# PROCEEDINGS OF THE EIGHTH INTERNATIONAL CONFERENCE OF AGRICULTURAL ECONOMISTS

HELD AT
KELLOGG CENTER
MICHIGAN STATE COLLEGE
U.S.A.
15–22 AUGUST 1952

GEOFFREY CUMBERLEGE
OXFORD UNIVERSITY PRESS
LONDON NEW YORK TORONTO
1953

# AGRICULTURAL STATISTICS—THEIR STATUS AND MEANS OF IMPROVEMENT

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THE subject-matter of my paper covers a wide range, from which I have to make a selection. First of all I have tried to select aspects which may be of interest to agricultural economists as distinct from agricultural statisticians, and to avoid the technicalities dear to the latter. There should not, however, be any great difference of interest between agricultural economists and agricultural statisticians, since statistics are, for much of the economist's work, his tools and his raw material; and to change the metaphor, he must be concerned that the statistical foundations are strong enough to carry his superstructure of economic reasoning.

Second, no one who reads a paper on the present status of agricultural statistics at an international gathering can ignore for a moment the vast difference in that status between a few of the more advanced countries at the one extreme, and what are called the less developed countries at the other. These differences in status are of course reflections of underlying differences in the economic, social, and political character of the countries.

As a general proposition the range and quality of the agricultural statistical service in any country appears to depend on its wealth—that is, on the resources which it can afford to put into collecting and analysing agricultural statistics, and even more important, into creating the general body of administrative services of which agricultural statistical services are but a small part. It may depend further on whether the country has an administrative and political set-up which would result in a good deal of use being made of the figures either for policy or execution. Closely correlated with the wealth of the country will be the literacy of the farm population, so that a country which can afford agricultural statistics will usually be better placed to gather them in from the farmers.

An observer from Mars would probably expect to find that the range and quality of agricultural statistics also depended on the extent to which the country earned its living from agriculture; but if so, he would be gravely mistaken. It is one of the small tragedies of the world that those populations whose material condition most

depends on enlightened agricultural policies have the fewest statistical means of determining those policies.

What I have said up to this point will explain why I am giving a fair amount of my time to those aspects of agricultural statistics in which there are the most marked differences between country and country—particularly between what might be called the North Atlantic group, to which I would for this purpose add the southern members of the British Commonwealth, and, on the other hand, the Near and Middle Eastern group. If I neglect Latin America and southern and eastern Europe, it is for lack of detailed knowledge about them. In concentrating on these inter-country differences I am doing so not only, nor mainly, for the purpose of supplying the less developed countries with a body of precepts to put into practice—such a course would be as unwise as it would be impolite—but also for the purpose of reviewing the methods used in the more developed countries. These too—and perhaps I may count my own country among them—have much to learn from an exchange of views. In Great Britain we have been collecting agricultural statistics on a continuous basis for over eighty years, but still feel that our methods are capable of improvement. At the same time they have stood the test of time fairly well, and the testing to which they have been exposed over these decades has led to the evolution of a body of fairly systematic thought.

I have already alluded to certain background factors such as the wealth of a country and the literacy of the farm population. Perhaps the extent of supply for the market and the effectiveness of local communications could be added as of like importance. But there is little that needs to be said about them here; any improvements in these spheres will be made not for the sake of agricultural statistics, but for their own sakes.

*Basic administrative organization.* Among the matters in need of attention for the sake of agricultural statistics I would put first the adequacy of the administrative machine, both central and local. This choice of priorities may perhaps surprise some of you, but it is a product of several discussions with representatives of under-developed countries who have paid me the compliment of a call during their visits to London.

I have heard or read, with feelings of misgiving, of a tendency on the part of several countries which are seeking to introduce statistical services for the first time, or to radically improve them, to start first by importing professional statisticians and then go on to import Hollerith machines. I would almost go to the other extreme and

recommend that professional statisticians should be refused visas for five years, and that tabulating machines—Hollerith or other—should be put on an embargo list for a further ten. (I am not unaware, of course, of the special fields in which professional statistical advice is invaluable, even in the countries of the sort I have described, and I feel particular admiration for the work proceeding in India on the estimation of crop yields by samplings of weighings and cuttings.)

