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A Report on the General Enumerative Surveys—I

By Emerson M. Brooks

Statisticians are constantly trying to make their methods more precise, not only because of their scientific interest but also to meet the ever-increasing load which modern society throws upon statistical measurement. A notable contribution has been made over the last dozen years by means of the adaptation of probability sampling, along with the interview-type schedule, to agriculture and the development of the so-called master sample materials through the cooperative efforts of the Bureau of Agricultural Economics, the Bureau of the Census, and the Statistical Laboratory of Iowa State College. Ironically enough, the Bureau of Agricultural Economics has not been able to make very wide use of these new methods since the added precision means added cost.

We were able, however, to arrange for two general Nation-wide enumerative surveys, both covering items which could not readily be obtained by mailed inquiry. The field work for the first of these was carried forward in January 1947 and for the second in April 1948. The scheduled items were arrived at through Bureau-wide discussion, and the surveys were jointly financed from economic research and agricultural estimates funds, with costs divided between the two on the basis of the number and character of questions asked. In addition, the second survey carried a section on marketing channels and transportation methods financed from an allotment under the Research and Marketing Act. An article based on these data is carried in this issue of the journal.

Questions are raised from time to time, and properly so, as to what was done and the results obtained. This is the first of two articles designed to answer such questions. That is, the Division of Special Farm Statistics has been asked for a report written in the form of two related articles, the first describing and to some extent evaluating the mechanics of developing and carrying forward the surveys and the second dealing with the data themselves, how they are being used or where they are published. It should be understood that these articles are not designed either as an outline as to how to carry forward an enumerative survey or as a discussion of the merits or demerits of the enumerative versus other statistical methods. Some light should be thrown on both of these questions, however, by an actual examination of how the surveys were run, of their costs, and the results obtained.

In conclusion, attention is called to one final factor: No attempt is made to evaluate the experience gained, especially by those actually in charge of survey operations, in the States and in Washington. But certainly, the Bureau statisticians are now much better qualified to do enumerative survey work and to discuss plans for the future, including the task immediately ahead of advising on the Census of Agriculture for 1950.—O. V. Wells

TO obtain broader and more adequate coverage of economic information, the Bureau of Agricultural Economics has made two large-scale Nation-wide enumerative surveys. The first of these, in January 1947, included interviews with 14,468 farmers in a scientifically selected sample of 814 counties. Figure 1 indicates the distribution of the counties. Some 450 local people were hired and trained to do the interviewing. Usually each had two counties in which to work, the home county and another some distance away. In each county, four or five areas of land, or sample segments, had been selected and interviews were obtained with all farm operators whose farm headquarters were inside the boundaries of a segment.

There were two questionnaires. The "short" one, covering 9 topics, required an average of 57 minutes per interview. It was used on 10,268 farms. The "long" schedule included four additional subjects and its interview required 99 minutes. It was used in interviews with 4,200 farm operators.

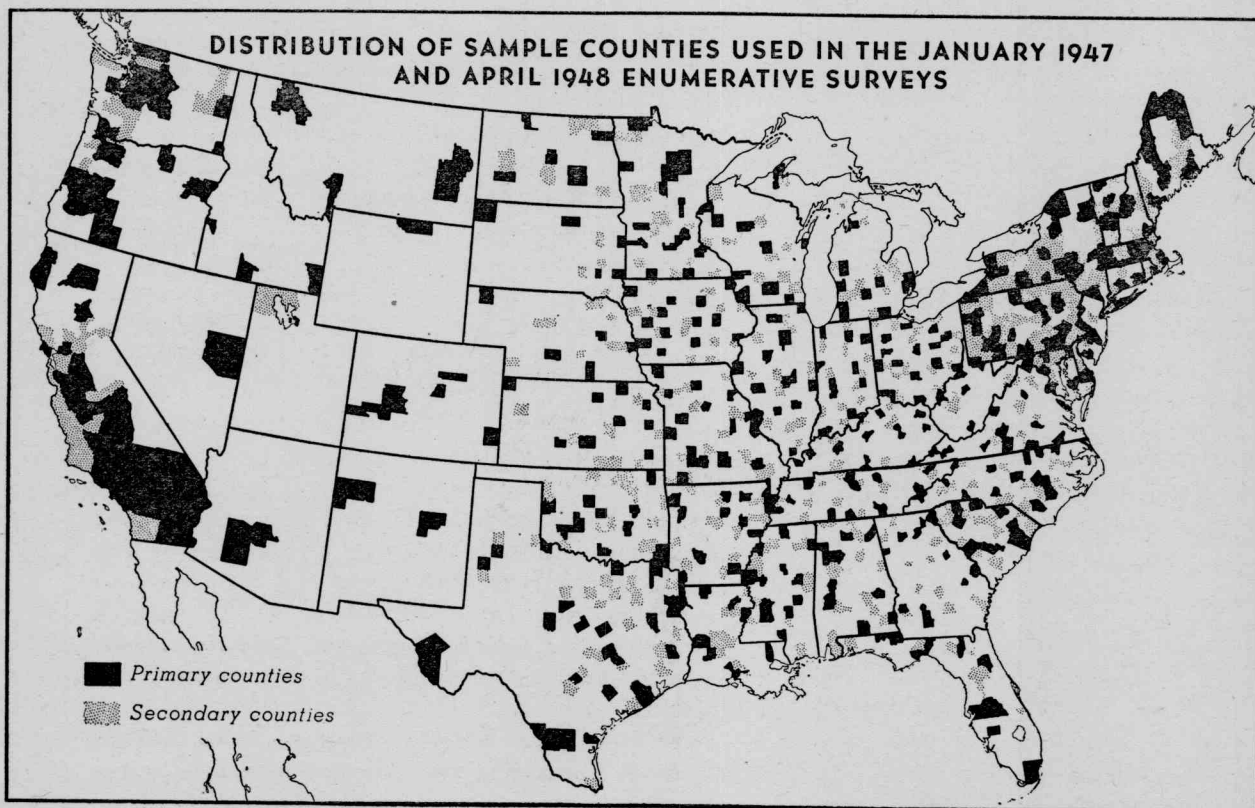
The short questionnaire dealt with these problems:

