International Standards and Definitions for Agricultural Statistics and Requirements for World Census of Agriculture

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ABSTRACT: Even now, almost 150 years later, it is necessary to reiterate the quote of the "First International Congress of Statistics" for a need to adopt a common language, and introduce unity and integrity into our work. We re-emphasize the need for this "common language" in concepts, standards, classifications and definitions to bring "unity" into our work so that data from different nations, regions, surveys, censuses, etc. are consistent, comparable, meaningful and usable in analysis both statistically and economically. This paper hopefully demonstrates that FAO's World Census of Agriculture is a step in this direction. This paper covers a wide spectrum of statistics in the agricultural sector and highlights the problems being faced by agricultural statisticians collecting data in a multi-faceted, and complex sector for economic analysis.

"The Congress will open a new era for statistics. Statistics will enter into the same phase as several other sciences, its elder sisters, which like her appreciated the need to adopt a common language and to introduce unity and integrity into their research work. May we be able to accomplish successfully our noble mission and serve, we too, the course of science and the cause of humanity."

Adolphe Quetelet
First International Congress of Statistics
London, 1853

1. Need for Standards

In common language, "data" refers to "given facts" about a place, person or thing, such as production of rice, price of rice, age or number of persons, etc. However, in real statistical terms, there is no such thing as production, prices or inter-industry flows independent of the statistical operations involved in its measurement. Data are constructed statistical measures that are operationally meaningful through the levels of aggregation, valuation, basic units of count and weighting schemes which are determined by some theoretical background and with some analytical aim in mind. Information on all economic and social phenomena needed for policy making and decision taking is not useful until they are distinctly defined, which is the basic need for making standards and definitions for collection and compilation of all statistical data. Use of standard concepts and definitions can provide clear linkages between various sectors of economic activities and between various micro and macro databases coming from a number of surveys and censuses.

Looking at the data from an international platform, statistical standards and definitions are important for two main reasons. First, it is known that economic and social behaviour of derived units can be compared if "other" things remain the same. This factor "other" can very well be understood if data collected on economic and social behaviour follow standard definitions. Second, the preparation process for collection of data is complex and costly. It is not always feasible to define "things" using a one man resource, as it is difficult to comprehend all possible alternatives. With the increased awareness of the role of statistics in decision-making, it has become increasingly useful to take advantage of the experience of other countries and/or organizations. In view of this, international statistical agencies have been requested at various forums to provide internationally agreed upon statistical standards to improve the comparability of national data.

2. Programme for the World Census of Agriculture (WCA)

A census of agriculture is a large-scale periodic statistical operation for collection of quantitative information on the structure of a nation's agricultural production sector. Since 1950, the Food and Agriculture Organization (FAO) of the United Nations (UN) has provided a programme for carrying out a census of agriculture for each decennial period, and has assisted countries with standard definitions and concepts based on experiences of many national and international experts and developments that are taking place in various agencies and meetings. The basic objectives of an agricultural census are:

- to provide aggregate totals for fundamental agricultural data to use as bench marks for intercensal estimates,
- to provide a frame for other agricultural sample surveys, and
- to provide data for small administrative units and detailed cross-classifications of farm structural attributes.

This paper uses FAO's "Programme for the World Census of Agriculture" [FAO 1995] as the basis for discussion and a look into concepts and definitions from the point of view of its contribution in setting up standards and definitions.

A census of agriculture, due to its decennial nature, is best suited for collecting data on various characteristics relating to agricultural holdings that change slowly over time. The census of agriculture provides basic data mainly on the organization and structure of the agricultural production sector. It generally covers comprehensive statistics on agricultural land area, land use pattern, size distribution of holdings, various types of tenancy, crops cultivated, status of irrigation system, number and kinds of livestock, agricultural machinery and implements. The proposed lists of items, on which information is to be collected in WCA, are grouped into ten categories:

1. Identification,
2. General Characteristics,
3. Demographic and Anthropometric Characteristics,
4. Employment,
5. Land and Water,
6. Crops,
7. Livestock,
8. Machinery and Equipment,
9. Buildings and Other Structures, and
10. Other Activities.

