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A Report on the General Enumerative Surveys—II¹

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This is the second and concluding article evaluating the general enumerative surveys of January 1947 and April 1948. The first article, written by Emerson M. Brooks for the issue of this journal dated April 1949, described the field work and pre-survey planning and preparations. The present article includes an evaluation of methods and results from two viewpoints: first, the consideration of general factors such as completeness of field work and methods of processing and expansion of sample data; second, an appraisal of the results obtained for each subject covered in the questionnaires. Certain experiences from a third enumerative survey made in September 1948 are included when they are particularly pertinent to the discussion.

Evaluation of General Factors in Obtaining and Processing Data

A previous article on the two general enumerative surveys of the Bureau of Agricultural Economics included a detailed description of the operations of 5 months or so that preceded the actual surveys.² Another 4 to 10 months of time and an expenditure of funds about equal to that spent for field work are required to complete the mechanical phases of processing the data. The final analysis of results which leads to publication or other use of the data often requires many more months. Table 1 shows the publication dates of

results obtained from the two surveys. In most of the cases in which data have not yet been analyzed the delay was reported to result from limitations of personnel.

Planning and Analysis

From the viewpoint of the analyst who is interested in a particular field of subject matter, there is a period of about 10 to 20 months in which there is intermittent activity in connection with the survey. He is first called upon to specify the data that are wanted and to prepare tabulation plans as well as to assist in designing the questionnaire; then to modify both objectives and questionnaire in the light of limitations imposed by the size of sample, the length of interview, and the machine-tabulating methods to be used in processing the data. He is asked to help prepare the instructions to interviewers covering his particular subject, and is expected to be familiar with the voluminous gen-

¹ Analysts who contributed information and assisted in the appraisal of the subject-matter fields are: Harley M. Brewer, Albert P. Brodell, Ralph R. Botts, Gladys K. Bowles, Charles G. Carpenter, Donald E. Church, M. R. Cooper, Louis J. Ducoff, Margaret Jarman Hagood, Buis T. Inman, Albert R. Kendall, Nathan Koffsky, T. Wilson Longmore, D. O. Mesick, Margaret R. Purcell, Richard G. Schmitt, Jr., W. H. Seofield, Glenn D. Simpson, Paul W. Smith, George B. Strong, Paul P. Wallrabenstein, and H. H. Wooten.

² A REPORT ON THE GENERAL ENUMERATIVE SURVEYS—I, this journal, Vol. 1, No. 2, April 1949.

TABLE 1.—*Status of results from interview surveys of 1947 and 1948*

Subject	Dates of publication	Form of release
January 1947 survey:		
Accidents.....	May 1947.....	4-page mimeographed report.
	May 1948.....	8-page printed report; and 2-page summary in Agricultural Situation including results of 1947 and 1948 surveys.
Acreage and tenure.....	May 1948.....	2-page article in Agricultural Situation.
Land values.....		Used for research only.
Farm population.....	August 1947.....	Geographic distribution used in making annual farm population estimates, 10-page mimeographed report.
Farm employment and wages.....	September 1948.....	57-page mimeographed report.
Livestock and poultry numbers.....		Used for research only.
Tractors.....	May 1948.....	8-page mimeographed report.
Crop stocks.....		Used for research only.
Value of products sold.....	About April 1950.....	
Farm expenses.....	do.....	
Family living expenses.....	About September and December 1949.....	
Other income of household members.....		{ These data were obtained for the Census Bureau: no release to be made by BAE.
Operators' dwelling facilities.....		
April 1948 survey:		
Accidents.....	Nov. 1948.....	10-page mimeographed report (and combined reports listed above).
Acreage and tenure.....	July 1949.....	5-page article in Agricultural Economics Research. (A report on moving dates is in preparation.)
Tenure practices.....	(1).....	
Farm population.....	(1).....	
Farm employment and wages.....	About October 1949.....	
Livestock and poultry numbers.....	(1).....	
Machinery numbers.....	March 1949.....	5-page mimeographed report.
Crop stocks and production.....		Used for research only.
Crop acreages.....	(1).....	
Financing farm machinery.....	August, September 1949.....	13-page mimeographed report and article in Agricultural Situation.
Sickness of farm operator.....	June 1949.....	2-page multilithed report.
Fire damage.....		Used only to get list of fires.
Marketing channels and transportation methods.....	Apr. 1949.....	4-page article in Agricultural Economics Research.
	June 1949.....	9-page article in Marketing and Transportation Situation. (A more complete report is in preparation.)
Farm construction.....	Dec. 1948.....	2-page mimeographed report.
Fertilizer.....	(1).....	

¹ Data not yet analyzed.

eral instructions to interviewers which may here and there contain specifications materially affecting the interpretation of his data. For example, if he is interested in data on 1946 wheat production from the January 1947 survey, he should know the contents of a few paragraphs appearing on page 20 of the 77-page instruction booklet and covering the question of absentee operators and those who moved to the farm after the 1946 crop was harvested. The analyst is consulted in arriving at proper procedures for editing, coding, and punching of the data. Unfortunately, in practice he has often prepared the tabulation plans some time after the field work was completed.

Our experience has borne out the wisdom of the

requirement that tabulation plans should be prepared in advance of the design of the questionnaire. This precept is usually accepted in theory but sacrificed in the pressure of the presurvey time schedule. Often final budgetary decisions regarding a survey cannot be made until a few weeks before field work must begin, which means that if there is to be adequate time for planning, some surveys will be planned that are never made. This effort may be regarded as insurance against too hastily planned surveys. The principal reasons why the presurvey time schedule should provide for the preparation of at least rough tabulation plans at an early stage, are as follows.

