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Co-operation between Agricultural Economists and Statisticians in the Production of Agricultural Statistics in the State of São Paulo

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INTRODUCTION

THE part agriculture represents in a country's gross income is one of the indicators of that country's state of development. Usually, the more important agriculture is in a country's economy, the less developed that country is likely to be.

Agriculture in Brazil accounts for a sizeable part of the economy. Nevertheless, great problems remain unsolved in the field of agricultural statistics.

Paradoxically, those countries which most need agricultural statistics, usually lack them and this, in the end, involves high social costs. Decisions on agricultural policy are hampered by lack of, or vagueness in, statistical information relating to economic and social problems in agriculture. There is no sound basis for taking decisions on agriculture.

A further difficulty is due to the fact that national, regional and state agencies, public or private, which issue agricultural statistics based on administrative records or survey of basic data, consider such information almost confidential, so that it is difficult to get data.

Whenever information on a given problem is required, one has to conclude that surveys were badly planned and that data were not duly checked before final calculations were made. Therefore, there is a lack of coherence and data on the same subject, obtained from various sources, frequently conflict.

PROBLEMS OF AGRICULTURAL STATISTICS

Specialized bodies of international agencies such as FAO and OAS have concerned themselves with measurements of economic and social aspects of the agricultural sector, and attempt to advise national agencies in the field of agricultural statistics, offering them technical assistance.

They intend to assist in the structuring of efficient organizations for the production of agricultural statistics meeting each country's requirements and compatible with each other, so that significant regional and world-wide comparisons and calculations become feasible.

According to FAO's Statistics Division, several of the developing countries share various problems in the field of agricultural statistics. The most significant common characteristic seems to be the lack of programming of activities, i.e. 'work of government agencies in charge of data collection is not systematically planned, duly taking into account requirements, resources and current professional levels when setting up statistical projects. Projects are drafted and authorized on an emergency basis'. Field work is hurriedly carried out by temporary teams, dispersed at the end of the job. This cycle repeats itself whenever an emergency occurs.

Production of agricultural statistics is, however, a constant task and requires rational organization. It should meet users' requirements at minimum cost. For this purpose, requirements, resources and the level of professional qualification of technicians involved will have to be defined.

Efficient operation of the agency in charge will require preparations of each project and previous contracts with data users in order to ensure fulfilment of their requirements. Obviously, problems regarding the way to obtain required information and its statistical processing will have to be defined. Finally, decisions on sources to be used to obtain primary data and structuring and checking of field work deserve close attention.

Therefore, definition of goals, breakdown of the programme into data collection projects, securing compatibility, proper timing and correct budgeting, are essential for implementation of the programme at minimum cost.

A short list of the various kinds of requirements a modern statistical organization is required to meet shows the complexities of its tasks, due to the variety of the agricultural sector's activities and the complexity of its relationships with other sectors of the economy.

This organization should supply information to consumers of agricultural products and to those who sell, transport or process such products, to those who finance production and those who manufacture and sell inputs. It must further inform government decision-taking bodies attempting to co-ordinate these activities and responsible for drafting supply, stocking, export and agricultural research and extension policies, as well as others, which are more general, such as policies in the monetary and tax fields.

They all require adequate quantitative information describing the infrastructure of agricultural enterprises and the situation as regards production and sales of farm products on a seasonal basis.

Besides the complexity of agricultural activities and their far-reaching relationships with the economy's other sectors, a number of other unfavourable circumstances account for the difficulties in setting up an efficient and adequate system of agricultural statistics in Brazil. These can

be summarized as follows:

—agricultural production is carried out in a large number of independent enterprises, over a vast geographical area;

—classification of agricultural enterprises and their production requires collection of a great volume of highly variable information. Due to this fact, modern sampling techniques are only economically feasible for large administrative units. Smaller administrative units (counties, for instance) must continue to collect data through traditional methods;

— a vast statistical system at the national or regional level does not eliminate the need for specific surveys to solve special problems;

— teaching of statistics at agronomy schools is not designed to train specialists in official agricultural statistics;

— collection and processing of information requires a degree of training and dedication above the average now available among civil servants;

— a sound system of agricultural statistics requires much effort and its results, although representing an improvement of social infrastructure, are not spectacular.

