olives) and nuts (coconuts) are used mainly for extraction of culinary or industrial oils and fats. Consequently, dessert or table nuts, such as walnuts, are excluded because although they are high in oil content, they are not used mainly for extraction of oil.

3.2 **Classification**. The oil palm produces bunches containing a large number of fruits or nuts having a fleshy mesocarp or pulp enclosing a kernel covered by a hard shell. As regards coconuts, the primary product is the nut, including the woody shell, the flesh and the water or milk, but excluding the fibrous outer husk (coir), which represents about one third of the total weight of mature unhusked coconut.

3.3 **Recommendations**. Production data should be reported in terms of dry mature products as they are usually marketed. For coconuts, see 3.2 above. Olive crops should be classified according to their main use, i.e. olives for oil or table olives.

4. **Spices, condiments and aromatic herbs**. Spices are plants which, in one or the other of their components (rhizome, bark, fruits, berries, seeds, etc.), contain strongly flavoured and aromatic substances, and for that reason are used mainly as condiments. Most of them are perennial.

Spices are rich in essential oils which, in addition for use in the food industry, are also used in cosmetic and medicinal preparations. The nutritive value of spices is insignificant, but their commercial value is high.

Production data of spices should be reported in terms of ripe, dried or powdered products in order to make them roughly comparable with trade figures.

A partial listing of some of the main spices includes peppers, pimento, vanilla, cinnamon, canella, cloves, nutmeg, mace and cardamom, ginger and anise, badian and fennel.

5. **Other permanent crops**

5.1 **Coffee**. A tropical shrub or small tree yielding two-seeded fruits or cherries which are processed to free the seeds or "beans" from the pulp fruit and then from the mucilage and silver skin covering the beans.

By weight, the mature but still fresh cherries consist of 45-55 percent pulp, mucilage and skin, and 45-55 percent beans. The dried/clean/cured beans are generally called "green coffee" or "clean coffee". At this stage, coffee is considered a "primary crop". It contains very little in the way of nutritive elements, apart from some fat. For this reason coffee is classified among the edible but "non-food" crops. Because it contains caffeine, an alkaloid, it is also counted with "stimulant" crops.

The coffee with mucilage and skin not removed is called parchment coffee.

5.2 **Cocoa**. Cocoa is a tropical rain-forest tree cultivated for its beans which are contained in large numbers in ovoid pods growing directly on the trunk and on the large branches.

The beans and the white mucilage or pulp covering them represent about one third of the total weight of the pods. Beans and mucilage are taken out of the pods and fermented. The fermented and dried beans are considered a "primary crop", from which various processed products may be derived, including roasted beans (in the shell), and nibs (fragments of roasted/shelled/crushed beans). The nibs are ground to give cocoa mass, from which cocoa fat or butter is extracted by pressing. The resulting cake is then pulverized into cocoa powder.

Cocoa beans contain carbohydrates, protein and particularly fat. As such, it is considered a "food" crop. Since they also contain alkaloids, caffeine and theobromine, they are considered a "stimulant" crop as well.

5.3 **Tea**. A shrub or small tree of the Camellia family that is cultivated in sub-tropical and tropical regions, mainly the Far East and China, for its tender leaves which, when prepared by different processes give the so-called "made" tea. There are two main varieties: *assamica* and *sinensis*. FAO defines the "primary" crop as the tender leaves, withered, rolled, fermented and dried (black tea). Green tea is unfermented black tea.

As tea leaves contain no nutrients but do contain various alkaloids, caffeine and theine or theophylline, they are classified among the "non-food" and "stimulant" crops.

Green tea leaves may be consumed fresh as vegetables, while oil may be extracted from the seeds.

5.4 **Natural rubber**. The Para rubber or caoutchouc tree is indigenous to Brazil but now is cultivated mainly in the Far East. The natural rubber is the milky fluid latex which exudes when the tree is cut (tapped), and coagulates on exposure to air. The dried latex is treated with sulphur at high temperatures in a process known as vulcanization to increase the more desirable properties of the final product, such as elasticity, strength and stability.