(1) *To decide whether it is feasible to collect*

the data from viewpoint of sampling error. Tabulation plans are needed, specifying the kind of statistics to be computed from the data (whether levels of expanded aggregates, or compositions and relationships) and the extent of the detail needed to meet the objectives for which the data are obtained. These tables should be reviewed by sampling statisticians to find whether the sample can reasonably be expected to meet the objectives with respect to sampling error. They should also be reviewed in the light of certain typical biases in response. For example, if the item depends on the recalling of incidents that occurred over many months (accidents, purchases of machinery, transportation), aggregates could not be accurately estimated and tabulations intended only to give such aggregates would not be feasible. Some interrelationships would also be distorted unless the analysis provided for the separation of those classes most likely to be under-reported because of memory bias (the least severe accidents, the smaller purchases, etc.).

Results of these studies of the tabulation plans and any modifications of the original objectives resulting therefrom, should be a matter of record. They may materially affect some phases of processing that occur 6 to 18 months later. If allowed to remain a matter of conversational agreement (as has often been true in the BAE surveys) they can lead to misunderstandings when these conversations are forgotten or if another analyst is assigned to handle later phases.

(2) *To see that the questionnaire meets the specifications implied by the tabulation plans.* The most commonly recognized reason for having tabulation plans completed before or simultaneously with the designing of the questionnaire is to make sure that the questionnaire is correctly worded to give everything needed in the analysis.

(3) *To see that desired tabulations can be obtained from the questionnaire data by machine-tabulation methods.* Aside from the generally recognized principles of designing the questionnaire to facilitate coding and punching, certain types of data present unusual difficulties of machine tabulation which may require a partial modification of the original objectives. Review of the tabulation plans may lead to the decision to tabulate on the basis of a unit other than the farm; for example, by showing distributions of purchases of machinery rather than the distribution

of farms that bought machinery. Any such decision should be recorded.

For the purposes discussed above, tabulation plans need only to show the form of the end results desired. For purposes of informing the machine-tabulation operators regarding the kind of tabulations needed from the punched cards in order to arrive at these end results, a somewhat different kind of tabulation plan is needed. This must take account of the estimation or expansion methods to be used, it must provide for the weighting together of results representing different sampling rates, and it must provide for the proper handling of those reports which are not usable for all or part of the items in the tabulation. These "NA" (not ascertained) reports usually make up a very small fraction of reports for all items except those requiring a projection of future intentions or the recall of information going back several months. Often the NA's are different from other cases. For example, a very severe accident with continuing medical costs may be reported unknown as to the expected total cost. Some assumption must be made about the NA's in every indication prepared from the survey, and in the case where data are used to study interrelationships the problem is complicated by the fact that reports usable for one variable in the analysis may not be usable for another. For these reasons, the final machine-tabulation plans must be worked out jointly by the subject-matter analyst, a sampling statistician, and a machine-tabulation specialist. In general it may be said that improvements in sampling efficiency are obtained at the cost of increasing the work required to convert data from the punched cards into estimates. Some respects in which the sample design for the 1948 survey in comparison with that for the 1947 survey was simplified chiefly for this reason are: (1) the elimination of different sampling rates between States within any major region and (2) the elimination of the plan to use separate estimates for non-interviewed farms obtained from clean-up segments (discussed in part I of this report which appeared in the April 1949 issue of this journal). Another complication was introduced in the second survey, however, in the heavier sampling of large farms in the West, and this feature will probably be extended to other areas in future surveys, because of the tremendous variability introduced in the indications for many items by the very large farms.

By the time the analyst receives the machine-tabulated data, they have been through the hands of four groups of people—the field interviewers, the State office reviewers, the coding unit, and the machine-tabulation unit. More than 200 pages of mimeographed instructions have accumulated for the guidance of these groups in processing the data. If the analyst has been connected with the survey from its inception, and has had a major interest in it, he has participated in the decisions involved in most of these instructions and is aware of their implications for the analysis of the data. If not, then it can only be hoped that no important point will escape him.

Among the instructions is one set directed primarily to the analyst. It includes an analysis of the sample in terms of such general features as the extent and probable effects of underenumeration and nonresponse, and gives recommended methods of expansion or weighting and some alternative methods or adjustments that would be feasible under certain simple assumptions. If the analyst has reliable data against which to check some part of the survey results, and if he has a flair for statistical methodology, he may prefer to make some more complicated but more nearly correct assumptions. For example, it may be decided that the relationship shown by the survey between certain items is reasonably accurate but that the aggregate level for one key item, because of sampling or expansion errors in the survey, is more accurately given by an independent source of data. In that case the other items may be most efficiently estimated by using the independent data for the key item plus the relations shown by the survey. Obviously, a subject-matter specialist's knowledge and judgment are needed to arrive at the most efficient estimating methods, at least in regard to the basic assumptions. One difficulty in getting best results from the interview surveys lies in the fact that the subject-matter specialists, in many cases, have relatively little interest in the statistical treatment of the data, for their primary interest is centered on the end results.

When the survey data have been analyzed and a report has been prepared, it is reviewed by a standing technical committee. This group decides whether the results and conclusions shown are valid in the light of probable sampling and expansion errors and possible response biases. They may recommend deletion of a part of the

results or condensing certain categories to show less detail where sampling errors are excessive. Occasionally survey results are found to conflict with official estimates. Such conflicts are infrequent because the surveys are chiefly concerned with information not available from other sources. In the case of information on farm employment, the survey data were obtained primarily to revise and supplement existing series, and they have been used in this way. The crop and livestock information obtained in the surveys covered items for which there are official estimates, but only a partial analysis has been made. Results were inconclusive and no publication is contemplated. (See subject-matter discussion in the last part of this report.)

