

Issues and Concerns for Developing Countries

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ABSTRACT: Over the years the attention of agricultural development planners has evolved such that data needs refer not only to issues relating to agricultural holdings and agricultural production, but also to those relating to the welfare of the population dependent on agriculture, as well as the food security of the population as a whole. Despite this need and increasing awareness of the importance of statistics, most developing countries still do not have an adequate system of statistics pertaining to the agricultural sector. To improve the existing system, it is necessary to take into account a country's specific data needs and priorities within a comprehensive framework that goes beyond the traditional focus on agricultural censuses and production surveys. This paper suggests an approach based on the comprehensive integrated information systems to ensure that the priority data needs are met across the whole spectrum of data users without duplication. Such an approach would enable a country to go beyond the traditional data collection systems and provide additional information for making policies for sectoral programmes and to assess their impact on the welfare of the agricultural household sector.

1. Introduction

The share of the agricultural sector in the total economy of developing countries is quite high (40 to 50 percent) and the share of the population dependent on it is still higher. Historically, data on agriculture have been collected to meet development needs related to land use and agricultural production. Hence, the system of agricultural statistics has traditionally focused on censuses and surveys of agricultural and livestock holdings. The censuses, being large-scale operations, have in general been confined to collecting structural data which do not change over a short period of time. For the purpose of obtaining current agricultural statistics, reliance has generally been placed on annual sample surveys of agricultural holdings. However, as agriculture is the main source of employment and livelihood of a majority of the population in developing countries, the attention of agricultural development planners has over the years evolved such that data needs refer not only to issues relating to agricultural holdings and agricultural production, but also to those relating to the welfare of the population dependent on agriculture (e.g. income, health, nutrition, etc.), as well as the food security of the population as a whole. Agriculture planners are also concerned with improving production in the context of sustainable development. In this connection, they are interested in data relating to the depletion of natural (land) resources and their environmental effects. More recently, the need to examine the impact of agricultural policies on the welfare of the population dependent on agriculture has led to an interest in household surveys that integrate key agricultural and welfare data.

Yet, despite the increasing awareness of the importance of statistics in planning for agricultural development, it is noted that most developing countries still do not have an adequate system of statistics pertaining to the agricultural sector. The available agricultural data are incomplete in terms of: (a) the range of commodities covered (for example, in many cases only cash crops for large farms are covered), (b) the range of variables or data sets covered (for example, data on agricultural inputs are in many countries practically non-existent), and (c) coverage of the nation (sometimes parts of the country are excluded from the national statistical reporting system). Furthermore, even when data are available, their reliability is often questionable. In fact, agricultural data in a country also come from

other kinds of censuses or surveys as well as from administrative records. As the different institutions involved are not aware of each other's activities, there is considerable duplication of effort and, in many cases, conflicting data are reported for the same items. As regards data on the welfare of the households engaged in agricultural activities and the food consumption level of the population, in many countries appropriate household surveys are either not available or not regularly undertaken. When it comes to data relating to the depletion of land resources and their environmental effects, the situation is worse. Finally, even when considerable data relating to the agricultural sector are available, it has seldom been recognised that the different data components often have different coverage and time frames thus requiring special processing, tabulations, adjustments, etc. prior to their usage in an integrated manner or for the purpose of a particular study or analysis. The reasons for this state of affairs are manifold. However, the key contributory factors are given below.

1. Agricultural censuses, surveys and other statistical inquiries are often undertaken in isolation of each other and there is often a lack of understanding and coordination between statistical agencies and offices undertaking economic analysis, planning and decision-making.
2. Many of the problems associated with agricultural statistics in developing countries are typical of the development of statistical systems in general. These include:
 - poor coordination of scarce resources, especially of donor assistance;
 - programmes reflecting the interests of donors rather than those of the country;
 - non-sustainability of externally funded programmes due in part to: (a) the technically complex nature of the programmes, (b) inadequate development and use of local manpower, and (c) failure of Governments to provide counterpart funds;
 - disruptive effects of civil wars as well as some external programmes on the work of statistical offices; and
 - lack of trained manpower, high turnover of staff from statistical systems, and poor management practices.
3. Statistical systems have also suffered from a lack of development in the use and analysis of the data collected. As a result, in times of economic austerity, statistical services have been among the first to experience resource cuts often resulting in the collapse of what are often, anyway, very fragile systems.