If we consider the complexities of agricultural statistics, the great difficulties of their collection and the weaknesses of the administrative organizations concerned with the matter, we can easily understand the present situation and size up the great effort required for its improvement.

As a contribution to the discussion of the need and possibility of co-operation between agricultural economists and statisticians in planning and producing required agricultural statistics, we feel that what has been done in this field at the São Paulo State Secretariat of Agriculture over the past twenty years may be of interest.

AGRICULTURAL STATISTICS AT THE SÃO PAULO STATE SECRETARIAT OF AGRICULTURE AND THE RURAL ECONOMY CENTER

Those in charge of the Secretariat of Agriculture have always included in that organization an agricultural statistics service, since they were well aware of the importance of up-to-date and trustworthy information for guiding their decisions.

Before IBGE was established in 1936, the Secretariat operated the Agricultural Information Service, which was then merged with the State Department of Statistics. That agency was set up for the purpose of centralizing the state's statistical information, along the lines of the Brazilian Geographical and Statistical Institute, entrusted with centralizing statistics at the national level.

The organization included, and still includes, a number of country statistical agents, hired by IBGE and working at the seat of the country. Besides collecting and preparing varied statistics, the country agents completed Form D, designed to collect agricultural statistics, quarterly

and in triplicate. One copy was filed at the county statistical agency, another forwarded to the State Department of Statistics and the third sent to SEP—Production Statistics Service of the Ministry of Agriculture in Rio de Janeiro which, after appraising and adding up data, supplied overall results by state and on a nationwide basis.

Since the start, county statistical agents used the subjective appraisal method.

IBGE, although its system of operation was soundly conceived, had to function under difficult conditions and it was soon found that its agricultural statistics lacked accuracy, besides being published so late that information was no longer relevant as an indicator of prevailing conditions. This situation prevailed all through the country, but was especially felt in São Paulo, where the Secretariat of Agriculture makes greater use of statistical information for establishing operational plans and measures designed to benefit agriculture.

For this reason, when the Agricultural Regions Section was reorganized in 1942, regional agronomists were entrusted with establishing subjective forecasts and estimates of the production area of major farm products in their regions. Agricultural statistics produced by the Agricultural Regions Section between 1942 and 1945 were felt to be essential tools for analyzing the farm situation in the state of São Paulo.

The first rural economy center of the State Secretariat of Agriculture was set up as a committee in 1945, and in due course became the Rural Economy Sub-Division.

Since the start, the Sub-Division's agricultural economists concerned themselves with agricultural statistics, since available information was worthless, in quantity and quality, even for the most simple economic analyses. Poor coverage and lack of accuracy of available statistics made conclusions or indications resulting from economic analysis highly doubtful.

Of the Sub-Division's four sections, those in charge of crop forecasts and markets and prices were more directly involved in statistical problems. The purpose of the Crop Forecasts Section was to consolidate and expand work started in the Agricultural Regions Section. The statistics group was concentrated in this section and, thanks to its agricultural economists, expanded situation statistics by means of monthly reports on crops, which were summarized and quantified. To obtain data on land ownership throughout the state, the rural Real Estate Register, based on rural property tax rolls, was organized.

Its most important activity, however, were forecasts of the production of major foodstuffs and industrial raw materials, in order to avoid speculation and depressing prices at harvest time.

From 1948 on, production and prices data for 21 main products were used for calculation of gross income. Gross income of these 21 products seems to have been the first economic indicator for Sao Paulo's agriculture to be systematically calculated.