It may be noted that, for purposes of checking existing series, error limits must be much smaller than when the purpose is to present new information on phenomena of previously unknown magnitude and composition. Also, once a survey has indicated the approximate level of certain aggregates, a repeated survey of the same size cannot necessarily keep this level up to date. This is true because the errors in the estimation of the level may be greater than the small changes that occur in that level from one year to the next. Another problem cited by many analysts regarding the use of survey data to revise existing series is the fact that these series may be published by States while the survey, because of the small sample by States, can be used only for regional indications. This presents no unusual difficulty, however, if there is confidence in the survey indications for regions. The more extensive series can then be used to obtain a break-down within the regions while regional totals are obtained from the interview survey.

Field Work

Both the January 1947 and April 1948 enumerative surveys were made in the "800-county" sample illustrated in figure 1 of the previous article on the General Enumerative Surveys (this journal, April 1949). The decision to spread the samples into about 800 counties, or a fourth of all counties, was based on a rough compromise between two sets of considerations. On the one hand, most studies of the variability of agricultural items between farms indicate that the widest possible

spread of the sample into counties is most efficient because the increased unit cost is more than offset by the smaller samples needed. On the other hand, the plan to use a corps of about 400 intermittently employed interviewers made it desirable to cluster the sample around 400 spots, with work loads that were roughly equal. The possibility of a 400-county sample suggested itself but it was decided that for surveys of 10,000 farms or more, a greater spread was desirable. Therefore, approximately 800 counties were selected in two stages: 400 counties in which resident interviewers would be hired and another 400 counties to which the interviewers would travel. Either the first 400 or the combined 800 counties provide representative national samples. In the January 1947 and April 1948 surveys all 800 counties were used; in a September 1948 survey, when 9,883 interviews were taken to collect data on farm employment and accidents, only the 400 "home counties" were used. No attempt is made here to evaluate the general design of the sample. Rather, the features of the design are briefly summarized from the viewpoint of providing a basis for evaluating the extent to which the execution of field operations conformed to or departed from the standards implied by the sample design.

Within the sample counties, Master Sample segments were used to specify the sample of farms. Further details on the operation of drawing the samples are available elsewhere.³ An important feature of area samples of the kind here considered is that if all phases are carried out as visualized in theory, they lead to results which represent a fresh determination of the facts under investigation, which is in no way dependent on previously existing or assumed relationships in the universe of inquiry. The practical accomplishment of this result, however, places an exacting burden of specifications on the interviewers. The task of evaluating the sampling aspects of the enumerative surveys is principally one of determining to what extent the interviewers were able to satisfy these requirements.

The crucial requirement of interviewers with respect to sampling is that they find and count correctly all the farms which the sampling definitions

specify as part of the sample and that they obtain the desired questionnaire information from these farms, and from no others. Methods of preparing estimates from the survey data generally assume that *all* the specified farms, or at least those having the item of inquiry, are counted. They further assume that although it is not usually possible to get interviews from every one of the counted farms, those not interviewed will be controlled in some way so that averages and percentage distributions obtained from the interviewed farms alone will not be appreciably different from those for all the specified farms.

The first part of this requirement—the complete and correct counting of the farms in the specified sample areas or segments—is not absolutely essential to the preparation of estimates of averages and distributions unless the uncounted farms differ from the counted farms. But it is basic if independent estimates of universe totals of any kind are to be prepared, for all such estimates are closely related to the count of sample farms. The criteria for determining which farms are counted as sample farms were discussed in the previous article. (This journal, April 1949.) These criteria, hinging on the definition of a single point on each farm as its "headquarters," are simple in both concept and application for the 94 percent of all farms which have resident operators. To take care of the other 6 percent of farms no simple device has yet been developed. The various possible situations give rise to a rather cumbersome set of rules on "farm identification" which consume considerable training time and effort, although they are irrelevant in most cases.

Another aspect of the criteria for determining the sample farm count is the definition of a farm. The census definition has been specified. As this includes at the lower limit many agricultural producing units that are too small to be ordinarily thought of as farms, effort must be devoted to training interviewers in this concept of a farm. These units at the lower margin of the farm definition often contribute only negligible amounts to aggregates but their exclusion would seriously affect per farm averages and farm distributions. It is important that the lower limit be rigorously adhered to in order that variations in completeness between surveys should not obscure the changes that are occurring in the item for which estimates are desired.

³ E. E. HOUSEMAN. THE SAMPLE DESIGN FOR A NATIONAL FARM SURVEY BY THE BAE. *Jour. Farm Econ.*, Vol. 29, No. 1, February 1947.

TABLE 2.—*Number of farms identified per 100 segments and number of interviews as a percentage of expected number of sample farms, United States*

Survey	Farms identified per 100 segments ¹	Interviews as percentage of expected sample farms
Expected number based on 1945 census.....	Number 485	Percent -----
January 1947:		
Short schedule.....	460	77
Long schedule.....	429	64
All.....	444	73
1948:		
April.....	474	88
September.....	442	85

¹ Weighted for different sampling rates.