- A. Accidents to farm people
- B. Farm acreage
- C. Prices of farms
- D. Farm population
- E. Farm employment and wages
- F. Livestock numbers
- G. Farm tractors
- H. Crops on hand
- I. Value of farm products sold

The additional topics in the long schedule were:

- J. Farm expenses
- K. Family living expenses
- L. Other income of members of household
- M. Operator's dwelling facilities

It was intended originally that only the long questionnaire would be used but considerations of cost made it necessary to utilize a shorter inquiry for the farms in about 70 percent of the segments. There were some exceptions, notably



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FIGURE 1.

in Illinois, where other research made it essential that data on farm and family living expenses, other income of members of the household, and operator's dwelling facilities, be obtained regarding all farms in the sample.

The second enumerative survey, which obtained 11,395 interviews, was made in April 1948 in the same 814 counties used for the January 1947 survey but in different areas within each county. Fifteen topics were included in this survey:

- A. Farm acreage and tenure
- B. Tenure practices
- C. Grain and hay stocks and 1947 grain production
- D. Crop acreages
- E. Livestock and poultry
- F. Farm power and machinery
- G. Financing of farm machinery and equipment
- H. Farm population and family employment
- I. Hired farm employment and wages, week ended April 24, 1948
- J. Accidents to people living or working on this farm
- K. Sickness of farm operator
- L. Fire damage
- M. Marketing channels and transportation methods
- N. Farm construction
- O. Commercial fertilizer

A third enumerative survey was made in September 1948 but, because of budgetary limitations, it was restricted to information on two subjects—farm employment and wages and accidents to people living or working on farms. Interviews were obtained on 9,883 farms in 427 of the counties used for the two previous Nation-wide surveys.

These surveys obtained information on a wide range of subjects and concerning matters for which heretofore there had been little, if any, factual information. For example, the data on farm accidents and on marketing channels and transportation methods are unique in their fields.

Planning of a Nation-wide Enumerative Survey

An enumerative survey can be likened to a four-legged table. One "leg" is the design and plan of

the sample, a second is the structure of the questionnaire, a third is the work of the interviewer, and a fourth is the analysis of the data. It follows that if any one of these legs is weak the table will not be serviceable. As there are more than 5 million farms in the United States and only 10,000 or 15,000 of them are included in a sample, an enumerative survey must be a precision instrument. This means that every phase of the project must be carefully planned and faithfully executed. The initial decisions include a determination of the budget, the approximate number of farms to be visited, the number of counties to be included in the sample, and the approximate date the survey is to be made. Once these decisions have been reached, an enumerative survey goes through some 16 stages:

1. Determination of subject matter to be included in the survey
2. Design and drawing of the sample
3. Preparation of timetable of operations
4. Design and construction of questionnaire
5. Pretest of schedule and procedures in the field
6. Preparation of instructions to interviewers
7. Duplication of schedules, instructions, operational forms, etc.
8. Distribution of material to field
9. Training of State supervisors
10. Locating and hiring interviewers
11. Training of interviewers
12. Interviewing, including supervision of interviewers
13. Editing and coding of schedules
14. Tabulation and summarization of data
15. Analysis of data and expansion of the sample
16. Publication of results

Determination of Subject Matter To Be Included in a Survey

Requests for inclusion of topics in these surveys were voluminous. To reduce them to manageable proportions, six questions were raised concerning each proposal:

1. What is needed?
2. How frequently is it needed?
3. When during the year is the best time to obtain the information?
4. Why is it needed; that is, for what will it be used?
5. How will farmers and the national economy benefit either directly or indirectly?
6. What are the tabulation plans?

This information was needed not only to determine the subjects to be included but also in deciding on the size and type of sample, in drafting the questionnaire, in planning operations, and in training the field organization.

When the schedule topics for the January survey had been decided upon by the Chief of the Bureau and a draft of the schedule submitted to

the Budget Bureau for approval, that agency pointed out that it would not be desirable for BAE to make an income survey in January and the Bureau of the Census make an income survey in April. At conferences it was agreed that sections would be added to the BAE schedule on "other income of members of the household" and on "operator's dwelling facilities," and the Census Bureau in its April survey would not get income information from households containing a farm operator.