Other agricultural surveys are required for obtaining current agricultural statistics (items that change quickly over time) which may reflect changes in the economic status of either the holder (i.e. institutional unit engaged in the agricultural activity) or the holding itself. This includes subjects such as area (irrigated as well as total), production and productivity of various crops; livestock and poultry inventories; fertilizer and pesticide applications; uses of high yielding/improved varieties; prices paid and received by the farmers; cost of production; investment in agriculture; economic viability of agriculture activity; subsidies and taxes on agricultural income/output/inputs; and poverty and levels of living of farmers/population dependent on agriculture; agri-environmental indicators. For formulation of plans for development of the sector, apart from data on these items which are directly related to holders and agricultural holdings, data are also required on many associated issues like trade and

transport infrastructure available to agriculture, needs of irrigation and power, status of agro-industries, development of skilled manpower, research, training and extension facilities, etc. Depending upon the administrative set-up and development of statistical systems, these data can either be obtained from administrative sources, or through conducting sample surveys.

The programme (WCA) suggests that countries may review their data requirements and select suitable items depending upon available resources. While determining the requirements, one has to keep in mind that analysis of performance of the agriculture sector requires data on prices and quantities of inputs and outputs, enterprise costs and returns, and net farm income, but it is generally not feasible to collect such data in a census. Similarly, data on food prices, consumption, nutrition, etc. which change rapidly over time cannot be collected through such an operation. However, since a census of agriculture is an operation covering all units (or a sufficiently large number of units when the census is conducted taking a sample survey approach) engaged in agricultural production (excluding service establishments, which cannot be associated with agricultural holdings), data collected in the census provide a basis for imputing data on units which have been covered in other data collection processes to cover total activity. In view of this use of data generated in an agricultural census, it is necessary to examine standards adopted in WCA vis-à-vis standards provided by other systems such as International Standard Industrial Classification of all Economic Activities (ISIC), Central Product Classification (CPC), Standard International Trade Classifications (SITC), and International Standard Classification of Occupation (ISCO). There is also a continuous need for looking into and comparing standards developed by (a) other international organizations for conducting various censuses and sample surveys (e.g. housing and population census or labour force surveys) for the collection of statistical data, and (b) standards used by systems (e.g. System of National Accounts) which have been developed for setting up databases for analytical use. The discussion on standards and definitions in the present paper has been divided into two parts. The paper first covers general discussion on items which have been recommended for collection of data in WCA, and links them with other international standards. Secondly, some concepts have been introduced which are generally required by policymakers to analyse a situation. Obviously, this second part is of a more illustrative nature than being comprehensive.

3. Data Items Recommended for Collection in WCA 2000

As indicated above, data items proposed for collection in the WCA can be grouped into ten categories. Of these ten categories, standards recommended in the *first four categories* dealing with identification, general characteristics, demographic and anthropometric characteristics, and employment have been formulated using standards recommended by the UN Statistics Division and the International Labour Organization (ILO) in ISIC, ISCO, housing and population censuses, etc. It is a matter of general understanding that these standards can be revised as and when any revision takes place in the base document. This flexibility has been adopted to facilitate linkages of data collected in the census of agriculture with other databases. Generally, it is a standing practice that at the time of revising any base international document, a coordination committee is constituted which holds discussions with all international organizations concerned. In this context, however, it may be mentioned that the current programme of WCA recognizes the need of relevant data on women in agriculture and recommends that emphasis on the need to collect census statistics disaggregated by sex be maintained throughout the process of census planning, questionnaire design, data collection, processing and dissemination. This is in line with recommendations made on the subject at various forums.