Gross income calculations, much appreciated by economists, further highlighted the weaknesses of data collected and raised the problem of improving the crop forecasts. One of the Sub-Division's specialists was then entrusted with the study of modern methods for obtaining agricultural statistics, in view of their use in improving state-wide crop forecasts.

INTRODUCTION OF THE SAMPLING METHOD

In 1951, the preliminary phase of changing the crop forecast system was started. A pilot survey was carried out in Indaiatuba County, to test feasibility of a property sample by means of mailed questionnaires and on-the-spot surveys. At the same time, feasibility of use of the rural property tax rolls as a reference system was tested. Information collected allowed to establish the required size of samples to estimate production of the state's six main products with a standard error not in excess of 5 per cent.

Experimental surveys were carried out throughout the state in 1952, and 1953, with samples of 1350 and 1500 properties respectively.

In 1954, improved agricultural statistics permitted the start of official publication of a body of forecasts and estimates obtained by sampling.

The Sub-Division lacked resources required for the series of field surveys deemed necessary, which were programmed in due course. The option to set up a mobile team for carrying out interviews and filling in questionnaires was discarded in favor of collaboration with the Agricultural Regions Section, whose network of agronomists adequately covered the state.

Collaboration of regional personnel was not easily obtained and some persuasion was required to convince them to carry out this additional work without extra pay. In due course, they were instructed as how to correctly complete the questionnaires. Actually, the first questionnaires were very simple and only featured questions on area and production of sample properties, which simplified relations with those who had to answer them.

As occurs with any new activity, early work in this field was somewhat controversial. However, a number of correct forecasts, tested when crops reached the processing plants, established the repute of these new methods. In this respect, the fact that we worked with a group of well-known agricultural economists has been most helpful.

The use of scientific methods for calculating forecasts and estimates of crop area and expected or harvested crops was limited to a probability sampling system in selection of farm properties to be included in the sample.

In logical sequence, we would now have to investigate the possibility of increasing the volume of data within the system already in operation and to study methods allowing to replace subjective information obtained from the farmer by objective on-the-spot measurements.

In due course, inclusion of items on comparatively minor crops and

breeding operations, showed that the sampling system only allowed estimates with an acceptable sampling error for ten products. To obtain low standard error estimates for other products would require a substantial increase of the number of sample units. As regards inputs investigated, only overall labor and conventional machinery yielded acceptably accurate estimates. Other items, such as tractors, fertilizers, pesticides and feeds yielded estimates with an excessive standard error.

For such items, specific sampling systems, with a substantially larger general sample, or other sources of information, such as sales of inputs or administrative records, would be required.

In 1958, when the Rural Economy Sub-Division became a Division, the Economic Surveys Section, concerned with development of the use of sampling for the obtaining of agricultural statistics, was established.

Work on replacing information provided by farmers by objective on-the-spot measurements was started with research on an objective method for coffee production forecasts.[1] In 1958, two coffee trees of each plantation were selected at random and their fruit measured and weighed. As a result, a forecast of expected overall production was established, subject to discount of losses on the tree, the ground, during transport and further operations before sale of the raw or processed product. This method was expected to yield precise estimates but was not generally used, since it was felt that it represented excessive work for the regional agronomists. On the other hand, *a posteriori* comparisons showed that estimates supplied by farmers were sufficiently close to totals obtained from the Brazilisan Coffee Institute's administrative records on coffee sales.

Quality of information on coffee production satisfied users, and economists did not sufficiently insist on increased accuracy of estimates through use of objective methods to forecast and estimate production of coffee and other products.

Doubts within the Sub-Division as to the accuracy of information on farmed area, supplied by farmers, were put to rest, thanks to a limited research programme on cotton, showing that rate of correlation between area as informed and average area was 0·98.

As a result, we still lack objective surveys on area and production forecasts. Through the initiative of the group's economists and in order to establish indexes of prices paid by farmers, a special questionnaire was drafted. During the 1959 crop year, a field survey of 1500 properties was carried out. This allowed the proportion of each group of inputs in overall farm expenses to be established.