Design of and Drawing of the Sample

For these surveys, an area sample has been used, that is, interviewers have visited all the farms that have "headquarters" inside the boundaries of selected segments in a specified number of counties. The first step in drawing the sample, therefore, was to decide on the number of counties to be included and their method of selection. For the January 1947 and April 1948 surveys, 814 counties were used. Briefly, the sample of counties was selected by dividing all the counties in the United States into 408 groups or strata on the basis of the most recent BAE generalized type of farming areas, with about an equal number of sample farms in each group. Each State was handled independently except for those in the Mountain States and the New England States. Usually a group was divided into approximately equal parts and one county was selected for each at random, with probabilities proportional to their number of farms.

The second phase in drawing the sample was in the selection of segments within the sample counties. For this purpose the master sample segments were utilized but as there are some 60,000 of these and only about 4,000 segments were needed, a random selection of the desired number was made in each county.

The third and final process in the determination of the sample was the selection of the farms within the segments. To give each farm an equal chance of being in the sample, it was necessary to specify a single point or place for use in making this determination. This was referred to as the farm headquarters and if it was inside the boundaries of a sample segment an interview was to be obtained. The interviewers were provided with county maps showing the location of the

sample segments and with aerial photographs on which they traced the boundaries of each tract of land inside the segments; they then established by specific rules the headquarters of each farm that had any land inside the segment. If the farm operator lived on his farm his residence was the headquarters but if he did not live on his farm one of the following places, in the order given, was considered to be the farm headquarters:

1. A dwelling either occupied or unoccupied
2. A building
3. The main entrance to the farm
4. The northwest corner

It will be seen that every county and every segment or area of land—hence every farm—had a chance of being in the sample regardless of its size or type of agriculture. This procedure is believed to be statistically sound and in operation it can be applied to the field with satisfactory results.

In the January survey about one-third of the segments were designated for a complete clean-up; that is, the interviewers were to make a resolute effort to get an interview with every eligible farm operator in these segments. The theory was that the data obtained by a complete coverage of farms in about one-third of the segments would provide a basis for estimating the bias for incomplete enumeration of the remaining segments.

This procedure did not work as well as expected because of an inability to get 100 percent coverage in the clean-up segments so it was not used in later surveys. Moreover, the cost was rather high because of the excessive time-and-mileage expense in making the numerous call-backs in the clean-up segments.

For the April survey the same counties were used so that as many of the previous interviewers as seemed desirable could be re-hired but new segments were selected in order to avoid over burdening respondents and to provide additional names for later mailed inquiries.

In addition to the area sample the so-called large farms were handled separately in the 17 Western States for the April and September 1948 surveys. These farms are so large or their operations of such magnitude that it was considered necessary to devise a separate sample for them, in the case of the Western States where the area sample was rather small. A list of farms in the West meeting the 1945 Census criteria for large farms was sampled at the rate of 0.02; and to

these were added any farms obtained by the area sample which satisfied the large-farm criteria.

The Census definition of a farm was used in the enumerative surveys as the sample was stratified on this basis and data for "census farms" were needed in expanding the sample data, analyzing the results, writing the report, and, on the part of the general public, in interpreting the published material. A census farm essentially is all the land handled as a unit on which a person carries on agricultural operations with the aid of his family and hired workers, provided his place consists of 3 acres or more, or the value of production the previous year amounted to \$250 or more. This concept of a farm is rather complex and is difficult to apply in field operations but it is the best available and it does have the virtue of long use and general acceptance.

It is apparent that the sampling procedure was involved and that the interviewers had to do their job well if the results were to be satisfactory. Their success in identification of sample farms as compared with the expected number of farms in the segments based on Census data and in obtaining interviews for eligible farms is indicated in table 1.

TABLE 1.—*Expected number of farms compared with number of farms identified and number of interviews completed*

Item	Jan. 1947 survey	Apr. 1948 survey	Sept. 1948 survey
	<i>Number</i>	<i>Number</i>	<i>Number</i>
Expected farms ¹	19,756	12,917	² 7,815
Farms identified.....	17,704	12,563	7,165
Interviews completed.....	14,468	11,395	6,666
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Identified as percentage of expected.....	89	97	92
Interviews as percentage of identified.....	82	91	93

¹ Based on 1945 census count for sample segments.

² A total of 9,883 interviews was obtained; the 7,815 represents those in segments used for the first time.

The relatively low figures for the January 1947 survey compared with those for the April survey were due to many factors. Supervisors as well as enumerators were inexperienced. The weather¹ was severe, roads were bad, and many farmers could not be reached because, as usual, they were not on their farms during the winter. There were 73 segments that could not be reached at all be-

cause of excessive snow or prolonged floods. It has been estimated that under average conditions there are 500,000 farms in the United States that cannot be visited during the winter because of impassable roads. In planning the date of a farm survey this should be given definite consideration.

Data in the table show that only 92 percent of the "expected" number of farms were identified in the new segments used in September, compared with 97 percent in April. It is believed that the reason for the decrease is that training schools for interviewers were not held in September, at which the importance of farm identification would have been stressed. Moreover, the interviewers were not given the close supervision during the survey that they had been given in April.