For FAO, the "primary crop" is the latex, concentrated, stabilized and dried.

5.5 **Hops**. A climbing perennial vine cultivated for the female unfecundate inflorescence called hop "cones". Ripe, dry cones, which are used for imparting a bitter flavour to malt liquor, are the primary product.

5.6 **Sisal**. *Agave sisalana*. The agave family includes many plants with fibrous, fleshy and persistent spiny leaves attached to rizometous rootstock which flower only once. The fiber obtained is a hard fiber.

5.7 **Abaca or Manila hemp**. Extracted from the leafy stalks of certain banana trees that are found mainly in the Philippines.

LIVESTOCK STATISTICS

I. INTRODUCTION

The importance of collecting and publishing countries' agricultural statistics and the difficulties encountered in assembling them according to the maximum possible degree of international comparability as regards concepts, definitions and classifications, have been illustrated in Chapter I of the paper dealing with crop statistics.

II. LIVESTOCK NUMBERS

1. Importance of livestock

Domestic animals are very important to mankind. They furnish precious food products (meat, milk, eggs, honey) and valuable non-food-industrial products (wool, hair, silk, hides, skins, furs, wax, feathers, bones, horns, etc.). Quadrupeds are widely used, particularly in developing countries, as beasts of burden and for draught or are used for commuting to and from agricultural holdings. Some are used also for recreation purposes (horse riding), and most of them are a source of organic/natural fertilizers and fuel.

Feeds of animal origin are also important, e.g. meat meal, bone meal, blood meal, tankage, etc. These are produced from slaughtered animals rejected at the sanitary inspection, from inedible offal, from residues of meat scraps and trimming after the fat has been extracted, from tannery by-products, from poultry by-products (particularly from those processed into ready-to-cook), from hatcheries by-products (infertile eggs and other refuse), from eggshells, etc.

2. **Definition**. The terms "livestock" and "poultry" are used in a very broad sense, covering all domestic animals irrespective of their age and location or the purpose of their breeding. Non-domestic animals are excluded from the terms unless they are kept or raised in captivity, in or outside agricultural holdings, including holdings without land.

Cattle, buffaloes, camels, sheep, goats, pigs, horses, mules, asses and chickens are raised and enumerated in many countries. Some countries raise and enumerate ducks, geese, turkeys and bees, whereas rabbits, guinea fowl, pigeons, silkworms, fur animals, reindeer and various kinds of camelids are limited to far fewer countries.

Many factors are known to affect the comparability of statistics of livestock numbers between countries. The main ones relate to the coverage of data, the date and frequency of enumeration and the classification of animals.

3. **Classification**. Livestock is generally classified by countries by genera, sub-divided in a few cases by species. More frequently, individuals of various genera or families are aggregated into a single group, e.g. the term "poultry" covers domestic fowls, guinea fowl, ducks, geese and turkeys.

It is recommended that countries enumerate, when applicable, at least the animals listed below, classified according to this list. All the items underlined have been recommended, while those items not underlined are suggested on an optional basis:

CATTLE, total

A. Calves and young stock under 1 year of age

B. Young stock, 1 year of age and under 2 years

C. Cattle, 2 years of age and over

a) Females

i) cows

- mainly for milk production

ii) heifers (including in calf)

b) Males

- mainly for meat production (including spent)

BUFFALOES, total

A. Buffaloes under 3 years of age

B. Buffaloes, 3 years of age and over

Buffalo cows
mainly for milk production

SHEEP, total

A. Lambs under 1 year of age

B. Sheep, 1 year of age and over

Females
- intended for breeding
- intended for slaughter

GOATS, total

A. Goats under 1 year of age

B. Goats, 1 year of age and over

- Females

PIGS, total

A. Young pigs, less than 50 kg

B. Pigs for breeding, 50 kg and over

- Gilts
  - gilts in pig
- Sows
  - sows in pig

C. Pigs for fattening, 50 kg and over

a) 50 kg and less than 80

b) 80 kg and over

HORSES, total

A. Horses for agricultural production or use

B. Other horses

MULES, total

ASSES, total

CHICKENS (domestic fowl), total

A. Chickens for breeding and egg production

- Laying hens and pullets

B. Chickens for meat production (slaughter)

- Broilers
- Other (capons, etc.)