In due course, a regular survey of prices of each group's representative inputs was set up, and an index of prices paid by farmers calculated.

ESTABLISHMENT OF THE STATISTICAL SURVEYS AND ANALYSES DIVISION

The 1968 administrative reform converted the Rural Economy Division into the Agricultural Economy Institute and established the Statistical

Surveys and Analyses Division, responsible for crop forecasts, market information and econometric statistical analyses. At that time, the number and kind of information to be regularly collected was reviewed, and several situation indicators, such as indexes of prices received and paid, production volume and value, crop area, returns and a few parity indexes started to be calculated on a monthly and yearly basis.

To study structure and operation of enterprises in specific and important fields such as cattle breeding, milk production and others, *ad hoc* surveys with a probabilistic sampling of properties are being carried out. Information for completing questionnaires is supplied by those in charge of the enterprise.

Considering the lack of a sufficient body of information, authorities have lately adopted the *ad hoc* survey system. Therefore, specialized planning organizations and even official research agencies are compelled to collect primary data for each project, at a very high social cost. Much of such information should be available at a central statistical agency.

The statistics group feel that, under present conditions, influence of agricultural economists on appraisal and guidance of operations has not been wholly satisfactory. There certainly is an important catalytic effect, but direct contact has been insufficient.

Since agriculture in the state of São Paulo is highly dynamic, it is easy to see that the agricultural statistics system organized at the Secretariat of Agriculture cannot perform efficiently without constant feedback from users. Some kind of market response is required to direct our activities and only users are in a position to indicate in which direction our activities should proceed in terms of matters to be investigated and the degree of accuracy desired in each instance.

The ideal solution would be a board of users of agricultural statistics, to allow discussion and coordination of requirements defined by that board with present possibilities and available resources. Since such a body does not exist, we feel that such discussion is only possible with a group of economists presenting their own requirements and those of other users.

A discussion with economists should clarify three issues. First, the minimum desirable body of information and periodicity of its collection should be defined. Secondly, the degree of accuracy of surveys should be established and, thirdly, required information by region or product, and degree of accuracy of such information should be defined.

It would seem that, at present and in São Paulo, relations with consumers of statistics do not represent a critical problem.

It is felt that, at the present stage of the art in the field of production and analysis of agricultural statistics, widening and improvement depend basically on improved field work, carried out by specialists of the Integrated Technical Assistance Coordinator's Office.

Analysis of questionnaires collected over the last few years clearly shows that quality of information obtained by the extension network, based on information supplied by farmers, leaves much to be desired. The greatest difficulties occur whenever questions are not directly related to

crop quantification (area and production).

Interviewers should therefore be made aware of the need to improve data collected, which means spending more time and effort on those who supply information and carrying out objective measurements as far as possible.

At present, the Surveys Division is engaged in a project for widening and improving economic information, as part of a larger research program of the Secretariat of Agriculture.

A sample of 7000 properties is now being established, which should allow accurate estimates for each of the state's nine regions.

Within the next three years, besides regional estimates, we expect to have special samples for poultry and eggs, oranges, bananas and vegetables. We are further engaged in perfecting collection and calculation of average prices paid to producers of temperate climate fruit and vegetables. Such prices vary widely depending on quality and condition of produce.

This will, however, require increased efforts exercised on the technical assistance network since, under the Secretariat's new structure, only this network is authorized to perform continuous field research.

Surveys of prices of inputs and volumes consumed by the state's agriculture should be supported by the more important exercise of accurately identifying the plantation in which such inputs are used, rather than overall consumption, and this has not been possible so far.

In spite of all that still remains to be done and improved, the state of São Paulo enjoys more and better information on its agriculture than any other state of the Union.

BRAZILIAN AGRICULTURAL STATISTICS

The government has not yet carried out its decision to reform continuous agricultural statistical services on the national level.