Although the field procedure was difficult it appears that part-time interviewers can grasp the essentials of area sampling and can do the work satisfactorily if they have adequate supervision during the early stages of the survey.

Preparation of a Timetable of Operations

It is difficult to prepare a timetable of work to be done that can be adhered to strictly but the effort must be made or the whole project may bog down. On August 20, 1946, the following timetable was agreed upon for the survey that was to be made in January.

<i>Schedule preparation</i>	<i>Dates</i>
1. Initial draft of questionnaire.....	Aug. 20 to Sept. 2
2. Clearance of pretest schedule within BAE and the Budget Bureau.....	Sept. 3 to Oct. 3
3. Pretest in Pennsylvania and South Carolina.....	Oct. 4-14
4. Redraft for submission to Budget Bureau.....	Oct. 15-17
5. Clearance of final questionnaire with Budget Bureau.....	Oct. 18-24
6. Reproduction of schedules.....	Oct. 25 to Nov. 10
7. Schedules to be mailed to field not later than.....	Dec. 1

This was a tight schedule—too tight as it turned out. Delays resulted primarily from the frequent changes in the questionnaire, especially the inclusion of the Census Bureau income section referred to previously. According to the timetable the questionnaires were to be mailed to the field not later than December 1. This date was decided upon in order to get the large volume of material in the mail ahead of the Christmas rush, to have the supplies in the hands of the State people in time for them to arrange it for distribution well in

advance of the State meetings, and so that those States that would hold training schools before Christmas would have the supplies for this purpose. Actually the final schedules were not mailed until December 19, 20, and 23. Such delays throw an unnecessary burden on the whole organization, especially the field staff. If at all possible they should be avoided. The timetable for the April survey did not involve quite as many days as that for January. Lessons learned in operating the January survey made it possible to expedite the drafting of the questionnaire and organization of the work for the April survey.

Design of Questionnaires

Questionnaires or schedules of varying shapes and sizes were considered for the enumerative surveys but the decision to use a pamphlet type with pages 8 by 10½ inches seems to have been sound. A schedule of this kind is easy to handle and does not appear formidable. Holes were punched in the left margin of the schedules so that they could be placed in cloth-bound ring notebooks for the convenience of the interviewers. The notebooks provided a neat and orderly way to keep the schedules during the field work, gave a solid back to support the schedule when the interview was taken in the open or in a car, and protected the schedules from rain or snow and general mutilation. The use of sheets of this size is also of real advantage when the numerous drafts of each page or section are made during the preparation of the schedule, as they can be used in any typewriter of ordinary size.

Two general types of questionnaires are used for enumerative surveys, the "record type" and the "interview type." In the record type the questions are indicated but not wholly stated. In the interview type, each question is stated in full and exactly as the interviewer is to ask it. Experience in these surveys indicates that best results are obtained with an "interview type" questionnaire. A well-designed questionnaire simplifies and speeds up the interviewing as well as the editing, coding, tabulation, and analysis.

Considerable attention was given to the psychological aspects of the phraseology used. Every effort was made to couch the questions in the simplest language and the fewest words possible and in terms readily understood by farmers.

In the questionnaire used in the January 1947

survey a short concise statement concerning the information to be asked for and the need for obtaining the data was placed at the head of each section of the schedule. It was intended that the interviewer should use these when proceeding from one subject to another. Probably many did not do this, but the theory was that the information was there for them to refer to quickly if a respondent raised questions as to why the data were wanted or how they would be used. Such statements must be extremely brief, yet informative and conversational in tone; otherwise they may sound like a stump speech and irritate the respondent who wants to hurry along and finish the interview.

These introductory statements were omitted from later questionnaires but the interviewers were given definite instruction at the training school concerning the need for the collection of the data in each section of the schedule and a carefully prepared statement concerning the purpose and use of each topic was included in the detailed instructions for each survey.

One of the techniques used in designing the questionnaires that has proved very useful is the use of "screening questions" to which the respondent answers Yes or No; if the answer is No the interviewer passes over several questions which do not then apply in that particular interview.

Following are some do's and don'ts in the construction of schedules based on experience with these surveys:

1. Use short questions, each with only one objective.
2. Use clear and simple terms.
3. Avoid questions that refer to periods too long for recollection.
4. Avoid asking for percentages if absolute numbers can be obtained.
5. Keep the average interviewing time under an hour.
6. Use the best paper that can be afforded.
7. Use printed schedules and large print.
8. Provide adequate space for recording answers.
9. Leave ample margins for interviewers' notes.

Pretest of Questionnaire and Procedures

No questionnaire can be considered ready for use in a survey until it has been tested, together with the field procedures, under conditions approximating the actual survey situation. The January questionnaire was tried out in Maryland, Virginia, Pennsylvania, and South Carolina before it was considered ready for the printer. Additional tests should have been made in other parts of the South, and in the Corn Belt, and the Mountain and Pacific States, because of variations in

farming practices and terminology, but this deficiency was partially offset by suggestions made by the State supervisors at the area training schools which were included in the final draft.