C. Other chickens (multi-purpose mixed stock)

- Laying hens and pullets

TURKEYS, total

DUCKS, total

GEESE, total

GUINEA FOWL, total

RABBITS, total

BEEHIVES, total

It is suggested that countries collect data on births and natural losses of various livestock categories, as well as further sub-divisions, according to age and/or utilization. These data are important indicators of productivity of the livestock herd and are used for the construction of herd balances and herd models.

In the poultry sector, considerable changes have taken place over the last twenty years in many countries, particularly with regard to the growth of a modern specialized and intensive sector alongside the traditional sector. It is, therefore, desirable to collect and publish, whenever possible, poultry data for the modern sector separate from the traditional sector. For the modern sector, several countries conduct monthly enumerations to collect data on poultry numbers, as well as on closely related items, such as number of eggs put in incubators, chicks hatched and chicks placed, all separately for laying hens and for broiler production. It is recommended that countries collect and publish this information which is usually available from commercial hatcheries.

4. **Date and frequency of enumeration**. The livestock population is subject to marked seasonal fluctuations, resulting in periods of maximum and minimum numbers within the course of the year. These periods are different for various species of livestock and are, also, different from country to country.

While recognizing the need for estimating livestock numbers more than once a year, particularly pigs and poultry, it is recommended that at least one enumeration should be made towards the end of the year.

5. **Coverage of the data**. All domestic animals should be taken into account in an enumeration, irrespective of their age or purpose of breeding.

In areas where nomadism and transhumance are practised, livestock may be enumerated twice, or may not be enumerated at all if enumerators fail to pay sufficient attention to these livestock-rearing practices. Nomadic animals are those without any fixed installation which continually or periodically shift from place to place. The seasonal migration of livestock from pastures on plains and lowlands (autumn-winter) to pastures on mountain-sides (in spring and summer) and vice versa is known as transhumance. The phenomenon of nomadism exists in Africa and in the Near East. Transhumance, including alpine pasture, is no longer as important

as it was at one time in Spain, Italy and other European countries, but it is still widely practised in other countries.

III. ELEMENTS APPLICABLE TO ALL OR MAIN SPECIES OF LIVESTOCK

Total numbers. Animals enumerated in a given day, or in few consecutive days of the year.

Females in reproductive age. This includes females of 3 years of age and over for horses and buffaloes; 2 years of age and over for cattle; one year of age and over for sheep and goats; and six months of age and over for pigs.

Females actually reproducing during the year. The number of females which have had offspring during the year. In the case of species which can have more than one offspring during the year, the breeding female has to be included for each litter.

Birth rate. The number of animals born alive as a percentage of number of females actually reproducing.

Number born. The number of animals born alive during the year.

Natural deaths. The number of animals which died during the year for natural causes.

Number of animals slaughtered. Includes all animals slaughtered during the year, of both indigenous and foreign origin, within the national boundaries.

Take off rate. The percentage of all animals of the species which are taken from the national herd during the year, for slaughter in the country or in other countries.

IV. LIVESTOCK PRODUCTS FROM SLAUGHTERED ANIMALS

1. **Primary products**. Those products, coming directly from the slaughtered animals, including meat, offal, raw fats, fresh hides and skins.

2. **Processed products**. These are derived from the processing of primary products and include sausages, lard and salted hides.