The *fifth category* covers items related to land and water, and suggests collection of data on area, number of parcels, land tenure, land use, irrigation status, etc. Standards proposed in this group are

generally related to analytical needs for agricultural policy making and have very little interaction with other activities. These standards have been formulated using a large amount of experience gained in organizing agricultural censuses in various countries over many years. An added feature of this category included in WCA is inclusion of details on soil type, soil characteristics and soil degradation to meet the need of environmental analysts. Standards for these items are based on FAO's extensive work on land and soil with other international institutions such as the UN Environment Programme (UNEP) and the International Soil Reference and Information Centre (ISRIC). While recommending some of these standards, it has been kept in mind that an agricultural census is a large scale operation which uses a large number of enumerators with limited knowledge and laboratory facilities. Standards proposed to collect data on soil take into account standards developed for the Global Assessment of the Status of Human-Induced Soil Degradation (GLASOD) survey.

The *sixth and seventh categories* deal with the features of crop cultivation and livestock inventory on the holding. The items relate to area under temporary crops, area and number of trees for all permanent crops, if the holding has used fertilizer, pesticides and improved seeds, livestock inventory, etc. These data relate to physical measurement and do not include items such as yield or production, quantity of inputs used, etc. Data in agricultural censuses are collected for the agricultural year. To promote international standards, the FAO has included an appendix in the publication on the programme for the WCA giving lists of crops along with their botanical names. FAO has also published a document entitled *Definition and classification of commodities* [FAO 1996a] giving definition and classifications of primary and processed products originating from agricultural activity and linking FAO commodity codes with other systems such as SITC and Harmonized Systems (HS).

The *last three categories* deal with machinery and equipment, buildings and other structures, and other activities, and cover items generally used for performing agricultural activity or other activities which are undertaken by the holder along with the agricultural activity. These items provide a very minimum amount of data to understand the overall structure of the agricultural activity in the economy. Standards provided under these categories by the WCA are more of an illustrative nature. Further details on these items can be obtained from the ISIC, the System of National Accounts (SNA) [UN, et al. 1993], the System of Economic Accounts for Food and Agriculture (SEAFA) [FAO 1996b], etc.

4. Standards for Analytical Use

4.1 Agricultural Households Sector

The agricultural households sector is of specific interest to FAO, as well as to many other national and international institutions. To study some of the issues like prices paid and received by the farmers, investment in agriculture, economic viability of agricultural activity, subsidies and taxes on agricultural income/output/inputs, poverty and levels of living of farmers/population dependent on agriculture, status of associated infrastructural development, it is essential to take agricultural households as the sampling unit. In this discussion, we review how data collected in agricultural censuses could be used for (a) studying the structure of the agricultural households sector, and (b) providing a frame for conducting surveys related to agricultural households.

The agricultural households sector has not been exclusively defined in any publication. This is mainly because the concept of this unit depends largely on the objective of the study. Thus, it would be more appropriate to understand its concept and formulate standards. A household is a real resident economic unit which, in a more specific manner, has been defined by the 1993 SNA as "a small group of persons

who share the same living accommodation, who pool some, or all, of their income and wealth and who consume certain types of goods and services collectively, mainly housing and food" [UN et al. 1993, paragraph 4.132]. This concept is based on the text given in the UN publication *Principles and Recommendations for Population and Housing Censuses* [UN 1980].

The 1993 SNA has recommended that subsectoring of the households sector is one area in which the System should be flexibly implemented [UN et al. 1993, Annex 2.3] and states that "There are thus many useful ways in which the households sector may be subsectored and statistical agencies are advised to give due consideration to the various possibilities. More than one method may be adopted if there is a demand for different breakdowns of the households sector from different users, analysts or policy-makers" [UN et al. 1993, paragraph 4.158].

As an agricultural household is an economic unit, it may be useful to consider the ISIC approach for determining the activity classification. The ISIC has recommended that "The activity classification of each unit is determined by the class of ISIC in which the principle activity, or range of activities, of the unit is included. Secondary and ancillary activities are to be disregarded when classifying a unit. The principal activity of the unit in general should be determined from the goods it sells or ships, or the services it renders to other units or consumers" [UN 1990, paragraph 114].