The questionnaire used for the April survey was pretested in Indiana, extensively in the South, but not at all in the West because of time limitations and the distances involved. This was unfortunate as there are problems in those States, such as the proper handling of publicly owned grazing land, which are troublesome. However, this situation is so complex that a brief study of it during a pretest probably would not be adequate to develop new procedures. The April questionnaire was printed in time for use at the area schools so changes based on the criticisms of the State supervisor could not be made.

The pretests were carefully planned giving special attention to these factors:

1. *Location*—counties were chosen which would provide tests of particular problems.
2. *Personnel*—included a subject-matter specialist, a sampling expert, an analyst, an operations man, a State supervisor, and a number of typical interviewers.
3. *Supplies*—included maps, aerial photos, schedules, instructions, field forms, etc., that were used in the full-scale enumerations.
4. *Interviewing*—included both single and double interviewing. Double interviewing means having one person do the interviewing while another observes and makes notes concerning any phase of the questionnaire or the interviewing.

One of the complex situations with which interviewers have had to deal is that of "multiple-unit" farms, or farms with croppers, in the South. In actual practice these are, for the most part, simply large farms on which the work is done by individuals or croppers who receive a share of the crop and various perquisites in lieu of wages. But because it has been customary census procedure to consider the croppers as independent farmers it is difficult to devise a way that will obtain information for the multiple-unit as a whole and yet have the information on the cropper operations in a form that will permit them to be segregated and treated as information from separate farms would be. To illustrate:

Suppose that John Jones owns.....	1,000
and that he rents from others.....	500
Making a total of.....	1,500
Of this he rents out to two bona fide renters.....	200
Leaving him to operate with his family, hired workers, and croppers.....	1,300
Of this 1,300 acres 50 croppers have.....	500
Leaving him to operate with his family and hired workers.....	800

According to the Census definition the total 1,500 acres consist of 53 farms, or 53 farm operators: the two bona fide renters, the 50 croppers, and John Jones who is considered the operator of the "home farm" of 800 acres. In practice, however, the specified 1,300 acres is usually operated as one farm with Mr. Jones making the decisions as to what to plant, when to plant, when to cultivate, when to harvest, and when to sell. Opinions differ as to what should be considered the "farm" for enumerative purposes. Some think the entire 1,500 acres should be considered the "farm"; others think it is the 1,300 acres; still others prefer the 53-farm idea.

In the January 1947 survey the headquarters of the 1,300-acre unit was decided upon and if the "headquarters" was inside a sample segment a schedule was obtained from Mr. Jones for the 800-acre home farm and for a sample of the 50 croppers. This meant that croppers living inside a segment who were not associated with a multiple-unit with its headquarters inside a segment were *not* interviewed; conversely croppers living outside a sample segment who were associated with a multiple-unit *with* headquarters inside a segment *were* interviewed. This was a confusing procedure to explain to interviewers and for them to apply in the field.

Before the April survey extensive pretests were made in North Carolina, Alabama, Mississippi, and Texas, in cooperation with the Census Bureau, to develop, if possible, a simpler procedure for enumerating multiple-unit farms. Two problems were involved: (1) how the Census Bureau should handle the problem when making an enumeration of all farms and (2) how the problem should be handled in a sample survey.

So far as the April enumerative survey was concerned the decisions made and the reasons for them are as follows:

1. Interviewers were to be instructed to obtain a complete schedule for all "Census" farms with headquarters inside a sample segment.
2. When the headquarters of a multiple-unit was inside a segment (a) a schedule was to be obtained from the operator for the land that he operated with his family and hired workers. It was assumed that this "farm" would be the same as the so-called "home farm," (b) no schedules were to be obtained for any subunits whose individual headquarters were *outside* the segment, and (c) no attempt was to be made to obtain information on a multiple-unit basis.

The following factors were among those considered in arriving at these recommendations: (1)

Data for "census farms" are needed in expanding the sample data, analyzing the results, writing the report and, on the part of the general public, in interpreting the published material. (2) The sample was drawn on the basis of number of census farms, and probably will be so drawn for future surveys. (3) The number of multiple-units included in a national sample of 11,000 farms probably would not exceed 200 or 225—too few to make possible a presentation of multiple-unit data. (4) The proposed procedure would obtain data that more nearly represented the actual sample segments than any of the alternative procedures. (5) The recommended procedure probably would be easier to apply in the field than any others that had been considered.

Instructions to Interviewers and Distribution of Material to the Field

Instructions and explanatory material for the use of interviewers in these surveys were prepared in two parts. A Training Manual was prepared to give the interviewers a general knowledge of survey procedures; it included a discussion in layman's language of the theory of sampling, interviewing techniques, and related matters.

The other publication was a pamphlet called *Instructions to Interviewers* which contained detailed instructions concerning the interviewers' work for the specific survey. The *Instructions to Interviewers* was set up in logical sequence to enable the supervisor, when training interviewers, to start on the first page and continue through the pamphlet, taking up each step of the field work in the order in which it would be done during the survey. The Training Manual and the *Instructions to Interviewers* had covers of different colors for quick identification.