V. CONCEPTS, DEFINITIONS, COVERAGE AND RECOMMENDATIONS PERTINENT TO LIVESTOCK PRODUCTS FROM SLAUGHTERED ANIMALS

1. Slaughtering and meat production

1.1 Definition. Meat can be defined as "the flesh of animals used for food". In statistical language, meat is intended to be with bone-in, unless otherwise stated, and to exclude meat unfit

for human consumption. From the term "meat" are to be excluded edible offal and slaughtered fats.

1.2 Concept of production. Data on meat production are usually reported according to one or more of the following concepts:

1.2.1 Live weight of animals intended for slaughter is the weight taken immediately before slaughter. It is assumed that animals intended for slaughter are kept on slaughterhouse premises for 12 hours and are not fed or watered during this time.

1.2.2 Killed weight is the gross weight of the carcass including the hide or skin, head, feet and internal organs, but excluding that part of the blood which is not collected in the course of slaughter.

1.2.3 Dressed carcass weight is the weight of the carcass after removal of the parts indicated for each of the livestock species listed below:

Cattle, Buffaloes, Horses, Mules, Asses, Camels;

- the hide or skin
- the head where it joins the spine
- the fore feet at the knee joint, and the hind feet at the hock joint
- the large blood vessels of the abdomen and thorax
- the genito-urinary organs (other than the kidneys)
- the offal (edible and inedible)
- the tail
- the slaughter fats other than kidney fats

Sheep and Goats:

- the skin
- the offal (edible and inedible)
- the genito-urinary organs (other than the kidneys)
- the feet
- the slaughter fats other than kidney fats

Pigs

- the offal (edible and inedible)
- the genito-urinary organs (other than the kidneys)
- the slaughter fats (other than kidney fats and back fat which are butchering fats)

1.2.4 Carcass weight is the weight of the carcass as defined above, including slaughter fats.

1.2.5 Data on production of meat for minor animals (poultry, rabbits, game, etc.), are usually reported according to one or the other of the following concepts:

a = Thighs + Wings + Breast + Ribs + Back = Ready-to-cook (oven ready)

b = a + Heart + Liver + Gizzard + Neck = Ready-to-cook (incl. giblets)

c = b + Feet + Head = Eviscerated weight

d = c + Viscera (inedible offal) = Dressed weight

e = d + Blood + Feathers + Skins (when applicable) = Live weight

The concept of meat production changes with the coverage of production as follows:

1.2.6 Production from slaughtered animals (SP): all animals of indigenous and foreign origin, slaughtered within the national boundaries.

1.2.7 Production from indigenous animals (GIP): indigenous animals slaughtered plus exported live animals of indigenous origin.

1.2.8 Total indigenous production (TIP) or biological production: indigenous animals slaughtered, plus exported live animals of indigenous origin and net additions (plus/minus) to the stock during the reference period. If it is expressed in weight, this measure should take into account the change in the total live weight of all the animals.

1.2.9 In calculating indigenous production, it should be noted that as imports and exports of live animals are generally recorded in numbers, not weight, it is important to know what kind of animals (large or small) are imported and exported. For example, the meat equivalent of two million chicks can vary by 80 to 250 tons, while the meat equivalent of two million adult chickens can vary by 2000 to 4000 tons.

1.3 Coverage of production. Most countries distinguish in their statistics between controlled or inspected or commercial slaughtering and other slaughtering, called variously, farm or private, non-commercial or uncontrolled slaughtering.

Under the first category, slaughtering in public and industrial slaughterhouses, meat processing plants and major poultry farms are usually included. Statistics on those slaughterings, and corresponding meat production, are easy to obtain from the administrative records of the establishments concerned. They report normally on a monthly basis; in some countries, weekly.

Under the second category slaughtering in small slaughterhouses, butchers' shops and on farms is included, mainly for the farmers' own consumption. Statistics on non-commercial slaughtering, which can be derived from various sources, are essentially rough estimates and should be established once a year.

1.4 Recommendations

1.4.1 On the different possibilities of measuring the production of meat, it is recommended that countries collect and publish data primarily in terms of dressed carcass weight. However, in view of the fact that national practices regarding the definition of carcass weight are still far from homogeneous, each country should clearly indicate which parts of the animal are included in or excluded from its carcass weight concept. It would be desirable if countries provide conversion factors from carcass weight to live weight or *vice versa*.