As a general proposition however I feel that the best starting-point is to concentrate on building up an organization at local and central level, which can be relied upon to collect and process fairly simple statistics with reasonable regularity and dispatch, before any of the refinements are attempted.

For the purpose of this argument even a local village headman can be counted as part of the organization; there is no need to think exclusively in terms of regular civil servants, and in many countries one would waste one's time in doing so. Even in the more developed countries there is much to be said for making use of the services of local semi-trained volunteers, and in my own, some of our statistics are collected by people whose civil service attachment is, like their salaries, quite nominal.

The main point, as I see it, is that if there is an adequate organization and staff, the collection of all sorts of statistics becomes possible; without it nothing gets started which is capable of lasting. Even if the country has so far done so little that there is nothing better to build on, at least try to find one literate person in each village, get him to measure the pace of his stride, and then set him to walking around the boundaries of his community, with the aim of measuring its extent. Then perhaps the distribution of the land between grazing and the several kinds of crops can be estimated with tolerable accuracy by visual impression. At all events make a start somewhere. At a little higher level of development, I would pay particular attention to the recruiting and training of staff at what might be called the sergeant and sergeant-major level, who are the backbone of organizations of this type.

I would add that in my view it is desirable to start with a modest range of subject-matter. In several countries a recent interest in agricultural statistics has been inspired by national income statisticians who need an agricultural component for their calculations. I have found it less easy to explain to them than I find it to explain to you, that it is useless to think about statistics of farming income until one has built up a system for accurately recording such primary data as areas under crops or numbers of livestock. The only exception I

can think of to this general rule relates to countries in which most agricultural products are sold off farms and travel along very few railways, roads, or rivers. In such cases one can sometimes get a sufficiently good count, in terms of end-products, by placing observers at the ports and stations. The same principle is, of course, of more general application. For instance, in my country adequate statistics of milk sales can be obtained from three or four marketing organizations and there is no need to trouble our 200,000 dairy farmers.

*Complete list of farms.* Another of what I would call the fundamentals of collecting agricultural statistics is to have a complete and always up-to-date list of all the farmers from whom census and other questionnaire information is required. Here I may be on controversial grounds, as even the United States with their vast resources, do not, as far as I know, seek to maintain such a list. Nevertheless, I would attach importance to it for the following reasons. First, it gives a reasonable guarantee of comprehensiveness of the statistical data collected if special efforts are made to compile such a list and keep it up to date, and if each incoming census or other return is checked against the list. Second, it can be used, and if possible should be used, to establish a uniform definition of farms throughout the country, which gives one a more accurate count of the farms, and which may indirectly serve to establish an exact consistency of legal obligation to make a census return. Third, it becomes easier to account for all gains or losses of land to the agricultural industry—a matter of some interest in small, highly industrialized countries with little spare land. Fourth, such a complete list of farmers can be used for selecting random samples for special inquiries, and avoids the need for highly ingenious but otherwise unsatisfactory expedients like area sampling. For all these reasons we in Britain have found it well worth while to employ a substantial proportion of our statistical staff simply on maintaining a list.

*Public relations.* My next topic concerns the element of compulsion in securing information from farmers by means of censuses or otherwise. I assume that any system of censuses can be guaranteed to produce a response of at least 90 per cent., or it can hardly be called a census. But this still leaves us to consider the missing 10 per cent., and further, it leaves us wondering about the completeness and reasonable accuracy of the individual forms in the 90 per cent.

This subject has been very much in our minds in Britain during the last five or six years, because during the war we greatly increased the frequency and size of our census forms, and have had to maintain this extra burden on the farmers during the period of post-war transition,

though they had, not unnaturally, been expecting a reversion to the lighter pre-war load. One answer we have found has been to develop the public relations side of our agricultural statistics work, and while retaining compulsion in the background, to rely essentially on the farmers' willingness to respond.