Questionnaires were printed and other forms were mimeographed, although printing is preferred as it is easier to read and stands up better under frequent handling.

A large-scale enumerative survey requires careful distribution of many forms of various kinds. For the January 1947 survey, for example, some 98,000 pieces of material of 34 different kinds were mailed to the 41 State offices. Because of the variation in number of farms, sample counties, and interviewers per State, the number of copies of each of the 34 items going to each office had to

be predetermined and then carefully counted for distribution. In addition, 500 kits, each containing a complete set of the schedules, forms, instructions, etc., were prepared and mailed to field offices for the use of the interviewers in the training schools.

The most important point in regard to the distribution of supplies is to get them to the field well in advance of the survey so the State supervisor can organize them for distribution to the interviewers throughout his State. The materials should be in the State office 3 or 4 weeks before the date the interviewing is to begin. This enables the State supervisor to coordinate the assembly and distribution of the supplies with his other work and field travel. Successful timing was achieved for the April and September surveys.

Training State Supervisors

The Statisticians in Charge of the 41 field offices had the full responsibility of all phases of the enumerative-survey projects in their respective States. It was recognized, however, that in most instances they would not have the time necessary to do the "leg work" involved in locating, hiring, training, and supervising the interviewers, so one of the younger statisticians in each office (usually rated as a P-3) served as State Supervisor and was given special training in the details of the projects. For the January and April surveys area training schools for the State supervisors were held in Columbus, Ohio; Salt Lake City, Utah; and Montgomery, Ala. The 1947 area training school lasted 5 days and the one in 1948, 3 days. Because the subject matter and field procedures for the September 1948 survey were similar to those of the April survey no area schools for supervisors were held before the fall survey.

The program for the 1947 area schools for supervisors was planned in detail to cover the necessary material during the 5-day conference. The first day was devoted to survey methods, techniques in establishing rapport, use of maps and aerial photographs, the scope and objectives of the January survey, and discussion of the highlights of the schedule and the instructions to interviewers.

The second day the class was divided into two groups, one of which made recorded interviews that were played back so that any weaknesses in interviewing techniques could be detected, while

the other group went into the field to take practice interviews with actual farmers.

The third day had the same program except that the work of the two groups was reversed.

The fourth day was devoted to discussion of the recorded interviews, the experiences with the practice interviews in the field, and the details of the sample design.

The fifth day was used in explaining the methods of expanding the sample data; editing, coding, and machine tabulation of the schedules; hiring procedures; and a review of the job to be done in each State.

At the area schools an attempt was made to distinguish between the things they needed to know and the things they needed to understand. For example, a supervisor needs to know the salary rate of interviewers but that can be given to them in a table; on the other hand, what constitutes a farm headquarters is a matter that requires an understanding of basic principles and hence requires much more discussion and consideration.

The use of recorded interviews as a device in training supervisors who have had limited experience in interviewing appears to be worth while but probably would not be worth the trouble and expense when experienced supervisors are involved. There is, of course, no substitute for actual interviewing experience in the field. It should be a part of every training school.

The area training schools are an indispensable part of every Nation-wide survey unless the subject matter and field procedures have been used in a recent survey and are familiar to the supervisors. In April, greater emphasis was given to reasons for making the particular survey, how the results would be used, and how farmers and the general public would benefit from the survey. More time was devoted to farm identification and especially to the importance of obtaining interviews for small farms, and to the editing and coding of the completed questionnaires. By having the supervisors study the instructions carefully and take practice interviews before coming to the conference the training period can be reduced to 3 days, as was done for the April survey.

Locating and Hiring Interviewers

Interviewers can make or break a survey not only from the viewpoint of public reaction but also with respect to the adequacy of the data that are

collected. The sample may be statistically perfect, the questionnaire well designed, and the analyses skillfully made, but if the interviewers have done a poor job the results of the survey will not be satisfactory. This makes the task of the State supervisors in locating and hiring interviewers especially important. Usually in these surveys the supervisor sent letters to representatives of State and Federal agencies or others in the sample counties, giving information about the forthcoming survey and asking for recommendations of people who would make good interviewers. The supervisor then made a trip through the State interviewing the people who had been recommended and searching out others who were needed. Copies of the questionnaire and instructions were left with prospective interviewers for study and practice before they attended a training school.

For the January survey about half of the interviewers were recommended by county agents. Other sources of recommendations included the Field Service Branch of PMA, U. S. Employment Service, vocational agricultural teachers, colleges and universities, school superintendents, local business men, and other community leaders.

These local interviewers were paid on an hourly basis. Their ages, previous interviewing experience, educational background, and general qualifications varied widely. On analyzing the personnel forms for the 453 interviewers in January 1947 it was found that 91 percent were men, 60 percent were between 30 and 60 years old, 45 percent had been graduated from high school, 24 percent had attended college, and only 23 percent had interviewing experience.

A rating of the interviewers' work indicated that the type of person who makes the best interviewer in surveys of this kind is a farmer's daughter under 30 years old with a college education. This is not intended facetiously. A farmer's daughter has a knowledge of farm practices and terms that helps in interviewing; being young she can better stand the strains of the work; her college study aids her in grasping the objectives of the survey and the details of the procedure; and she has an advantage in gaining a courteous and helpful acceptance by the respondent.