Thus, the problem is multi-faceted in nature and it is obvious that the actions to improve the situation should involve adequate financial resources and national capability building (including appropriate infrastructure, training, etc.) These actions would be better guided and targeted if a comprehensive approach aimed at meeting the needs of agricultural sector planning and development is taken in the future. This paper discusses in brief an approach to meet this need.

2. A Comprehensive Approach for Agricultural Statistics

The improvement of the existing system of food and agricultural statistics would have to take into account the country's specific data needs, priorities and resources. However, it is essential that these be considered within a comprehensive framework that goes beyond the traditional focus on carrying out agricultural censuses and production surveys. This is also essential in order to reflect the socioeconomic and environmental concerns associated with agriculture as a sector of economic activity. Thus the objectives of the comprehensive system should be:

1. to improve the production and dissemination of core data and establishing hyper-linkages with household based data;
2. to provide support for the systematic review of economic development and policies relating to agriculture and food security and assess the impact of these policies on growth of agriculture and environment taking into account regional, social and income disparities of the population dependent on agriculture, and form the basis for promotion of sound economic growth and an orderly and stable system of agriculture which is sustainable over a long period of time; and
3. to help adopting appropriate economic policies and identification of issues and problems in a timely manner, so that a country can implement suitable corrective measures more quickly.

The adoption of the above approach essentially involves the development of a comprehensive approach for the collection and compilation of agricultural data based on:

- identification of data needs vis-à-vis existing availability of data;
- establishing micro-macro linkages for arriving at structural as well as current information with the required details;
- use of statistical tools like Supply and Utilisation Accounts and Economic Accounts for Food and Agriculture to examine consistency of the information gathered from the variety of sources and to derive key food and agricultural indicators;
- integration of data collection, processing and tabulation of data in one framework to meet the diverse analytical and reporting needs;
- making plans for collection of additional information; and
- making use of household surveys for investigation into policy issues.

Developing the existing agricultural statistics system in the above context consists of a number of steps as discussed below.

2.1 Identifying a Set of Core Data

The first step is to identify a set of core data which are very often required for an overview of the food and agricultural situation. This includes data on items such as production of agricultural commodities and yields, livestock production, use of agricultural inputs (farm machinery, fertilisers, pesticides, etc.), trade in agricultural products, prices of agricultural products and inputs, land use and cover, forest production and resources, fisheries production and resources, food consumption levels and distribution, household income, and agricultural population and labour force. The core system could also include certain pre-harvesting data for the purpose of deriving advance crop estimates to be used for determining any likely shortfall and hence the expected level of food import/aid which may be required.

While assessing the needs and priorities, one may also identify the areas of concern which are important for growth of agricultural output and where an assessment of the cause and effect relationship is required. It is also necessary to identify the needs of data users in terms of frequency of data collection, the required level of data aggregation, which may include either geographical/administrative regions or the type of analytical unit, and degree of accuracy. In certain cases, data at micro-level may also be required for undertaking economic analysis.

An important point in determining the type of data aggregation needed is the consideration of areas of concern generally addressed in agricultural planning or policy analysis. In this context, there are three areas for which aggregated data are generally needed, namely aggregated macro data relating to agricultural commodities, technology for agricultural production, and socioeconomic impacts on the population dependent on agriculture. The unit of analysis or aggregation for the first area of concern is the outcome of agricultural activity (i.e. type of output), while for the other two areas they are agricultural holding and institutional unit (e.g. households), respectively. The first type of unit is basically an invisible unit, while the other two units are visible and are also used as sampling or enumeration units. A brief discussion on each of the three areas of concern is given below according to unit of aggregation involved.