Among the specific steps we have taken are the creation of an advisory body, on which the farmers are represented, to be consulted on all major matters of agricultural statistics and especially on any proposed extension which could be criticized as springing from the excess zeal of statisticians or administrators; the passing of legislation which, while providing the Minister with powers to require statistical returns, puts express limitations on those powers and on the right to disclose the returns; particular attention to making the forms easy to understand and complete; publishing very simple summaries of the census results immediately they are available; a certain amount of general publicity and educational work, and attending very patiently to tedious correspondence on individual cases. Another possible line, which we have not yet developed as much as we might, is to explain to the farmers the uses to which the statistics are put. We are, however, fairly confident of having put it across that the statistics collected have a direct bearing on the fixing of farm prices and on the operation of our food-rationing system.

Some of this may sound elementary and even trite. We would all agree to the proposition that one cannot collect agricultural statistics simply by brute force; and any administrative officer knows that enforcement by legal action can only be used to deal with a hard core of real recalcitrancy. But there is, as our own experience has disclosed, a big difference between passively recognizing that the goodwill of the farmers is needed, and going out of one's way to build up that goodwill.

In some countries difficulties in building up goodwill are associated with, if they do not directly spring from, the use of statistical returns as means of assessing taxes. The farmers will not and cannot be forced to produce evidence to be used against them. I am afraid I have not much comfort to offer. In my belief the collection of agricultural statistics and tax assessments are fundamentally antagonistic, and will always remain so.

In our own case the view has been expressed that it is an injustice to compel a farmer, under the sanction of the law, to furnish information and then allow it to be used against him, not only by the taxation officers, but by the police or anyone else who may be concerned with enforcing laws or regulations. And not only is this unjust but it leads

to falsifications of the figures, and still more important, to a breakdown in the relationship of mutual goodwill which we feel to be so essential. We extend this principle even to the point of refusing to issue lists of farmers where the result might be that the lists could be used by advertisers and canvassers to pester the farmers.

I also include under the head of public relations the fullest publication of all census and other results, at the earliest possible time. This is a matter of general importance, not least to agricultural economists, who are leading consumers of published statistical information. We attach importance to full and early publication for the special purpose of keeping up farmer interest, as well as for the general purposes of producing a body of material for analysis and debate and for the formulation of policy, and of satisfying the authorities that we have a visible result for the expenditure of public funds.

Finally, while still under the head of public relations, I would say a word about the extent to which one should rely on compulsory as opposed to voluntary means of securing information. We in Britain are opposed to compulsory questions where the question is particularly difficult for the farmer to understand or answer, or where for any reason we may expect a low rate of response. Not only would the use of compulsion in these fields lead to an undesirable amount of enforcement procedure to uphold the law, but it would put too much strain on the essential element of goodwill. We therefore reserve compulsion for fairly simple inquiries likely to produce a high rate of response, and in other cases rely on voluntary questionnaires or other special methods of inquiry. In other words, our conception of a compulsory system is one of a very high rate of response to a simple questionnaire rather than a low rate of response to a difficult one.

*Efficiency and economy.* Among the means of improving the status of agricultural statistics one which no practising statistician could overlook is finance—getting enough money to do the job. This is, however, a problem for each country to settle for itself, and I have no prescription for wheedling money out of legislatures or treasuries. But there is one point on which I may have something worth saying. Even in what one considers to be a well-run organization there may still be opportunities, if one searches hard enough, for making economies, so that whatever sum one is given can be made to stretch farther. Having made this search one is at all events on safer grounds in asking for more funds. I myself have had the experience of submitting to, and to some extent inspiring, a substantial reduction of funds with so far little effect on the quantity or quality of service given.

There are various ways of going about this, but only one is directly relevant to my theme. This is the great advantage, as I see it, of centralizing as many as possible of the processes of collecting and manipulating statistics, so as to get these processes organized along the lines of a factory—indeed I might almost say a conveyor belt. If you apply time-and-motion studies to the handling of census returns you will probably find that most of the time and cost are taken up by pushing pieces of paper around—handing them from one person to another, folding and unfolding, tying into bundles, &c., and in one sense this is all wasted time. Just how a factory-type organization may work out in practice will of course depend on the frequency of the census returns, and the number of items; and I realize that the sort of centralized organization I have described may cut across the devolution of responsibilities to local government agencies, which may be highly desirable on other grounds. Nevertheless, as a technique for getting things done, I am sure that agricultural statistics lend themselves particularly readily to the economies of scale.