1.4.2 Countries not reporting according to the dressed carcass weight concept should clearly indicate which concepts they use when reporting production figures. They should provide appropriate conversion factors to convert their production into carcass weight equivalent, indicating also which parts or organs of the animal are excluded for conversion to dressed carcass weight.

1.4.3 Production of meat of small animals should be reported, preferably according to the concept "ready-to-cook", specifying whether giblets are included or excluded. It is important that whatever concept is used be clearly explained.

1.4.4 It is recommended that all countries collect and report meat production data and corresponding numbers of slaughterings according to the concept of slaughtered production and indigenous production, both in line with FAO definitions, (see 1.2.9 above). In all cases, production should cover only that "approved for human consumption".

1.4.5 It is also recommended that countries which report edible offal and fats together with meat production in one figure provide the approximate percentage of edible offal and fats in the aggregated meat figures.

1.4.6 It is recommended that countries report at least annual figures covering all slaughterings, commercial and non-commercial, and corresponding meat production, for the following livestock species as applicable: cattle, buffaloes, sheep, goats, pigs, horses, chickens, turkeys, ducks, geese, guinea fowl, rabbits, other.

1.4.7 Countries reporting commercial figures only should indicate this limitation in a note or footnote and furnish, at least from time to time, estimates on non-commercial production. In general, separate figures should be reported for commercial and non-commercial production, particularly when the estimates of the last category are considered to be weak.

1.4.8 It is recommended that slaughtering data be reported in terms of both numbers slaughtered and meat production. In case any country collects and publishes statistics only in terms of one or the other, appropriate conversion factors should be provided, i.e. average carcass weight figures. If possible, countries should report, in addition to annual data, also monthly or quarterly data, at least for commercial slaughtering and production.

1.4.9 It is recommended that figures for cattle slaughtering be shown separately for calves and adult cattle, a suggested borderline between the two being 220 kg, live weight. Other animals, for which a breakdown of the total slaughtering between young and adult animals are considered to be useful, are: sheep, goats and pigs.

1.5.0 It is suggested that countries collect and release statistics on meat production from non-domestic animals, such as game meat, etc.

2. Edible offal

2.1 Edible offal are those edible parts or organs of the animals, other than fats, which are usually separated in the course of the preparation of the carcasses at slaughterhouses. Which of these organs or parts are considered edible offal varies from country to country, depending on the definition of "dressed carcass weight" adopted by those countries in reporting meat production data as well as on the countries' habits. Some countries calculate edible offal as a percent of the carcass weight, the percentage varying from 3 to 10 percent according to various classes of animals.

2.2 In view of the above remarks, it is recommended that countries report production figures separately of what they consider edible offal, which, logically, should not be included in meat production figures. Below is a list of items which are considered edible offal in most countries:

Head or head meat	Throat bread	Thick skirt
Tongue	Sweet bread	Genital organs
Brains	Lungs	Udder
Feet (cleaned)	Liver	Stomach or tripe
Tail meat	Spleen	Blood
Heart	Diaphragm	

2.3 See 1.4.5 above.

3. Fats

3.1 Under this heading, national sources report production data which include one or more of such fats as slaughter fats, butchering fats, rendered fats (lard, tallow), etc., giving rise to the following concepts:

a) Total unrendered fat: slaughter fats and butchering fats (edible and inedible).

b) Total unrendered edible fats: edible slaughter fats and edible butchering fats.

c) Slaughter fats: edible and inedible unrendered fats which fall in the course of dressing the carcasses and are recovered from discarded and fallen animals, guts, sweepings, hide trimmings, etc.

d) Edible slaughter fats (loose fats): unrendered fats which fall in the course of dressing the carcasses, such as fats in abdominal and thoracic cavities.

e) Inedible slaughter fats: unrendered fats from discarded and fallen animals, guts, sweepings, hide trimmings, etc.

f) Butchering fats: unrendered fats obtained from the excess fat trimmed or removed from the wholesale and retail cuts during butchering. Kidney fats, suet and pig-back fat are also included in this definition.

g) Processed fat: rendered fats such as lard, tallow, etc., obtained by melting or processing slaughter and butchering fats.