- *Aggregated macro data relating to agricultural commodities:* These data are required to know a country's total agricultural production, amount of inputs used, etc. These data are also required for the compilation of input-output tables, food availability, etc., and can be used to make decisions on various issues relating to food supply and formulation of production targets, export and import policies, etc. Such data disaggregated by administrative subdivisions, agro-climatic/agro-ecological zones, etc. provide a useful basis for framing policies for addressing regional disparities.
- *Data on holdings:* An agricultural holding is an economic unit of agricultural production under single management without regard to title, legal form or size. Aggregated data on agricultural holdings are required to make decisions on production technologies. These data are used for measurement of productivity, output-input and capital-output ratios, etc., for taking decisions on capital and labour substitution, mixed farming and optimum utilisation of scarce resources in an environmentally friendly manner through crop rotation and other soil conservation programs. Data on agricultural holdings are also useful for compilation of production function, economic and environmental indicators.
- *Data on institutional units:* An institutional unit is responsible for managing the economic operation on the holding. The unit is responsible for taking technical and economic decisions for carrying out economic activity associated with the agricultural holding as well as other socioeconomic activities associated with the institutional unit. Thus, an institutional unit is a real economic unit. By definition, it is capable of owning assets and incurring liabilities in its own right. It can receive and spend income, borrow and lend, and so on. Aggregated data for such units are useful to study impact of various policy measures on socioeconomic conditions of the population dependent on agriculture. Data on institutional units are also useful for measurement of poverty and determining levels of living of the agricultural population, compilation of terms of trade, etc. Such data are also used for making governmental policies relating to taxes and subsidies, and formulation of macro-models.

2.2 Critical Review of the Existing System of Data Collection

It is necessary to study the different direct or indirect sources which can provide the data previously identified. Examination of the data sources should be undertaken separately for each of the available censuses and surveys, as well as for other sources like administrative records. The issues to be examined may include: (a) frequency and geographical coverage of the data collection, (b) the list of items included in the identification block and their concepts and definition, and (c) the list of items covered in the survey vis-à-vis the list of items on which data are required. At this stage, especially for agricultural censuses and surveys, it may also be ascertained whether it is possible to modify the

concepts and definitions used to reflect the national standards (preferably linked with international standards). Such a modification would provide linkages with other data sources.

The data sources to be reviewed are not only the agricultural censuses or surveys but also the population and housing censuses, censuses/surveys of manufacturing establishments, income/expenditure/consumption and levels of living surveys. Data collected in these censuses/surveys can provide valuable information relating to agricultural households, population dependent on agriculture, and consumption of agricultural goods in the country. Wherever necessary, the appropriate tabulations need to be derived from the original data. Some of the data on items like procurement and producers' prices of agricultural products, distribution of fertilisers and pesticides, electricity consumption for agricultural purposes, payments made for use of government sources of irrigation and actual cost of maintaining irrigation system, exports and imports of agricultural commodities, expenditure on research and extension, etc., can sometimes be obtained from administrative records.

2.3 Processing Data Within the Framework of Supply/Utilisation and Economic Accounts

The third step in the process of developing a comprehensive system consists of processing the data from the various sources within the framework of supply/utilisation accounts and economic accounts for agriculture. This may involve re-aggregation and re-tabulation of data according to the relevant economic units and making some imputations to fill in data gaps. Such an exercise would enable an examination of possible inconsistencies or errors of the data and provide the basis for deriving measures such as food supply/availability, agricultural productivity, investment and GDP in agriculture, etc.

2.4 Identification of Additional Data That May Be Collected in Existing Censuses/Surveys

Examination of the list of items covered in on-going or scheduled censuses and surveys could also reveal if data on some additional items connected with the unit of enumeration can be collected. This would strengthen the existing system of data collection in three respects: (a) provide additional information at a nominal increase in cost, (b) facilitate the study of cause and effect relationship, and (c) provide easy consistency checks on basic data (by observing certain key ratios derived from the data). As an illustration, while collecting data on agricultural production, it should also be feasible to collect data on inputs, seed variety used, status of irrigation, crop rotation and other cultivation practices, details of soil type and quality of land, employment, etc. Such additional data are of great value for studying the natural resource base and compilation of environmental indicators and GDP.

2.5 Need for an Integrated Household Survey

The issues discussed above focused on the core statistics needed for agricultural sector planning. Such information may also help to monitor the current trends of growth of agricultural production within the process of overall economic development, sound use of agricultural inputs (including plant nutrition and soil fertility, and technology of production), use of labour, capital and natural resources (land and water), strengthening human resources and institutional capacity (education, training and extension services), availability of credit and inputs vis-à-vis productivity, nutritional status and quality of food, and rural development. However, the objective of the policymaker in government could also be to assess the impact of various policy measures on certain development objectives, for example the impact of prices of agricultural products (or taxes and subsidies related to the agricultural sector) on the level

of living of population dependent on agriculture, the impact of conservation on status of soil and agricultural growth, etc.