A further advantage of a centralized organization is that it may be used to bring together the people who design the forms and those who have to check and add up the entries. If a form has been badly devised, with a poor layout, and ill-considered or ill-worded questions, these defects are bound to show up in dirty copy—that is, forms that are only partly completed, difficult to read, full of corrections and erasures, and perhaps scribbled over with marginal comments—all of which take much time and money to put right. If the form designers are also responsible for processing the completed forms they will soon learn to do better next time.

In view of what I have said about factory organization you may be expecting me to go on to advocate mechanized processes on a large scale. Personally I have a lot of use for desk machines but not, for the purpose of processing census forms, for tabulating machines. I would not seek to lay down any rule on this point, however, but merely say that the case for tabulating machines must rest on an exact calculation of gains and losses. In our own case the number of times that we would 'passage' the punch cards is not sufficient to justify the cost of a Hollerith or other like installation, and we use such an installation only for purposes of subsequent analytical work. We do, however, find that it pays to use advanced and expensive machines to handle the dispatch of forms to farmers, which is also capable of being organized along factory lines.

Perhaps I can insert here, although economy is only one of its aspects, a reference to the question of the mailed census questionnaire

versus the enumerative system, by which a more or less trained person visits every farm and goes through the form with the farmer, item by item. This is, I think the predominant system, but a few countries, like my own, find it possible to take advantage of the literacy of their farmers, and the general climate of opinion among them, to rely almost entirely on mailed forms, using no farm visitors at all.

The enumerative system has the advantage that the enumerator can help to raise the standard of accuracy of each individual form, and by extension, make it possible to add more difficult questions to that form. It has the disadvantage of the high cost of an army of enumerators, and I should suppose, of recruiting and training that army when no guarantee of continuous employment can be given them.

The mailed census system gains heavily on cost even though at the receiving end it becomes necessary to employ people to check the forms and clean them up. The disadvantage is that a mailed questionnaire must be restricted in its subject-matter to items which will be readily understood by the generality of farmers and can be expressed in a terminology familiar to them all.

In my country we shall probably continue the mail system because it has worked well and cheaply in the past and we can provide from other sources the data which are too difficult to put into a mailed form. For other countries there is much to be said for the mixed system which, I believe, is gradually evolving in the United States. By this system the farmer receives his form through the mail and is supposed to complete virtually all of it himself, and the enumerator is only there to help him on points of doubt and difficulty.

In coming on to my next topic I want to take back something of what I have said about theoretical statisticians—about keeping them at bay until a basic organization is established. Once it is established, the statistician begins to play a very useful role, even in the sphere of practical day-to-day economy in operation, which may at first sight seem remote from statistical theory. The reason is that the statistician can, amongst other things, turn his theory towards developing short-cut methods of handling statistics in bulk. He can tell us that in some parts of our work we are working to unnecessarily narrow margins of error, that we are doing two or three sums where one would suffice, that if the various processes are carried out in one way rather than another they should be mutually checking, and that it may be unnecessary to check certain kinds of clerical work in detail because an over-all check can be devised. There is also another important use of theoretical statisticians which has, I believe, developed a great deal

in the United States, but which I am not competent to describe beyond saying that to an outsider it looks like an attempt to convert faulty original material into a reliable finished product by various devices of curve fitting. So far have the Americans succeeded in this that they appear to me to be regularly using original material of a quality which I should fear to touch; and all credit to them for doing this so successfully.