3.2 The coverage of slaughter fats differs from country to country, depending on the definition of "dressed carcass weight" adopted by each country in reporting meat production data.

3.3 It is recommended that countries report separately production data at least for slaughter fats as defined above, preferably broken down into edible and inedible. Countries reporting slaughter fats together with meat production in one figure should indicate the approximate percentage of slaughter fats on the aggregated meat/fats figures.

3.4 As for processed fats, production data should be collected for lard and tallow (preferably in product weight basis rather than in fat content), as well as data on utilization of these products for food, feed and industrial uses.

4. Hides and Skins

4.1 It is suggested that all countries collect and release production data for hides, skins and fur skins. Data should be given in terms of weight (fresh or green), except for fur skins which should be reported in numbers.

4.2 Countries reporting production in numbers or expressed in dry, cured or salted weight, should provide appropriate conversion factors to green weight.

4.3 Production figures for hides and skins may include those coming from fallen animals, in addition to those from slaughtered animals.

VI. LIVESTOCK PRODUCTS FROM LIVE ANIMALS

1. Primary products include the following: milk, eggs, honey, beeswax and fibres of animal origin.

2. Processed products are those derived from primary products.

VII. CONCEPTS, DEFINITIONS, COVERAGE AND RECOMMENDATIONS PERTINENT TO LIVESTOCK PRODUCTS FROM LIVE ANIMALS

1. Milking animals and milk production

1.1 Concepts, definitions and coverage

1.1.1 The definition of milking animals varies considerably among countries, from those which include all females in reproductive age to those which include only dairy females bred especially for milk production which were actually milked during the year.

1.1.2 On the other hand, estimates of milk production given by countries may refer to one or more of the following concepts: gross production includes milk actually milked and milk suckled by young animals; net production excludes milk suckled by young animals but includes amounts of milk fed to livestock; production available for consumption is net production minus milk fed to animals and waste at the farms; milk deliveries to dairies or dairy plants, excludes quantities retained by farmers for food, feed and direct sales to consumers.

1.1.3 The FAO concept relates to net milk production as defined above, and, as regards milking animals, to all animals which have contributed to produce that milk.

1.1.4 Data on production delivered to dairies are easily obtained from the dairy plants. Estimates for the balance of the production may be obtained from various sources, such as *ad hoc* surveys or subjective estimates.

1.2 Recommendations

1.2.1 In view of the differences identified above, it is recommended that countries report the number of milking animals along with milk production, and also that countries at least ensure that the concept of milking animals adopted is in line with the estimated average milk yield per animal.

Countries are encouraged to refine their concept of milking animals to gradually approach the concept of animals actually milked during the year, keeping, when possible, separate records for dairy females bred especially for milk production and for other females milked.

1.2.2 Countries should report data on milking animals by animal type, i.e. cows, buffaloes, sheep, goats, etc.

1.2.3 It is recommended that all countries report (at least annually) total net milk production as defined above, in addition to the data on deliveries to dairies or milk plants. Such data are to be given by kind of milking animal (cows, buffaloes, sheep, goats) and they should relate to whole milk. If possible, they should be reported in terms of weight rather than in liquid measures.

1.2.4 Countries reporting on a different basis should indicate the concept behind their figures.

1.2.5 Countries are advised to report production, or at least deliveries, either monthly or quarterly, and to report the average fat content of their milk production.

2. Layers and egg production. Statistics of Hatcheries

2.1 Concepts, definitions and coverage

2.1.1 The definition of layers is not yet uniform among countries. Under this term, some countries recognize all females in laying age, whether laying or not, while in other countries the term is much more limited, covering only those females of egg-type breeds which have laid eggs during the year.