Evidence indicates that the extent of completeness of farm identification, or counting of the specified sample farms, is influenced by several psychological factors which may differ between surveys or even for different parts of the same survey. Chief of these are the thoroughness of training that interviewers receive in the sampling phases of the survey work, and the degree of deterrent to the completion of field work offered by the difficulty of the questionnaire. The same kind of master sample segments have been used in both surveys discussed in this report and in a third enumerative survey of September 1948, but the number of farms counted per 100 segments has varied as shown in table 2 (first column). In the January 1947 survey separate results are shown for those segments where a "short" schedule of 17 pages was used, and those where a "long" schedule having 12 additional pages of information on expenses and income was used.

Part of the difference between the survey results and the expected number of 485 farms may be due to a decrease in the number of farms since the census date. Most of it is apparently a result of other factors. The figures reflect the difficult nature of the January 1947 questionnaire, particularly the long schedule used for part of the farms in that survey. The April 1948 survey, although it involved a 23-page questionnaire, showed the greatest completeness in the farm count. This

questionnaire had very few questions which farmers would have difficulty or reluctance in answering and the allotted period of training was adequate. The September survey, having a questionnaire of only 7 pages, was very incomplete in farm identification probably because of a curtailment in the training program.

The wide variations in completeness of farm identification have imposed limits on the extent to which sample data could be expanded to universe totals independent of outside information. In the April 1948 survey, where the number of farms identified for the country as a whole weighted out to 98 percent of the expected number, data have been expanded on the basis of sampling rates without adjustment for incompleteness. In the other surveys, various methods have been used for different items in the schedules, depending on how the incompleteness in identification was expected to affect different items. The adjustments have usually been less than the 8 or 9 percent incompleteness in identified farms would suggest, because analysis of the samples shows that the farms missed were chiefly smaller than average farms, presumably having less than average amounts of the items investigated. For many items for which aggregates were wanted, no adjustments were made, on the assumption that only negligible amounts would occur on the smaller farms that were missed.

In addition to striving for absolute completeness of farm identification, interviewers are expected to obtain a high degree of completeness in interviewing the identified farms. It is not feasible to try to get interviews from every one of the identified farms in the time allotted for field work on the surveys. To make expanded estimates, the non-interviewed farms are usually assigned the characteristics and averages found for the interviewed farms. Another method is to make repeated call-backs to get interviews from a sample of the originally non-interviewed farms and to expand these results to obtain separate estimates for farms not interviewed. This latter method was adopted as part of the sample design for the first survey but was not found feasible in operation.

In the later surveys, another plan was adopted for controlling possible biases due to non-response. An interview goal of at least 90 percent of identified farms was set for each interviewer, with instructions to make three visits to each sample farm

if necessary. After three visits if no interview was obtained, a "check sheet" of key information concerning the farm was filled out with the help of neighbors. This program resulted in getting interviews from 91 percent of identified farms in April 1948 and 93 percent in September 1948, compared with 82 percent in January 1947. Key information obtained for non-interviewed farms shows that they were on the average smaller than the interviewed farms in nearly all regions. They were also generally less likely to have motortrucks, tractors, and electricity. Differences between interviewed and non-interviewed farms were usually not large enough to warrant adjustment of survey data for the interviewed farms considering the small weight carried by the non-interviewed farms. Possible sources of bias are revealed by the April check-sheet information showing that in Oklahoma and Texas several very large sample farms were not interviewed and that in the North Central region a disproportionate number of corn- and wheat-producing farms were not interviewed.

To summarize briefly the effects of shortages in identification and of the incompleteness in interviewing identified farms, we may compare the number of interviews obtained with the number of farms that were expected to be identified on the basis of 1945 census. Results for the three surveys are shown in the second column of table 2.

Assuming the 1945 census number of farms to be correct for the survey dates, these figures represent the fraction of the specified sample for which information was actually obtained. The remaining fraction (for example, 27 percent for the January survey) represents a fraction of the sample and therefore of the universe for which no information was obtained. The possible magnitude of non-response biases in survey data is closely related to the size of this unrepresented fraction of the universe. The figures above show a considerable improvement in the two later surveys. Perhaps a reasonable goal to set for future surveys would be 90 percent coverage in this sense, with a continued check of key information for the identified farms that are not interviewed.

Very few changes in sample design were made between the January 1947 and the April 1948 surveys. As noted in the earlier article on the enumerative surveys, list sampling of "large farms" at a heavier rate than the segment sample

was used in the 17 Western States in the later survey. In each of the surveys, the sample was distributed somewhat differently between States and regions. Changes between regions were made to adapt the sample to the specific objectives of the surveys. Within regions a simplification was made in the later surveys by assigning the same sampling rate to every State in a region (even though this involved some sacrifice of sampling efficiency) to facilitate processing and analysis.

Apart from satisfying the sample specifications by finding the right farms and interviewing as many of them as possible, the interviewer has a lengthy set of subject-matter specifications to follow. These are given briefly in the questionnaire wording and are elaborated in the interviewer's instructions. An evaluation of the accuracy of the answers obtained in the questionnaires must be based mainly on the analyst's appraisal of the survey results. This will therefore be discussed in the last section of this report, dealing with the subject matter of the surveys. But it may be noted here that the very small number of persons who refused to be interviewed (about 1 percent) and the generally small number of NA's (not ascertained) and "Don't Knows" reported on the questionnaires suggest that the ability and interest of the people recruited and trained for the interviewing was very high.