As government policies and programmes primarily address the needs and welfare of the population, it is obvious that attention should in the first instance be focused on the impact of agricultural policies on the availability of food in general and the economic condition of the population dependent on agriculture. This requires data on the welfare of the agricultural households collected concurrently with information on the key agricultural variables pertaining to the holdings owned or operated by the households.

Sample surveys of households are the principal vehicle for collecting socioeconomic data for the population or specific groups of the population. Data collected on household income/consumption/expenditure in such surveys serve a wide variety of uses such as measurement of the levels of living and the disparities among socioeconomic groups, measurement of absolute and relative poverty, measurement of the impact of government's socioeconomic policies for the benefit of different income (or regional) groups, etc. In several countries where area frame/lists are not available, efforts have been made to use the household approach also to conduct agricultural surveys. However, although household surveys collecting data on income and other socioeconomic variables also do collect some data on agricultural income/production, the details covered do not permit a study of the economic aspects of agricultural activities performed by the household. Similarly, agricultural surveys rarely collect enough details on the socioeconomic aspects of the agricultural activity. For this reason, a single household, multi-subject survey collecting data on key agricultural and welfare variables of interest may need to be considered for the purpose of assessing the impact of agricultural policies on the welfare of the population dependent on agriculture. Alternatively, one of the existing surveys using the household as the sampling unit may be redesigned to cover the required agricultural and welfare variables. In view of the scarcity of resources, the latter approach may be preferable. Whatever may be the case, such surveys require careful planning as discussed in the next section.

3. Methodological Issues Relating to Planning of the Multi-subject Household Survey

In addition to including agricultural and welfare related items in a single household, multi-subject survey, the issues involved would be related to the improvement in the efficiency of sampling design to obtain reliable data and coverage of areas which have been left out in the existing program. In this connection, it may be necessary to make a detailed analysis of the existing system of household surveys by looking at the sampling frame, sampling design, existing sample size and level of standard error of estimate. A choice would have to be made regarding the use of various techniques such as small area techniques, ratio and regression estimators, panel approach, subsampling, remote sensing and area frame techniques. The selection of any technique would very much depend upon the availability of resources, the existing set-up and the type of data required to be collected. In this section, we will discuss some of these methodological issues.

In a single subject survey, the aim is to collect data on one principal item which can be tabulated according to various classificatory variables. Such surveys do collect data on other subjects, but the information on these subjects is minimal and may not support analytical usage due to problems associated with concepts used for measurement, adequate representation in the total population, amount of details collected, etc. These surveys generally use straightforward sampling techniques like simple random sampling supported by stratification or cluster methods as an aid for selection of sample. Very often techniques of multi-stage cluster sampling and double sampling are used for a reduction of costs. Auxiliary information may be used for stratification, but this is not very relevant as stratification is

done for the sake of administrative convenience in these surveys. Use of these techniques is common even if it adversely affects the efficiency of the estimate.

Multi-subject surveys are conducted for covering a variety of subjects (variables). Since the data on the range of variables collected are to assist model building, the use of information on auxiliary variables and intra-cluster correlation plays a vital role in these surveys. For example, auxiliary information is considered both for designing a sampling scheme and for estimating a particular parameter. Similarly, techniques like post-stratification, ratio and regression estimators are used for model assisted estimation. As regards the sampling design, the technique of systematic sampling is preferred not only for the sake of convenience in selecting the sample but also to increase its efficiency. Sometimes it is feasible to transform the basic list to take advantage of this technique. However, in such cases, care would have to be taken so that the cycle for selection of the sample does not coincide with the cycle present in the list. In multi-subject surveys, it is also important not only to go into details of designing the sample but into the data analysis required. Sometimes it may be necessary to adopt a particular scheme for stratification or to use cluster sampling. However, as these may affect the data analysis, the “nuisance approach” may have to be adopted. As these issues can be elaborated only in an actual case, the discussion below is limited to the general principles. For more details, reference may be made to standard text books like *Practical Methods for Design and Analysis of Complex Surveys* [Lehtonen and Pahkinen 1996].

In conducting a multi-subject household survey for the purpose of impact assessment, interest is generally in micro-level analysis where it is important to study the same group of households over a number of years so that the impact of policy does not get confounded with sampling and non-sampling errors. In such cases, two options are available. In the first option, only part of the households are retained for a number of years so that the real change and the estimated amount of total benefit which can occur could be studied through a combination of micro and macro level analysis. In the second option, one may collect data on a selected number of attributes for two periods. While the first approach is more dynamic and can be facilitated by techniques like panel surveys, it provides a less efficient estimate as the exercise is limited to part of a larger sample. The second approach is normally adopted when a “before and after” type of assessment is required. However, in such cases, recall lapse is quoted as a major problem. Apart from these limitations, other sources of errors like enumerator bias and factors like respondent burden and changes in the status of certain respondents need to be considered while planning such surveys.