2.1.2 Female layers are classified by breed according to dominant production characteristics. There are egg-type females, as well as meat-type and mixed-type. They may also be classified according to the agricultural sector in which they are bred: the traditional sector (widely scattered and individually-owned small flocks in farms and backyards), and the modern sector (large scale, semi-intensive and intensive commercial poultry farms).

2.1.3 On the other hand, egg production is generally reported by countries as total or gross production, i.e. production from all types of females and from females kept in all agricultural sectors. Few countries report net production, i.e. gross production minus eggs used for hatching. Certain countries report data for both categories.

2.1.4 Several countries also report figures for commercial production, i.e. the part of the net production which enters commercial channels. Data on commercial production are easily obtained from the modern sector where most, if not practically all, commercial production is produced. Data on the traditional sector are rather weak in certain countries as they are based on assumptions of the number of females and/or rates of egg laying, or are rough estimates based on food consumption surveys and similar indirect sources.

2.1.5 The FAO concept of egg production covers all domestic birds which have contributed to egg production during the year, wherever they lay and the corresponding total production, including eggs intended to be used for hatching but excluding waste on farms.

2.2 Recommendations

2.2.1 In line with the FAO concept, it is recommended that countries report at least annually on layer numbers and egg production. Layers of all types and from all sectors which have laid eggs during the year should be included.

Whenever possible, a distinction should be made between layers of the traditional sector and those of the semi-intensive and intensive sectors.

2.2.2 It is recommended that all countries report, at least annually, both total production of eggs, excluding waste on farms, as defined by FAO, and production available for consumption, i.e. total production excluding hatching eggs and all types of waste. Countries reporting on different bases should indicate how their data differ from the recommended coverage.

2.2.3 It is further recommended that in reporting production data, countries should use both numbers and weight, or, at least, provide a conversion factor from one unit of measurement to the other.

In addition to annual figures, countries should release monthly or quarterly data, at least for commercial production.

It is suggested that countries report production figures separately for the traditional sector and for the modern sector, particularly when the data of the traditional sector have a certain importance and are much less reliable than those of the modern sector.

2.2.4 In all cases, it is recommended that separate data be collected and released by countries according to various kinds of domestic birds: hens, ducks, goose, turkeys, etc.

2.3 Statistics of Hatcheries

Considerable changes have taken place in the poultry sector (eggs and meat) during the last two decades in most countries, resulting in the rapid growth of a modern and specialized sector alongside the traditional sector.

An important role in the devilment of the poultry sector is played by commercial hatcheries. In fact, several countries collect and publish monthly data on various hatcheries' operations, e.g. number of eggs placed, chicks hatched and chick placements.

It is recommended, therefore, that all countries collect data (monthly, if possible) on the number of eggs placed in incubators, chicks hatched and chicks placed, separately for chickens, ducks, geese, turkeys and guinea fowl. Figures for chickens should be divided into, at least, two categories: eggs/chicks for the laying stock and eggs/chicks for the meat stock.

3. Honey and beeswax

Honey is a sweet viscous fluid, being the nectar of flowers collected and worked up for food by certain insects, especially the honey-bee. Flavour and colour of honey depend largely on the plants from which the nectar is gathered.

Bees store honey in honeycombs prepared by them, consisting in hexagonal wax cells. Beeswax is obtained by melting honeycombs with boiling water (yellow wax). White wax is yellow wax bleached. Beeswax is used for candles, cosmetics and other non-food use.

In principle, honey and beeswax production data should cover production recorded from bee-keepers operating commercially, as well as any other honey produced or collected.

4. Wool and Fine Hair

It is recommended that wool production data should be collected and released by all countries, including both shearing wool and pulled wool, i.e. that recovered from skins.

Wool production figures should be reported on both a greasy basis and a clean or scoured basis. When reported in one way only, appropriate conversion factors should be included.