*Sampling.* All of this is, however, only an *hors d'œuvre* to the theoretical statistician, who nowadays finds his main meat and drink in developing and applying sampling methods. Some of the recent and most successful original work on the application of sampling methods to census data in such fields as agriculture is due to Yates and his co-workers in Great Britain; and as my colleagues and I have had the advantage of collaborating with Yates on some of the applications of his theories, we start with a prejudice in favour of them. They are indeed fascinating and alluring, holding out possibilities of great savings of labour and money for little or no loss of accuracy. As a matter of hard fact, however, we have found agricultural census data disappointingly intractable to sampling methods, since the sampling errors turn out to be higher than one would expect. At least they do so in countries employing mixed farming systems or in which type of farming varies a good deal from place to place over short distances. My conclusion up to the present, and I may perhaps revise it later, is that sampling can only safely take the place of a full census in areas virtually practising monoculture, or be used to supplement a main census by additional questions on a sample basis. Outside the field of the census, sampling is likely to be successful only for certain handpicked types of inquiry, where the standard deviations are relatively low.

As I suggested earlier, one such field, which can be exploited successfully in some countries, is the estimation of crop yields per acre, and I hope we may hear more of this from some of its practitioners. In my country, however, we prefer to rely on visual observation of virtually the whole crop by trained observers, who supplement their observations by contacts with local farmers, merchants, and threshing operators. We do this partly because in our case the sampling error from a manageably small sample would be too large, and partly for the sake of speed which weighs with us a great deal.

*Secondary statistics.* So far I have been dealing only with the basic statistics of agriculture—crops, crop yields, livestock numbers, and perhaps machinery and labour. Among the *secondary* statistics I would include sales, purchases, incomes, prices, and perhaps rents, wages,

and land values. Of these topics perhaps I may select sales and prices for brief mention. The general principle governing statistics of sales is, I think, that if a million farmers are selling to a thousand merchants, it is much more economical to collect the statistics from the merchants, however unpleasant that may be for them. But the difficulty in this case is to get a complete return from the merchants—it is both difficult to compile a complete list of them or to apply compulsion, if that should be needed. Yet at the same time lack of completeness is much less important than uncertainty as to the extent of completeness. Almost any statistician would prefer a certain 70 per cent. response to a larger response that might be 100 per cent., but might on the other hand be much smaller. In the former case he can apply a correction factor, but in the latter case, not.

Where there are serious doubts under this head, as there usually are, it may become necessary to resort to direct inquiries from farmers on their sales, as is done in, I think, six or seven countries. Apparently they are satisfied with the results. For my own part I have no experience of this method since the operations of controlled marketing in the United Kingdom give us virtually complete marketing statistics for the main sale products with little trouble. Before the war we had some experience of direct inquiries from farmers on their sales, but it was disappointing. Since then we have not seriously had to ask ourselves whether farmers can or will accurately answer questions, which, relating to periods of time, must depend on accurate memory or accurate records. But our marketing controls will probably in the end cease or become much modified, and in that case I suppose we shall gradually pass over to the United States method, which I take to be an intermingling of somewhat inaccurate but complete statistics from the farmers with accurate but incomplete statistics from merchants and processors.

Regarding prices, the collection of data from the market is technically one of the simplest operations in agricultural statistics. Most countries have succeeded in setting up a system of price reporting at regular intervals according to a more or less standard set of grade and other commodity descriptions. The trouble begins when a weighted average price is required, and it is then found that the collection of the price data requires to be paralleled by the collection of data on quantities sold, which is much more difficult. It is no light task to establish a count of the physical output of a country's agriculture, subdivided by commodities, and still less so to achieve a subdivision which is identical both for the physical data and the price data, so that the two can be intermarried. Many countries have

solved this problem of the weighted average up to the point of being able to prepare price index numbers; some have yet to take the more difficult step of constructing weighted average prices of such a kind that multiplied by the quantities of output, they yield estimates of sales receipts. Any country that can take that step, and then the next and similar step of repeating the process for the things that farmers buy, is well on the way to constructing a profit and loss account for the whole of the agricultural industry. Such an account can be regarded as the climax of a system of agricultural statistics; if an aggregate profit and loss account for agriculture can be put forward with any confidence, it must follow that everything else being done in the collection and analysis of statistics is complete and sound. I feel the greatest respect for the statisticians of, I think, no more than two or three countries, who have achieved this climax under conditions of uncontrolled markets, although, as I realize, they may not have done it in exactly the way I have described.