Processing of Data

All completed schedules were mailed twice a week to the State offices during the survey. Here they were reviewed for adequacy of the farm-identification work and for consistency in the answers to interrelated questions. The editing in the State offices followed uniform rules developed in Washington. In the 1947 survey, the State offices also performed most of the coding of schedules. It was later found that this preparation of schedules for punching could best be done in a central location since complete uniformity is essential to efficient handling by the punch-card unit. Another advantage of central coding is that, as all the problems of classification and coding cannot be anticipated, the necessary modifications of coding instructions are facilitated.

When all the schedules for a county were received and reviewed, they were sent to Washington where they moved as a county unit through

later processing and to final filing. In Washington, schedules and the so-called farm identification sheets were "checked in." A cumulative count by areas was kept on the number of farms identified as compared with expected numbers, and on the interview rates (percentage of eligible sample farms interviewed). If the interview rate fell so low as to give serious underrepresentation of certain areas, it might be decided to duplicate the cards for farms from the same or similar areas to make up for some of the missing interviews. In the January 1947 survey, 312 duplicated schedules were added in 18 counties where the interview rate was very low. In the April 1948 survey the field conditions were more favorable and it was not necessary to duplicate cards. In the January 1947 survey, another group of 373 duplicated cards was added to represent sample farms not interviewed because of two rules permitting interviewers to sub-sample certain eligible farms—the sharecroppers on large plantations and the (usually very small) farms in segments found to have an excessive number of sample farms. No sub-sampling within segments was done in the later surveys, although in those segments that had more than 12 farms, only 12 interviews were required.

After being checked in, schedules were sent to the coding unit of 10 to 25 clerks hired for the purpose or borrowed from the divisions interested in the survey. In the 1947 survey the schedules were completely coded before being punched. As this slowed down the punching it was considered more satisfactory, in the April 1948 survey, to code only a part of the schedule at a time and to move the schedules back and forth between the coding and punching units until all sections were completed.

For each farm in the April 1948 survey, eight farm cards were punched. Nine additional cards were punched for units other than farms (for example, one for each tractor, one for each worker, etc.). The punch-card design, like the machine-tabulation plans, must be worked out by someone who is familiar with the objectives of the survey and the estimating methods to be used, in collaboration with a machine-tabulations technician. The preparation of punch-card specifications ties in closely with the coding instructions.

After data for a card (or a section of the schedule) were entirely punched, some checks were made on the accuracy of the data before machine tab-

ulations were prepared. An individual farm listing of the cards was usually made for inspection by the analyst. Consistency checks were made on the machines to disclose any inconsistencies or unreasonable relations between items, and cards were corrected for any errors discovered in these processes. Such errors usually were traceable to the editing or coding operations, which were not completely double-checked, as were the punching operations.

The close coordination of planning by the subject-matter analyst, the consultant on sampling and estimating methods, and the machine-tabulations technician has been difficult to achieve, partly because of the decided time lag in the processing of the survey data. In many instances 6 months or more elapsed between coding of schedules and receipt of tabulations by the office that requested them. Often additional months went by before an analyst was definitely assigned and was free to work on the results. This lapse of time tended to make each technician's contribution seem like an isolated chore rather than part of a unified activity. There was some improvement in connection with the April 1948 survey as compared with the January 1947 survey, and, as may be noted in table 1, more reports have already been published from the later survey than from the earlier one.

Another difficulty in achieving efficient coordination of effort in processing data has been the fact that the machine-tabulations technician, being also the supervisor of the operations of a large and expensive unit, has not been as free to acquaint himself with the processing phases that follow the preparation of machine tabulations as would be desirable. Familiarity with these phases would often permit him to modify the tabulation plans while still getting the required results. Such modifications might be intended to simplify machine tabulations or to simplify later clerical computations. It might be feasible to show expanded indications directly instead of sample data, thus relieving the analysts of part of the burden of statistical manipulations. This would probably require an additional technician in the planning of machine operations, and the installation of a multiplying punch. It would eliminate much of the professional and clerical time spent in the various divisions in expanding sample data, and would speed up the analysis of results.

TABLE 3.—*Number of farms reporting selected items in the enumerative surveys, January 1947 and April 1948*

Survey and item	Farms reporting ¹	Survey and item	Farms reporting ¹
January 1947 survey:	<i>Number</i>	April 1948 survey—Continued	<i>Number</i>
Usable schedules.....	15, 153	Family workers, survey week.....	10, 786
Accidents, October–December 1946.....	512	Hired workers, survey week.....	2, 031
Family workers, survey week.....	13, 684	Production in 1947:	
Hired workers, survey week.....	1, 785	Corn.....	6, 267
Livestock, Jan. 1:		Wheat.....	2, 468
Cattle or calves.....	12, 450	Machinery, May 1, 1948:	
Cattle on feed.....	1, 239	Tractors.....	² 7, 936
Hogs or pigs.....	9, 380	Tractor-drawn moldboard plows.....	² 5, 200
Sheep or lambs.....	1, 227	Mowers, power or other.....	² 6, 092
Horses or mules.....	9, 832	Grain binders, power or other.....	² 2, 050
Chickens.....	13, 330	Grain drills.....	² 3, 181
Turkeys.....	688	Side delivery rakes.....	² 1, 803
Tractors, Jan. 1.....	² 6, 462	Combines.....	² 1, 230
Stocks on farms Jan. 1:		Corn pickers.....	² 677
Corn.....	8, 666	Manure spreaders.....	² 2, 803
Oats.....	4, 560	Milking machines.....	1, 454
Wheat.....	2, 043	Motortrucks.....	² 4, 625
Soybeans.....	738	Trailers.....	² 3, 967
Stocks on or off farms, Jan. 1:		Power line electricity, May 1, 1948.....	7, 690
Potatoes.....	4, 200	Purchases of farm machinery in 1947.....	² 6, 997
Barley.....	600	Purchases of farm machinery involving credit.....	² 1, 067
Rye.....	152	Operators reporting sickness, January—	
Farm expenses and family living expenses (obtained on long schedule only).....	4, 465	April 1948.....	2, 540
April 1948 survey:		Fire damage in 1947.....	325
Usable schedules.....	11, 541	New houses started or completed in 1947.....	505
Accidents, January–April 1948.....	604	Houses repaired or remodelled in 1947.....	2, 870
deducted from others.....	4, 511		

¹ Includes duplicated cards added in 1947 survey to take account of subsampling and low interview rates in some areas. Counts for some items are approximate.