Training Interviewers

Training schools lasting 3 days were held in most States for the people hired to do the inter-

viewing in the January survey. Three days was little enough time to cover adequately the rather complex method of determining farms to be enumerated and to familiarize the interviewers with the long list of questions on the schedule, many of which were complicated. The training schools were carefully planned and the State offices were sent a detailed, hour-by-hour outline of the work and material to be covered.

Briefly, the purposes of the training school were these:

1. To make clear to the interviewer the importance of the work being undertaken.
2. To impress upon him his responsibility as an employee of the U. S. Department of Agriculture.
3. To give him a clear understanding of the Bureau's enumerative-survey program, why it is needed, and the basic concepts under which it operates.
4. To define his job—just what he was to do on the survey.
5. To train him in the skills necessary for a successful completion of his work including how to determine the farm operators to be interviewed, the purpose of each topic and question on the schedule, how to meet the respondent and establish rapport, how to introduce the topics on the schedule, how to probe to get more accurate replies, how to terminate the interview, and how to check the schedule for accuracy and completeness.

A combination of explanation, demonstration, and actual practice was used to accomplish these aims. About half the training period was spent in explanation and discussion of the program, the sample, the schedule, and the procedures in the field; the other half was used in demonstration interviews, in practice interviews, and in work in the field determining boundaries of segments, farm headquarters, and use of maps and aerial photographs.

On the final day of the training school the interviewers were given a quiz covering the major points of the survey. The replies brought out several points that needed clarification and the grades assigned indicated those interviewers who needed additional instruction and training.

It is desirable to keep the number of trainees at any one school to 10 or less in order that each interviewer be given adequate individual attention. Where there are only a few interviewers and they are located in different parts of the State "on-job" training was used; that is, the supervisor visited each interviewer and trained him in the work he was to do.

Supervision of Interviewers

Close supervision of the interviewers during the survey is essential if best results are to be obtained.

At the close of the training schools for the January survey the State supervisors rated the interviewers somewhat as follows:

1. Good—requiring a minimum of supervision.
2. Average—requiring additional training and supervision during the first few days of the survey.
3. Fair—requiring substantial additional instruction and training; in some instances they were held over for an extra day of schooling.
4. Not usable—to be replaced.
5. Absentees—unable to attend; these were trained individually by the supervisor after the close of the schools.

On the basis of this classification the State supervisor laid out an itinerary that would enable him, or some other professional person, fully informed on the project, to visit the interviewers during the first few days of the survey.

During the week before the beginning of the April survey, the interviewers were instructed to take some practice interviews in their neighborhood. The supervisor then visited each interviewer, reviewed his work, answered questions, and corrected and explained any errors. This provided a last-minute check and a vehicle for supervision in addition to that given during the actual survey. Evidence found in table 1, on the identification of farms in sample segments and the number of interviews completed, demonstrates the value of comprehensive training.

Processing of Questionnaires

After the termination of an interview the questionnaire was reviewed several times to discover omissions or errors that could be corrected. Enumerators were instructed to do this as soon as possible so that, if necessary, they could return to the respondent for additional information or correction of the data. When the questionnaires were received by the State supervisor he reviewed the schedules in detail, correcting or deleting faulty entries or returning the schedules to the interviewer for correction. When the questionnaires were received in Washington for machine tabulation they were again reviewed to detect possible discrepancies in the schedule entries and any variations in editing or interpretation by the supervisors in the different States. State supervisors had been provided with detailed editing instructions concerning each item on the schedule. The editing by the State supervisors is considered essential as they are familiar with local customs, practices, and terms. Having the editing done in the field offices distributed this work among

many people thus speeding up this phase of the project.

Coding of the survey data for machine tabulation was done in the field offices for the January survey, in accordance with detailed instructions. Later, when this work was reviewed in Washington it was found that so many of the problems had not, and in fact cannot, be anticipated that in later surveys the coding was done in Washington by a carefully trained and supervised staff. Even with the work centralized, it was found necessary to check all coding on the first 5 percent of schedules coded, and thereafter every tenth county coded by each person, to assure comparability. The punching and tabulating was done by the Bureau's machine tabulation unit.

Punching and Machine Tabulation

Perhaps the most general criticism that has been made of enumerative surveys is that it takes too long to get the completed results. Delay has been due primarily to the lack of an adequate machine-tabulation unit. When plans were made for the January survey, it was anticipated that the machine unit could be so expanded that it could process the survey data within 3 or 4 months after the field work was completed. But funds were not available for immediately enlarging the unit so the punching was not completed until September and the tabulations until October. Somewhat the same situation influenced the processing of results of the April survey.

As different topics in the questionnaire were sponsored by different Divisions of BAE it was their responsibility to make the analyses and write the reports on those topics. But it is also necessary that the analyses be reviewed by one thoroughly familiar with the sampling procedure.