This decision should take into account the fact that availability of an active group of agricultural economists, in charge of analyzing the agricultural sector, is one of the conditions of a properly operating agricultural statistics system, able to supply all information required under present conditions.

By their training the group of economists would tend to appraise the data collected, bringing about improvements and greater scope of the agricultural statistics system.

As regards the two federal agencies at present engaged with continuous agricultural statistics—the Ministry of Agriculture and the Brazilian Geographical and Statistical Institute—only the former has an organized group of agricultural economists in the Office for Analysis of Agricultural Policy—EAPA—acting as advisors of the Minister of Agriculture.

A preliminary feasibility survey of adoption of São Paulo's experience in other states was carried out in 1971, for the purpose of setting up an integrated agricultural statistics system in the eight states which most

contribute to Brazil's agricultural income.

The report submitted to the Ministry of Agriculture concluded that such a system could be set up within two years.

The system tested involves centralized planning, with work performed in collaboration with state agencies.

State planning agencies are fully aware of the need of sound agricultural statistics and are eager to collaborate in applying scientific methods to obtain such data. They expect the federal government to supply know-how and to complement resources required for carrying out this joint program.

The blueprint submitted schedules three working parties. One would produce statistics on production and inputs, the second market information and the third would be concerned with econometric and statistical analysis for production of derived statistics.

For the time being, it is felt that minimum information required would include:

1. Farming: area, production, prices.
2. Livestock: meat and dairy cattle, number of heads, milk production, meat production, poultry, number of chickens and laying hens—production of eggs and broilers.
3. Employment: number of employees, ways of payment, number of days worked, etc.
4. Production inputs—volumes and value:
   - (*a*) tractors: by HP
   - (*b*) trucks
   - (*c*) fertilizer
   - (*d*) insecticides, fungicides, herbicides
   - (*e*) purchased seed
   - (*f*) purchased feeds
   - (*g*) vaccines and drugs
5. Fixed assets:
   - (*a*) area of residential buildings—value
   - (*b*) area of plant buildings—value
   - (*c*) value of other fixed assets

It would, however, be highly important to discuss details of each item and permissible sampling error in each case.

Agricultural economists should now appraise this project and discuss the best ways to effectively improve statistics at the national level.

REFERENCE

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SPECIAL GROUP D REPORT

An attempt should be made to obtain precise, accurate statistics rather than a large amount of data which leads to inaccurate conclusions. The data must reflect reality and interviews, accounting sheets, income-tax records and administrative records should be used to supplement conventional techniques of sampling. Sampling must be performed by trained personnel.

The users of data should have some experience in collecting it and be aware of the limited resources available so that they do not demand data which is unnecessary or costly. Qualitative facts must be accumulated with quantitative data to give a more accurate picture. Definitions need to be clear and should only be changed for genuine improvements in understanding.

Statistics should be organized on a multidisciplinary basis. Economists and statisticians should consult at all levels. While specific research is necessary because of cost and a desire for in-depth knowledge, care should be taken not to extrapolate the data. Data collectors must maintain the confidence of the farmer. They must in addition be aggressive in order to maintain a position with outlook teams.

In a sophisticated system, income-tax data are useful. Actual records and bills of lading, etc., can be delivererd directly to the computer thus eliminating the need for expensive data collection techniques.

The construction of a simply disposition model is necessary in any proposed system. Book-keeping results are useful in constructing complete models of farm operations.

The integration of agricultural economists with statisticians is almost complete in most instances but if separation is a problem, it can be solved by hiring young economists as statisticians.

Among the participants in the discussion were: S. Atsu, *Ghana*; K. Bachman, *U.S.A.*; P. C. Baillet, *Belgium*; W. Dantas, *Brazil*; W. Frank, *EEC/Belgium*; A. Guerreiro, *Portugal*; D. Mubyarto, *Indonesia*; J. Olivera, *Brazil*; W. Porteus, *Canada*; J. Sarma, *India*; C. Vanzetti, *Italy*.