Countries producing significant quantities of fine hair or wool, such as cashmere and mohair, should report relevant production figures separate from common wool figures.

5. Cocoons and Silk

In countries where sericulture is an important activity, data should be collected on the annual cocoon crop as well as on production of natural raw silk, including waste. The cocoons are those suitable for reeling.

6. Processed products from live animals

6.1 Dairy products

6.1.1. The quantities of raw (crude, whole) milk used as such for human consumption are very small. The bulk undergoes more or less complex processes to obtain either products which are still liquid milk (standardized milk, pasteurized milk, partly skimmed milk, skimmed milk, buttermilk, etc.) or products which are no longer liquid milk (cream, butter, cheese, evaporated and condensed milk, milk powder, casein, yogurt, ice cream, etc.). Most milk and products are sterilized, generally with the UHT method (Ultra High Temperature).

In the processing of milk into dairy products, a certain number of by-products are also obtained, such as skimmed milk, buttermilk and whey, which in turn are used in the manufacture of dairy products, particularly dry skim milk, dry butter milk, dry whey and low fat cheese.

Cheese is the curd of milk coagulated by rennet separated from the whey and pressed and moulded into a more or less solid mass. Data on cheese relate, unless otherwise stated, to all kinds of cheese, from full fat cheese to low fat cheese; hard and soft cheese, ripe and fresh cheese, including cottage cheese and curd.

Whey is the serum or watery part of milk which is separated from the curd in the process of making cheese.

Cream is the yellowish part of milk, containing from 18 to 45 percent or more of butterfat that rises to the surface on standing or is separated by centrifugal force.

Butter is a solid emulsion of milk fat and water made to coalesce by churning the cream obtained from milk. Fat content is about 80 percent. Ghee is liquid butter clarified by boiling, produced chiefly in countries of the Far East. Butter oil is butter melted and clarified.

Buttermilk is the fluid milk remaining after milk is converted into butter in the churning process.

The products resulting from a modest or medium reduction of water are evaporated and condensed milk.

Products resulting from an almost complete dehydration are called dry milk or milk powder or powdered milk.

Yogurt is a fermented, slightly acid semifluid milk food made of milk and milk solids (whole, semi-skimmed, skimmed) and sometimes fruit, to which cultures of bacteria have been added.

Casein, also named lactoprotein, is the main protein of milk. It is obtained mainly from skimmed milk.

Lactose or milk sugar is a disaccharide sugar present in milk. It is commercially produced from whey.

Ice cream is a frozen food containing cream or butter fat or milk or milk solids, various flavouring substances, sweetening and usually eggs.

6.1.2. Recommendations. It is recommended that countries collect and report data on utilization of milk produced according to the following uses: milk for liquid consumption, feed, processing, waste and losses. Separate figures should be reported for the various classes of milk-producing animals. The figures should include utilization at farms, as well as at dairy plants. A breakdown of data into the two categories would be most useful. All data should be reported on an annual basis at least, better even on a quarterly or monthly basis.

Countries producing significant amounts of the various products mentioned above should report relevant production data along with the quantities of whole and/or skimmed milk employed in their manufacture.

Cheese production data are classified by countries according to different criteria: full-fat and low fat cheese, hard and soft cheese, ripe and fresh cheese, cottage cheese, curd, processed or melted cheese. While countries are encouraged to develop their cheese statistics, they should report production data at least classified according to the originating livestock species (cow milk cheese, sheep milk cheese, etc.), separately for cheese produced mainly from whole milk

and cheese mainly from skimmed milk or whey. Countries reporting data on melted cheese should carefully avoid double counting in reporting total cheese production.

It would be desirable that countries furnish some information on the utilization of various kinds of milk powder: food, feed, etc.

6.2 Egg products

The main products derived from eggs are: liquid eggs, white and yolk, together or single; eggs dehydrated or dried or in powder form, white and yolk, together or single, e.g. albumin, dried whites obtained usually as lumps or powder containing ovalbumin and other proteins.