The ISIC approach is based on the general approach used by the UN in giving flexibility to countries to implement the system depending upon their requirements. The concept indirectly takes into account production for own consumption. The ISIC concept recommends three alternative ways of classifications based on (a) value added, (b) output, and (c) employment. Although it is more appropriate to have value added as a basis for classification, the difficulty of compiling value added for constructing sampling frames in a large scale survey has pushed many countries conducting household surveys covering non-agricultural activities to use the concept based on output and employment. In the case of agricultural activity, there are conceptual as well as operational problems in using either of these concepts. These issues arise partly because of agriculture's seasonal nature and partly because it is a traditional family occupation in many developing countries.

The SEAFA, which is based on SNA, focuses on households whose resources are derived primarily from their own agricultural production mainly keeping in view the interest of analysts in the production, income and welfare of households engaged in agricultural production. It is entirely in the spirit of the 1993 SNA to define a subsector of this kind. Following the same kinds of criteria as used in SNA, the SEAFA defines an agricultural household as "a household whose largest source of income consists of mixed income(s) derived from agricultural production", agriculture being defined as in the activity accounts, namely Division 01 of ISIC, Rev. 3. In paragraph 4.153, the 1993 SNA distinguishes three types of household income: (a) mixed income, (b) compensation of employees, and (c) property and transfer incomes.

An agricultural household is one in which the total mixed income from agriculture is larger than either of the incomes received under (b) or (c) or the mixed income received from non-agricultural production. Mixed income is the balancing item on the generation of income account of a household enterprise (excluding the notional enterprise that produces housing services for own consumption). It replaces the operating surplus of a corporate or quasi-corporate enterprise (SEAFA, paragraphs 3.46 to 3.49). The following points should be noted about this definition of an agricultural household subsector in the SEAFA.

- When the household is engaged in production for own consumption, in particular the production of goods for own final consumption within the household, the value of both the

output and the consumption is imputed, and the mixed income derived from the production is a form of income in kind.

- The total output and value added by all agricultural households may diverge significantly from the total output and value added of all agricultural establishments, even in developing countries where most agricultural production is carried out by households. For example, a lot of production may be carried out in establishments owned by corporate enterprises, or even by non-agricultural households, while conversely agricultural households may have significant non-agricultural output.

For the purpose of collecting data on employment in agriculture in a survey programme, FAO in *Collecting Statistics on Agricultural Population and Employment* [FAO 1978] has recommended that "A household is considered to be an agricultural household when at least one member of the household is operating a holding (farm household) or when the household head, reference person, or main income earner is economically active mainly in agriculture." This definition covers households in which any member is engaged in agricultural activity in an economic sense. This concept, though, includes small and marginal farmers as well as those workers who are employed in agricultural activity, but does not cover casual and seasonal agricultural workers. Such an approach, as recommended by the FAO, is more suitable to obtain data on employment in agriculture or the population dependent on agriculture. A survey conducted using this concept cannot be used to collect data relating to improvement in technology, investment and matters related to public finance and policies.

From the above discussion, two alternative concepts of agricultural households emerge. The first looks at those households whose major activity is agriculture, and the second takes a broader approach in which data are collected on the population connected with agricultural activity. This second approach, as mentioned above, does not take into account casual and seasonal agricultural workers. It is also clear that data for any analytical use would include many monetary aggregates which could be obtained only in a sample survey. Thus, the role of the agricultural census is limited to providing a frame for such a survey and for analysing the structure of the sector.

The unit of enumeration in agricultural censuses is, by and large, the holding which is a techno-economic unit of agricultural production. The WCA collects basic demographic characteristics of holder and household along with sources of manpower used on the holding. The general concept of household as given by the UN [UN 1980] has been adopted by the WCA [FAO 1993, paragraph 5.28]. This concept of agricultural household can be approached through "holder" who is a civil or juridical person who makes major decisions on the agricultural holding operation [FAO 1993, paragraph 5.11]. WCA suggests that for each holder legal status may be recorded. Looking into details of legal status, one can classify holders according to the type of institutional sector. Following the guidelines given by the SNA, the first three categories of private holders (an individual, a household, two or more individuals of different households or two or more households) can be grouped into household sectors. One of the major difficulties, more common for developing countries, is to establish a relationship between the "parcel" and the household. This becomes more complicated if two or more parcels belonging to a household fall under different enumeration blocks. It would be necessary to find a workable solution for this issue if data produced by the agricultural census are to be used for studying the household sector. There are two alternatives to handle such a situation. First, while collecting the data from a parcel, details may be collected about other parcels of the same holding and data may be collected only from the largest parcel to avoid duplication. Another feasible way is to collect data for the entire holding from the parcel which is located in the enumeration block where the holder is located. However, the WCA programme does not recommend collection of detailed information on economic status and related matters for the total number of persons living on agricultural holdings.