² Number of units of the item specified rather than number of farms reporting it.

Subject-Matter Evaluation

The appraisals made by the subject-matter analysts revealed that they were not always fully aware of the limitations of the samples, and that they were sometimes disappointed in the number of farms in the samples that gave pertinent information about any particular item of inquiry. Of course, a sample of 15,000 farms does not give 15,000 cases contributing positive information for every subject-matter field. Apart from a few characteristics that nearly all farms have—such as acreage and population—only a fraction of the sample farms contribute positive information. Table 3 shows the number of farms having something to report in various subject-matter fields in the 1947 and 1948 surveys. These numbers determine largely the amount of sampling error and

hence the amount of detail to be derived in the analysis of results. Sampling errors are roughly predictable if there is knowledge of the distribution and variability of the item surveyed.

Two factors have prevented adequate appraisal of probable sampling errors in advance of the surveys: (1) The previously discussed delay in preparation of tabulation plans showing what is wanted from the surveys, and (2) the fact that, once the decision to make a survey has been reached, the sampling technicians, like the directors of field operations, must put all possible effort into getting their material ready for the field.

Those analysts who kept in close touch with the operations of editing and coding say that questionnaires were carefully filled out so far as could

be judged. Variations between different interviewers' interpretations of the questions were reported in very few subject-matter fields. Some questions were hard for respondents to answer, because they required the recall of forgotten events, or because concepts were somewhat vague in relation to unanticipated situations. In a few instances, questions that were important to the analysis were omitted from the questionnaire either through oversight or because, in the pressure of clearing the final draft of the questionnaire, certain changes did not come to the attention of all those concerned.

Some analysts believed that limiting the questionnaire to fewer subjects with more intensive coverage of these subjects would be desirable. This was particularly true of "one-time" subjects, where a well-rounded analysis required the description of various aspects of the questions under investigation. On the other hand, those analysts who dealt with standard-type question, where the surveys were used to bring existing series up to date, sometimes felt that the inclusion of lengthy one-time studies reduced the effectiveness of the surveys in getting results on the more standard items.

Accidents Among Farm People

Information on the accidents suffered by farm people was obtained in a September 1948 survey as well as in both the January 1947 and the April 1948 surveys—each covering a different part of the year. Thus, it was possible to obtain for the first time an over-all picture of the accident hazards and the losses due to accidents among farm people. Results of the first two surveys were published separately in May 1947 and November 1948, and annual totals from the three surveys combined were published in the "Farm Safety Review" for May-June 1949. The latter includes a frequency distribution of about 70 different kinds of accidents. Frequencies are also shown by age and sex of injured, place of accident, activity when injured, and the seasonal distribution of accidents of each type. Information on the severity of the different types of accidents, in terms of the time lost and medical costs, is included. Some results are available for the United States only; others for four major regions.

In the three surveys combined, a total of about 2,000 accidents of all kinds were reported. This

means that information on accidents in any particular category is subject to fairly large sampling errors—often 10 to 20 percent of the indication. In the almost complete absence of benchmarks on the frequency and composition of farm accidents, however, even data with such large errors provide usable information as they fill a gap in the available data on accidents for various segments of the population. Results of the surveys were widely distributed for use in the publicity for the 1949 Farm Safety Week, through the cooperation of the National Safety Council. A summary of the results was also published in the *Agricultural Situation* for June 1949 issued by the Bureau of Agricultural Economics, and the usefulness of the 2,000 accident narratives apparently has not yet been exhausted, in pointing up particular accident hazards, as those occurring at certain seasons or to particular age groups.

In addition to the sampling errors, memory bias affected the accident data obtained in the surveys. Respondents were asked to report on all accidents that had caused the loss of one or more days of work and which occurred to persons living or working on the sample farms during the period immediately preceding the surveys. The period varied in the different surveys from 3 to 5 months. A study of the difference in numbers of accidents reported for the month immediately preceding the survey, as compared with earlier months, indicates that, after allowing for seasonal changes, there is an increasing memory bias for the more remote months; in fact, there may be a 40-percent shortage in the accidents recalled after a 5-month lapse. Presumably the less severe accidents and those occurring to persons other than the respondent (who is usually the farm operator) are more likely to be forgotten.