I will just mention, to show that I have not forgotten it, a further aspect of a well-developed statistical system, which consists of advanced analyses, probably by use of tabulating machines, of such matters as the classification of farms and farmers, changes in method and pattern of farming, and the estimation of errors. But I forbear from developing any of these themes, owing to the technicalities involved. Instead I will conclude, if there is still time, with a remark or two on the international comparability of agricultural statistics.

*International comparability.* It is fitting at an international gathering to refer to this subject, and in expressing my belief in the value of assembling statistics on a uniform basis for as many countries as possible, I do so not only as a customary gesture, but in all sincerity. I think that any country which can accommodate itself to an international classification or international method of presentation, by making changes of detail in its own system, however troublesome these changes may be, has an obligation to do so. Yet the circumstances of different countries are so different that all too often adherence to a uniform system imposes a major change on an individual country which it cannot make without rendering the finished product virtually useless for internal consumption. By way of example, the international mode of presentation may, in order to meet the requirements of many countries, have to be so elementary or unsophisticated that a more advanced country would feel that it was wasting information or throwing away technique. Or it may be that a system of presentation based on the postulate that all farmers are the owners of their land—which is I think the majority case—would lamentably

fail to fit the facts of a country in which tenancy predominated. Here the directors of a statistical organization face a real dilemma. They desire to co-operate internationally, but have to meet the needs of their masters and their clients. These may not easily be persuaded that participation in an international questionnaire is sufficient reason for spending more money or putting forth more effort for a less usable result than before.

Yet in a particular case this dilemma may be resolved by some give and take, of which I have had a happy experience in respect of a minor problem. The 1950 World Census, as you may remember, called for a frequency distribution of crop areas by size of farm, that size being expressed in hectares. In my country the term 'hectare' is virtually unknown, and I estimated that to comply with F.A.O.'s requirement as it stood would absorb the resources of our entire organization for three months or more with a nil result so far as our internal needs are concerned. On discussion with a representative of F.A.O., however, I learnt that there was not the slightest intention of preparing an international table on crop areas by size of farm, and that we had been asked to prepare a national table solely for the purposes of educating ourselves. So long as we undertook that task of self-education we could use any measure of area that we chose.

I thought this a very sensible view indeed. International comparability of statistics is of value in itself, but still more valuable is the discipline that the international questionnaire imposes on the member countries, forcing them to ask themselves questions and to notice gaps and omissions, and inspiring them to set themselves more difficult tasks for the future. Among the means of improvement of agricultural statistics, international comparisons of all kinds—and even perhaps the sort of discussion which I am leading today—may well play a most useful part.

W. H. Ebling, *Wisconsin, and United States Department of Agriculture*

To discuss a subject as large as Mr. Kirk's in an hour and fifteen minutes is quite an undertaking.

There are many things that could be said on many of the subjects that he covered briefly in his paper. There are many others that probably he would have liked to have commented on if time permitted. I am going to comment on a few things from his paper and then briefly on some of the things that have been said earlier today.

You noticed perhaps how carefully in his opening remarks he pointed out that he was discussing statistics for economists, rather than statisticians. To me it was interesting that he felt he had to make

this distinction. I suspect, however, that in the United States the difference is smaller than he thinks. Many of us in the work in statistics think very much in terms of economics, and I, for one, am always confused as to just where the boundary line between the two fields lies, provided there is one.

I was interested in his figure of speech about visas for statisticians being terminated for a while from the standpoint of other countries, and about an embargo on tabulating equipment. I quite agree with what he is trying to say, and yet curiously his paper contradicts it. The fact that he can write so practically about the subject, it seems to me, indicates that Mr. Kirk, for one, would be quite safe for export and that he will have to make exceptions to his embargo in the case of statisticians, at least for himself and some others.