Considering the fact that the agricultural census is a large scale operation with the objective of collecting data mainly on farming related matters, the *Principles and Recommendations for Population and Housing Censuses* [UN 1980, paragraph 1.31] suggest that "Countries may, therefore, wish to consider the possibility of adding to their population census a question enabling them to identify persons who did some work in connection with agriculture over a longer time-reference period, even though their principal or secondary activity during the shorter time-reference period was non-agricultural."

4.2 Informal Agricultural Sector

The concept of an informal agricultural sector is important for many developing countries. In many developing countries, the informal agriculture sector (including forestry and fishery) plays a vital role. This activity in many countries provides food which raises the level of nutrition not only for the population living below the poverty line but also for the households in the middle and higher income groups. Output of such activities is very often imputed (without any basis) in formulating derived statistics like food balance sheets and estimates of national income. To make appropriate intervention, a minimum set of data is required on these activities in order to study the following aspects:

- size of informal agriculture in terms of the total land area covered and the number of households involved,
- the socioeconomic characteristics of the households practicing informal agriculture and those providing the labour input,
- the role of women in the activity,
- the type of inputs used and the sources of its procurement,
- the output of the activity and final use of the produce (household consumption or sale), problems faced by the households in acquiring inputs, credit (if required) or in selling the output, and
- the impact of the activity on environment and health.

Thus, in many countries no reliable data are available although the need for information on informal agriculture is recognized. In this section, we examine the standard for this sector in relation to standards set up by the WCA. The concept of "informal sector" adopted at the fifteenth International Conference of Labour Statisticians (January 1993) covers units that are engaged in the economic production of goods or services but operates at a low level of organization. According to this concept, the informal agriculture sector would consists of:

- agricultural activities of small and marginal cultivators as well as those cultivators/rural households who grow a few trees or maintain a few livestock to meet their own needs,
- agricultural activity of tribal/ nomadic population, such as shifting cultivation, and
- agricultural activity of households living in urban or semi-urban areas. These households have a system of maintaining a small scale kitchen garden to produce vegetables, or have a small pond to grow fish, or to raise domesticated animals (cows, sheep, goats, pigs or poultry) for getting a regular supply of livestock product. This activity is very often known as urban agriculture. The product of such activity is either consumed within the household or sold in the neighbourhood for supplementary income.

This activity can be undertaken by households either as their principal activity or as a secondary activity or as one of the normal ways of life (i.e. without taking it as a gainful regular economic activity) along with a large number of other economic activities. For example, agricultural land may be cultivated by a cultivator as primary economic activity and he may grow a few fruit bearing trees just to meet his own needs. Although the output of these activities can be significant, depending on circumstances and method adopted for collection of data, its output can very often be missed or not recognized.

Looking at the general recommendations for the collection of agricultural data given in the WCA [FAO 1995, paragraph 5.108] or similar other citations, it is always suggested to cover such activities. However, in practice, this would rarely be feasible. Probably such activity will be missed in most data collection operations because of the cost involved. The nature and problems for each of the activities listed above are different. Agricultural activities performed by the marginal and small farmers can sometime be a secondary activity which might be missed when data are collected in a household survey covering units with agriculture as their principal activity. Even in cases where crop production activity of small and marginal farmers are collected using crop estimation surveys, output of horticulture (i.e. trees on the holding) and livestock is very often missed. In the case of shifting cultivation or urban agriculture, data are generally not collected because of difficulty and cost of developing the frame.