Then there are probably shortages due to what might be called definition or classification bias, arising from the difficulty of deciding in some cases whether the injured person lost a day "from regular activities." This would particularly affect the reports of minor accidents suffered by children and older people who are not taking active part in the farm work. This "twilight zone" of accidents limits the meaningfulness of statistics on the total numbers of accidents, since changes between statistics collected from different sources or at different times may merely reflect variations in the completeness of coverage of these minor accidents of

doubtful classification. This may partly account for the wide discrepancies between the annual total number of farm accidents, obtained from the BAE surveys, and those derived by the National Safety Council from other data. An expanded total number of 1948 accidents to farm people of 860,000 is given by the BAE surveys. Even if a 40-percent increase is allowed to correct for memory bias and shortages of farm identification, we get only 1,200,000. This is three-fourths of the estimate of 1,600,000 by the National Safety Council and in some categories, such as home accidents, the discrepancy is even greater. National Safety Council figures are based on the projection and inflation of total numbers of accidental deaths, which constitute only a minute fraction of all accidental injuries, to obtain estimated total numbers of accidents. Despite the large errors and biases in the BAE survey results, they are being studied by the National Safety Council with a view to improving the current estimating methods used by that agency. The surveys have also provided information that meets the principal purpose for which they were collected—that is, the proper focusing of farm-accident prevention work. This work is naturally directed toward the more serious accidents and depends chiefly on knowing what they are and their relative importance, rather than the absolute numbers of each kind occurring.

Farm Acreage, Tenure, and Land Values

Information on acreage and tenure was obtained in both the 1947 and the 1948 surveys primarily to provide a description of trends in tenure, land in farms, and farm land under lease, which would bring these economic series up to date. Questions were asked in a way that would give results comparable to information obtained on these subjects in the quinquennial censuses of agriculture. In addition, the 1947 survey contained three questions on the probable selling price of the land owned or rented by the operator.

The 1948 questionnaire included a section on tenure practices that was designed to supply information needed to revise the BAE series on net rent from agriculture paid to farm and nonfarm landlords. This series is used in the annual computation of the parity income ratio showing the relation between per capita income of farm people from farming and per capita income of nonfarm

people. Many of the components entering the net-rent series have not been revised since they were originally obtained in a special sample survey of 1935. To bring these components up to date the survey section on tenure practices obtained data on rental shares of various crops commonly paid to landlords, the amount of cash rent paid in addition to the crop share, and division of certain operating expenses between landlord and tenant.

Each survey included a few questions on partnerships, and on the lease of Taylor Grazing and National Forest land.

The underenumeration of farms in the 1947 survey limited the usefulness of the information on acreage and tenure more seriously than was the case in regard to other subject-matter fields. The correction for underenumeration in other fields was often made under the assumption that no change had occurred in the distribution of farms between broad size groups since the 1945 census. Such an estimating method, of course, ruled out the possibility of using the survey to measure change in the size of farms, or total land in farms, since 1945. Thus the usable results on acreage and tenure from the 1947 survey were limited to those phenomena which were not seriously affected by underenumeration. These were the percentage distribution of farms between tenure groups, the percentage of farm land under lease, the percentage of operators renting land to others, and the extent to which veterans of World War II were operating farms under various tenure arrangements. These results were reported briefly in the *Agricultural Situation* for May 1948.

Results obtained from the 1947 survey on the value of farm property and on total cash rent paid were not usable. For the United States as a whole the survey obtained a total value figure that was 24 percent above the March 1, 1947, official BAE estimate, and an average value per acre that was 33 percent above the official estimate. Official estimates are derived by applying the percentage change in the BAE index of land values to the 1945 census values. Part of the discrepancy between the survey and the official estimates is probably due to the wording of the questionnaire. The BAE survey asked "How much would the part of this farm (that you own or rent) *sell for?*" In contrast, the census schedule used the term "value," and the schedule to crop reporters, which provides the basis for the BAE index, uses the term "aver-

age value." It seems probable that farmers would report the "selling price" higher than they would report "value," particularly in 1947 when land prices were advancing rapidly.

The survey results on total cash rent paid for rented lands gave an aggregate for the United States that was only half as large as the estimate used in the BAE cash-rent series. Most of this discrepancy resulted from an underestimate of acreage rented, as the survey results on cash paid per acre were in general agreement with the rent series.

The April 1948 survey data did not suffer from underenumeration and so they provided a much better basis for meeting the objective of measuring trends that have taken place since the previous census. Rather small changes occur from year to year, but the survey gave sufficiently accurate results to describe changes over the 3-year interval 1945-48, for nine geographic divisions and the United States. Results, published in the July 1949 issue of this journal, include the percentage of farms operated by full owners, by part owners, and by tenants. The percentage of croppers is shown only for the South as a whole, and of managers, only for the United States. The percentage of land under lease, and the average size of the farms in each tenure class, are shown on the basis of nine geographic divisions. As only 590 partnerships were reported in the survey, it was possible to publish only four-region results on the percentage of farms operated by partnerships, and the kind of kinships involved.

Information on the moving dates for tenants, obtained in the 1948 survey, is being prepared for release. Data on tenure practices from that survey have not yet been fully analyzed but a preliminary study of the results suggests that the survey will provide a check on the information now used concerning the shares of specified crops paid as rent by tenants and part-owners. Another phase of the net-rent series for which the survey results appear to be serviceably accurate is the residence of landlord (on or off farm) by method of renting. Survey information on the division of expenses between landlord and tenant have not yet been analyzed.

The survey information on land leased under the Taylor Grazing Act and in the national forests is being studied in connection with the land use inventory project. A preliminary review of results indicates that difficulties of definition were

presented by the various arrangements, such as permit and allotment systems, under which the public land is used. In States that have fairly large contiguous areas of public land, most of this land is handled through grazing districts under such systems rather than by leases to single operators. This limits the usefulness of data on "public land leased." Another limitation is found in the large sampling errors that occurred in the Mountain States region, where less than one-tenth of all counties are included in the sample, in contrast with other regions that have about one-fourth represented. (This sample distribution was used to allocate survey travel funds in a way that would give optimum results for the various items in the survey, many of which are of lesser importance in this region.)