The question of improvement in statistics, of course, is one that we can hardly touch in the few minutes that we have. May I comment on a few points he mentioned—one, the matter of farm lists. I note that he put a great deal of stress on these. I can only reply that we in the United States are very much less enthusiastic about such lists. I know you realize it and there is not time to discuss it, but we think such lists are too costly; we think the changes in the lists would be so rapid that it is quite impossible to keep them up to date under our conditions. We think, too, that in many of the countries where the work is less developed we could not get such lists at all.

I like what has been said about the matter of public relations in statistics. I think it is a thing that is commonly overlooked. In our work in Wisconsin we are very much aware of it, and of the need of publishing material that we collect. We say that our work divides easily into two, perhaps unequal, halves: one, the collection and analysis or input of material; the other, the presentation or output of it. It is quite necessary to do the second if we are to keep our funds for the first.

The statement on keeping statistical inquiries separate from taxation is important. I think we have done rather well on this in the United States. Surprisingly, we get some rather good agricultural enumerations by tax assessors in many of our important farming States. Where there is an intelligent agricultural population, I think it is possible to use the good offices of the assessors effectively in enumerating acreage data and some other material. This is done in about a dozen of the leading agricultural states in this country. I think, however, in the countries where the work is not as well developed that sort of thing would be rather far in the future.

If I may comment for just one more moment, I would like to refer

to the effort to help in developing agricultural data work in some of the Latin-American countries from which we have had many student trainees. The Census of the Americas in 1950 was an important development from the standpoint of improvement in this work. It made possible a beginning in a number of places where little had been done before. In the process of preparing to take this census many trainees were sent to the United States. I had the good fortune to see quite a number of them. They came to Wisconsin for some elementary work in statistics and some practical agricultural data courses. We saw something of what their interests were, and undertook to do what we could to help them in order that they might further develop some of this new work in their countries. We found some extremely interesting things.

The training of agricultural statisticians in these countries has all of the problems in the training of economists that Dr. Morales listed this morning. In many cases there has been trouble in finding men with the qualifications that are set forth as being prerequisite. For example, we had a group of ten very good trainees a few years ago from Latin America for whom we conducted a special seminar. One day we asked them what their background and experience in practical agriculture was. To our very great surprise, all ten were without practical agricultural background. All ten were natives of the capital cities of the countries from which they came, unable to supply that basic knowledge of agriculture which was the first prerequisite for agricultural economists that Dr. Morales pointed out and which also holds, I think, for statisticians. We found that in working with these men we had to keep the work at an elementary level, in many cases, because the background was inadequate. We had a good deal of success in tying this statistical work in with the economic work on a practical level. We experimented with it in a seminar in which we had each man report on his own country, setting forth the situation in the country, setting forth its problems as he saw them, what could be done about them, how statistics fitted into the problems, and so on. It was a practical attempt to help with the training of such men for this field in Latin-American countries.

One point more: in this country we have a long experience in this work which goes back something like 113 years to our first legislation. Out of it grew the Census of Agriculture, taken first at ten-year intervals and later at five-year intervals, and subsequently the dynamic work of the Department of Agriculture which measures things currently, year to year, month to month, or other changes, but we have been 113 years coming to the place where we are in this

field. I think, as has been pointed out before today, that such progress is slow in the beginning. When the early work in statistics was first done, much of the present work in economics had not even been heard of or thought about, and yet the work in statistics has been quite basic to the later work in economics. So, in development and in improvement in other countries I think we have to bear in mind that in the statistical field progress must necessarily be slow. It has been slow in every country. In the nature of things, it will continue so. The growth programme in this country will probably be duplicated in part by the growth programmes in most other countries, though they do not need to take as much time as we did. Perhaps they can do in a few decades what it took us a century to do.

H. ÅSTRAND, *Institute of Agricultural Investigations, Stockholm, Sweden*

In Sweden we hold agricultural censuses every six or seven years, but we try to follow the situation in between. We do this through the Institute of Agricultural Investigation—a farmers' organization—which maintains practically complete lists of all farmers in the country. The Institute has 2,300 local unions throughout the country, each with an average membership of about one hundred. Every local union elects a contact man with the Institute, who receives complete lists on punched cards of every farm in his district. It is his responsibility to report every change that occurs in his district to the Institute, e.g. the death of a farmer or the sale of a farm. Wherever possible the information so supplied is checked against official records.