4. Conceptual Issues for Conducting Household Surveys to Study Agricultural Sector

Irrespective of the nature and purpose of conducting sample surveys, there are some conceptual issues which require careful consideration. Issues like choice of survey population, sampling and enumeration units and periodicity naturally depend on the objective of the survey. These issues have to a large extent been discussed in FAO publications [FAO 1995, 1996a, 1996b, 1997b] dealing with the conduct of agricultural censuses and sample surveys including the relative advantage of adopting multiple frame methods vis-à-vis list frame and other techniques. Here, we would like to highlight three conceptual issues which are vital for conducting a household survey for studying issues relating to agricultural sector: (a) choice of accounting and reference period, (b) concept of agricultural households, and (c) concepts relating to production, income, consumption, etc.

The choice of proper reference periods for data collection and the accounting period are vital for any integrated household survey. Normally, income data are collected using the reference period of a year, while for household consumption expenditure, a month or a fortnight is used. On the other hand, crop

data in agricultural surveys are collected using a reference period that corresponds to the prevailing crop season or agricultural year. Thus, in the context of a multi-subject household survey integrating agriculture and welfare related variables, there is a need to synchronise the different reference periods such that the information collected on the welfare related variables are as much as possible linked to the income originating from the agricultural output. This could be accomplished by choosing a suitable accounting period.

The concept of the agricultural household is another issue which requires consideration. An agricultural household can be defined in four ways: (i) taking the economic activity (i.e. operating an agricultural holding) of the head of the household, (ii) taking the major source of income of the household, (iii) considering if any member of the household is operating an agricultural holding, or (iv) considering if any member of the household is engaged in the agricultural activity irrespective of whether he is operating an agricultural holding. All four approaches lead to different measures of population dependent on agriculture and serve different objectives. The first approach assumes that the holding is normally operated by the head of the household (as is the case in many developing countries) and by convention the household is an agricultural household, whereas the second approach limits the area of study to those households whose principal activity is agriculture. In the third approach, all households operating agricultural holdings are covered, whereas in the fourth approach all households dependent (fully or partially) on agriculture are included. A detailed discussion on this issue and related concepts is given in the FAO Publications *Collecting Statistics on Agricultural Population and Employment* [FAO 1978] and *Multiple Frame Agricultural Surveys: Volume II - Current Surveys on Area and List Sampling Methods* [FAO 1997a].

Concepts relating to production, income, consumption, etc., which are vital for investigating issues relating to the agricultural sector, also need to be considered in the household survey questionnaire. These issues come normally under the preview of national accounting and reference can be made to *System of National Accounts* [UN et al. 1993] where the related concepts have been discussed in detail. An accurate measure of each of the items of production, income, consumption or expenditure in physical terms as well as in monetary terms are useful not only on their own right but also to facilitate a consistency check. It is important to clearly define which items are required to be included. As an illustration, there are issues regarding the accounting of a standing crop, expenditure on purchase of livestock and machinery, valuation of crop lying in a field or kept in the farm store house. For an in-depth discussion on these issues reference may be made to *A System of Economic Accounts for Food and Agriculture* [FAO 1996c].

5. Concluding Remarks - a Feasible Solution

Galileo, while explaining the theory of fulcrum, stated that if he is given a place outside this universe to stand and fix a lever, he would be able to lift this universe. It is true that neither a place was available nor the universe was lifted, yet there were many illustrations to demonstrate the principle. Likewise, it may not be feasible to design and implement the perfect information system for decision-makers for all countries, but it is necessary to make a beginning by strengthening the existing system of agricultural statistics which would consist of improving a core block of essential statistics with hyper-linkage with the household sector. Today it may not be feasible for many countries to collect all the data required for investigating options for policy action, but at least a base work can be initiated. This issue is to be taken up along with building an in-house capability for collection, processing and analysis of data. A strong government support and a great deal of help would be required from international organisations and developed countries in planning, financing and developing national capacities to maintain such a system.

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