Enumerative Survey Costs

Frequently questions are asked concerning the cost of an enumerative survey. Presumably it is recognized that any interview survey will cost more on a per schedule basis than a mailed survey with the same size of sample. It is necessary, therefore, to take into consideration the value of the kind of data obtained, the much greater information obtained, and the types of analyses that can be made that are not possible with returns from a mailed inquiry. In short, if enumerative surveys are to be worth the time and expense they

must provide information that cannot be otherwise obtained for less money.

Two kinds of costs are involved in making BAE enumerative surveys. Those costs due to participation of regular personnel of the Bureau are called "absorbed" costs. Expenditures for supplies, travel, interviewer and clerical salaries and similar items, are called "out-of-pocket" costs.

Only out-of-pocket expenses are considered here and in table 2. For the January survey they amounted to an over-all average of \$11.69 for the 14,468 interviews. The average cost per interview for salary, mileage, and per diem during the survey was \$5.18. Comparable items for training interviewers averaged \$1.76 per schedule. The 453 interviewers averaged 24.3 miles of travel per schedule and completed 2.6 schedules a day.

The April survey made in the same counties as were used in January, obtained 11,920 interviews at an average cost of \$10.54. The cost of the 401 interviewers during the survey averaged \$4.63 or 55 cents per schedule less than in the previous survey. With a questionnaire that called for an average of 53 minutes interviewing time the enumerators averaged 2.9 schedules a day and traveled 23 miles per interview.

The September survey was restricted to 427 counties; the interviewing time averaged only 33 minutes, and the travel per schedule averaged 16.9 miles. The total cost averaged \$5.07 per interview; the cost during the survey averaged \$3.36.

TABLE 2.—Average "out-of-pocket" costs per interview

Item	Jan. 1947 survey	April 1948 survey	Sept. 1948 survey
	<i>Dollars</i>	<i>Dollars</i>	<i>Dollars</i>
Sample.....	0. 11	0. 18	0. 04
Pretest.....	. 07	. 09	-----
Duplication of materials....	. 18	. 17	. 12
Supervisor schools.....	. 40	. 31	-----
Hiring and on-job training....	1. 21	. 65	. 49
Interviewer schools.....	1. 93	1. 28	. 25
Pre-survey supervision.....	-----	. 42	-----
Interviewing.....	5. 18	4. 63	3. 36
Processing interviews.....	2. 47	2. 77	. 76
Other costs.....	. 14	. 04	. 05
Total out-of-pocket costs.....	11. 69	10. 54	5. 07
Number of interviews.....	14, 468	11, 395	9, 883
Average interviewing time (minutes).....	69	53	33

The operational data obtained from these surveys has made it possible to estimate with increased accuracy the probable cost of a proposed survey. The allocation made for the January survey turned out to be about 13 percent low. The April allotment to field offices was about 6 percent high. For the September survey the allotment was off less than 1 percent.

Summary

Experience to date indicates that enumerative surveys are useful in providing types of data not otherwise obtainable and in checking current statistics. It is evident that they can play an increasingly important part in the collection of primary agricultural data to supplement the results of the mailed inquiry which is the backbone of the statistical work of BAE.

From the standpoint of operations the January

survey was made at a bad time—roads were better in April and more farmers were available for interviews. The practice in April of obtaining pertinent data from the neighbor of an absent farm operator in a sample segment was found to be more satisfactory than the attempt in the January survey to obtain complete coverage in clean-up segments.

Farm operators, in general, gave the interviews fairly willingly. Refusals averaged a little more than 1 percent of the sample farms.

The importance of securing competent persons, training them carefully for the interviewing, and giving them close supervision, was fully demonstrated. It is evident that large-scale enumerative surveys are too expensive in time, effort, and money to be done with hasty preparation. They must be carefully planned and energetically executed.

Survey of Transportation From Farms to Initial Markets

By Donald E. Church

Data used in this discussion were collected in one of the two enumerative surveys evaluated in the preceding article in this issue. In addition to 1948 data on farm motortruck ownership, this paper presents new information on farm ownership of trailers and the proportion of the farm output that is hauled to market in farm-owned transportation equipment.

TWO considerations have recently emphasized the question of the extent to which farmers are dependent upon others for the initial movement of their crops, livestock, and products from their farms. These are the increasing costs of hired motor trucking and the widespread belief that regulatory commissions may reduce the present exemptions for agricultural products hauled by for-hire equipment.

The number of farm-owned motortrucks has been reported by the Census Bureau for many years, but no statistics on a broad scale have been available regarding trailers, which are significant as substitutes for trucks. Furthermore, neither the number of vehicles nor their distribution among farms is a reliable indicator of the extent to which farmers are dependent upon for-hire truckers and buyers for the initial haulage.

Use of Enumerative Survey

In view of the lack of adequate information about transportation at the farm level, a limited number of questions on the subject were included in the Nation-wide Enumerative Survey made by the Bureau of Agricultural Economics in April 1948. The complete survey was designed to obtain basic information on a wide range of subjects. This report deals only with the leading aspects of the transportation phase.

Farmers who were interviewed in this survey were selected to represent not only the United States as a whole, but also the four broad geographic areas outlined in figure 1 and here called the Northeast, the South, the North Central States, and the West. The sample was determined by the "probability" or "area" sampling method.