When we want to find out anything the Institute sends out questionnaires to the farmers on its lists. So far we have had remarkably good results, the response to the last questionnaire being nearly 100 per cent. However we have only been asking simple questions such as 'How many hogs do you have?' or 'How many hogs do you plan to breed this year?' It is much more difficult to get answers to questions of opinion or of economics, but we intend trying this in order to overcome the bias arising from ordinary farm accounts due to the fact that only those who are interested will keep them.

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It is very difficult to discuss anything about the problem of statistics in under-developed countries in five minutes, but I felt as I was listening to the paper presented today that everyone tends to speak from his own background even on a matter-of-fact subject like statistics. For example, the preparation of a complete list of farmers for the purpose of sampling may not be difficult in a country like

Great Britain but it is practically impossible for a country like India or China.

In India we have a fairly elaborate system of collecting statistics. In fact in this respect India perhaps represents the world in miniature. We have all types of statisticians, sophisticated ones as well as others, but our problem is that all of them are in the same country, so the simple solution of refusing visas which was suggested today would not be helpful to us.

Now, in India we have a system of complete enumeration for the basic agricultural data like acreage and yield. The acreage figures are generally quite reliable in what are known as temporarily settled areas. In these areas we have elaborate village maps where each plot is shown, and it is the duty of the village officer to put on this map the acreage under each crop every year. This gives us a very complete coverage and is tantamount to an annual census. The position is not so satisfactory, however, in what are known as the permanently settled areas because similar maps are not available and village officials are not so well trained. But with the abolition of the landlord system (and the permanent settlement which goes with it), the collection of statistics in these areas is being brought to the same level as in the temporarily settled areas. Today, agricultural statistics are being collected for about 90 per cent. of the village areas. The remaining 10 per cent. is primarily in tribal and other backward areas, but attempts are being made to cover these areas also during the next two or three years.

Although the area figures are quite reliable, it is our experience that the yield figures are not quite so reliable because they are generally estimated by the visual method. First the village officer makes an estimate as to what is the condition of the crop relative to the normal and then, on the basis of these condition factors checked or corrected by higher officers, an estimation of production is made by State governments. These estimates of yield being subjective, were found to be somewhat biased even in normal years, but the bias became more serious during the war, when food controls were introduced. There was a tendency to underestimate production because the village officers who were intimately connected with the farmers felt that if a higher production was reported, the Government might take away larger quantities of grain from the village by way of procurement. The position was getting serious and we were obliged to do something about it in 1944. That is how the objective method of crop estimation, viz. crop-cutting sample surveys, came to be introduced. In this field quite a lot of work has been done by

the Indian Council of Agricultural Research and the Indian Statistical Institute. What we are now trying to do is to extend these crop-cutting surveys to as many crops over as large an area as possible and on the basis of the data thus available to correct the production figures obtained by the traditional visual method.

Now, there are other types of data, e.g. conditions of rural labour or rural credit or data which are required for the estimation of national income, about which very little was available until recently. During the last two or three years, however, fairly large-scale and comprehensive sample surveys have been undertaken, the three most important being a survey of agricultural labour by the Ministry of Labour, a survey of rural credit by the Reserve Bank of India, and a national sample survey for purposes of estimating national income by the Ministry of Finance. The National Sample Survey is a survey the like of which does not exist in any other country, I think, on such a large scale. We are also making very extensive use of sample surveys to collect data from tribal, desert, and hilly areas which so far are non-reporting. We are also making use of sample surveys for collecting data on products like coco-nut for which no reliable data were available previously. We find that each of these surveys has problems of its own and requires considerable research and experimentation before a satisfactory method can be evolved. In fact, we are carrying on experiments in different parts of India, under different conditions to serve different purposes, which should have valuable lessons for other countries as well, especially under-developed countries.