4.3 Information Relating to Economic Activity

Among the numerous topics that are included in the WCA, obtaining information relating to economic activity may be one of the most complex. Such information is useful for designing adequate social and economic policies for the agricultural sector. There are many issues to be addressed in this respect which are related to the applicability of certain concepts, the extent to which information should and can be collected, the usefulness of the data, etc.

The collection of information on employment through an agricultural census may be approached from different angles, depending on the objectives countries wish to satisfy. One objective may be to measure "labour inputs or resources" used by holdings during the agricultural year in relation to the type, level and source of inputs contributing to the production, investment and maintenance activities of the holding. In this case, information on the number of persons employed by holdings on a regular as well as on a temporary basis during the reference period should be collected in a way which makes it possible to distinguish between workers on a full-time and part-time basis, as well as the use of seasonal and other short-term workers, the number of persons and the number of work days or months worked on the holding during the reference period. To make comparisons and analyses more complete, results should be consistent with production-oriented statistics obtained from other inquiries.

Another objective of collecting employment data in the agricultural census may be to obtain an up-to-date description of the labour market situation of all members of agricultural holdings (household members and related workers). To this end, information should be collected on the "economic activity status" and related labour force characteristics of all persons associated with the holding. A measure of the current labour force, in relation to a short reference period such as one week preceding agricultural census day or one day, the census day itself, may be sufficient as opposed to the measurement of the population usually active over the year. Concentration on a short reference period may also enhance the agricultural census' capacity to capture information on activities which are usually not considered as production, such as land improvement or construction of farm structures or residential buildings, etc. These may otherwise go undetected if activities are recorded with one year as the reference period.

The choice of measures for enumerating the economically active population in the Census of Agriculture is fundamental to the scope and quality of data on the economic characteristics of the labour resources used in agriculture, and it is also essential to establish their link with statistics on employment in agriculture obtained from other sources (e.g. the Population Census, labour force and other relevant surveys, administrative registers). To achieve international comparability of economic statistics between countries and regions, the FAO Statistics Division and the ILO Bureau of Statistics have jointly prepared a special supplement to provide additional guidelines to the National agricultural statisticians responsible for the implementation of the Agricultural Census Programme in their country.

5. Concluding Remarks: Agenda for Future

WCA has set up a coordinated frame for development of standards and definitions. Wherever needed, FAO has developed special supplements to make a point explicitly clear [e.g. FAO 1997]. However, there are still areas requiring the attention of international gatherings like this "Agricultural Statistics 2000". To demonstrate, let me mention that "land" is the key factor which links agriculture with other economic activities. Requirements of various users have developed various information systems for collecting data on land using diverse techniques like remote sensing. Thus, one of the immediate needs of the time is to develop standards and definitions, such as arable land, pasture land and forest land [Larson and Narain 1997], in which data emerging from various sources can be integrated. This has been recognized by FAO and work in this direction is in progress.

References

FAO (1978), *Collecting Statistics on Agricultural Population and Employment*, Rome.

FAO (1995), *Programme for the World Census of Agriculture 2000*, FAO Statistical Development Series No. 5, Rome.

FAO (1996a), *Definition and Classification of Commodities*, Rome.

FAO (1996b), *A System of Economic Accounts for Food and Agriculture*, FAO Statistical Development Series No. 8, Rome.

FAO (1997), *Programme for the World Census of Agriculture 2000: Additional Guidelines on Employment*, FAO Statistical Development Series No. 5a, Rome.

Larson, L.O. and Narain, P. (1997), *Land Quality and Other Indicators of Sustainable Development: Statistical Data, Quality Control and Problems of Aggregation*, FAO Land and Water Bulletin No. 5, Rome.

UN (1980), *Principles and Recommendations for Population and Housing Censuses*, Statistical Paper, Series M No. 67, New York.

UN (1990), *International Standard Industrial Classification of All Economic Activities*, Statistical Papers, Series M No. 4, Rev. 3, New York.

UN, et al. (1993), *System of National Accounts*, Series F No. 2 Rev. 4, New York.