Farm Population

Information on the age and sex composition of the farm population was obtained in both the 1947 and the 1948 surveys. Data from the 1948 survey have not yet been analyzed. Results from the 1947 survey were used to improve the estimates of 1947 farm population for the nine geographic divisions. For noncensus years before 1944, such estimates were based on results of mailed inquiries. Since 1944 the estimates for major geographic divisions have been adjusted to a United States level developed cooperatively by the Bureau of Agricultural Economics and the Bureau of the Census, using data from enumerative surveys of the latter agency. The January 1947 survey was not used to obtain a United States farm population figure because uncertainties in expansion factors due to underenumeration made it doubtful that the survey could give a better result than the official estimate adopted by the joint Census-BAE Committee on Farm Population. The latter estimate was between the two survey indications that were obtained by expanding the sample with and without adjustment for underenumeration. For the nine geographic divisions, estimates of farm population were derived from the survey by a method that allowed for differences in underenumeration between regions and that made the regional totals add to the official United States estimate. Data on births and deaths, and numbers of persons moving to and from farms, obtained from other sources

and published in August 1947, were adjusted to the totals of farm population for major geographic divisions obtained from the BAE 1947 enumerative survey.

In three States that have large samples (New York, North Carolina, and Texas) State estimates of the farm population were developed from the survey. Results for North Carolina and Texas, worked out in cooperation with the State experiment stations, were published by the stations.

The details of age and sex asked regarding members of farm operators' households are being used in an analysis of the relationships of family size and birth rates among farm women to the size and type of farm lived on. This is an extension of fertility analyses made possible by the sample data on population from the 1945 Census of Agriculture. A comparison of the 1947 BAE survey results with the 1945 census data, the only source of similar information, indicates that regional results are satisfactory.

An analysis of the age and sex composition of the total farm population and population in operators' households is being made and related materials on size of households and connection of the nonoperators' households with the farm are under analysis.

An additional valuable use of data on farm population obtained in the survey is in connection with planning the 1950 Census of Agriculture and Population. The data obtained from the special questions asked on this survey, along with similar types of data obtained in sample surveys of the Census Bureau, have been used to throw light on the kinds of households that would be included under alternative definitions of the farm population. Partly as a result of such experimental work, the farm population definitions to be used in the 1950 census will be changed so as to exclude certain types of households that have no connection with agriculture but that are included in the current estimates of farm population.

Farm Employment and Wages

Data collected in the 1947 and 1948 surveys in the fields of farm employment and wages represent a continuation of the new approach initiated by the Bureau of Agricultural Economics in a program of enumerative farm wage surveys begun in 1945. The 1947 and 1948 surveys are the fifth

and sixth of such national interview surveys undertaken by the Bureau insofar as farm labor and wage data are concerned.

The regular series of farm wage rates published quarterly by the BAE have been based on mailed reports from farmers on average wage rates paid to hired farm workers in their communities. The data from the interview surveys differ in that farmers were asked to report for each individual worker in their employ during the week of the survey. Rates of individual workers are undoubtedly easier for farmers to report than averages for all rates paid in a community and lend themselves to more exact statistical treatment.

In addition to questions regarding the cash wages paid to each hired worker, the farmers were also asked about perquisites furnished and about custom work. This is in contrast to the questions regarding wage rates previously asked, in which farmers had to fit their answers to a specified framework of four wage rates: per month with board, per month without board, per day with board, and per day without board.

The interview surveys obtained completely new information on earnings, time worked, duration of employment, worker characteristics, and man-days of hired labor used. The new questions made possible the computation of averages and frequency distributions of weekly, daily, and hourly earnings, days worked per week, and hours worked per day and per week. None of this information was available before the interview surveys were started. Results obtained from the 1947 survey have been published in the BAE series, "Surveys of Wages and Wage Rates in Agriculture," as Report No. 21 issued in September 1948. Data regarding numbers of hired workers, earnings, and hours worked are presented for the United States and for a seven-region break, by selected farm and worker characteristics. The publication also contains tables showing average rates for the predominating methods of payment. It is planned to publish the results of the April 1948 survey in Report No. 22 in the wage series, along with material from the survey of September 1948. Questions on bonuses and hold-backs asked only in the January survey have been analyzed, but no official report is contemplated.

Results of the January 1947 and earlier interview surveys led to the revision of the BAE series on wage rates and employment and to changes in

the type of information collected on the general schedule for these series. Analysis of the data from the interview surveys showed that the old BAE series of four types of wage rates were obsolete as they did not cover some important types of wage rates. Therefore, the BAE began publishing, in 1949, a group of nine wage rates in place of the four types used previously. The new questions on wage rates on the general schedule were regionalized so that information on the major types of wage rates in use in each part of the country could be collected. Changes were made in the questions to give sharper definitions of what was wanted.

The interview survey data of 1947 and earlier years have provided a basis for converting each type of wage rate collected on the general schedule to hourly cash equivalents. The hourly composite wage rate in the new series has thus become a meaningful statistic in that it is a measure of hourly cash earnings of all hired farm workers.

A check on the new methods of currently estimating wage rates which resulted from analysis of the January 1947 and earlier enumerative surveys, is provided by the April and September 1948 enumerative surveys. When data from these surveys were analyzed it was found that they gave results for the United States composite of hourly earnings for May 1 and October 1 which were within 1 cent of figures currently published for those dates.

Revised estimates of farm employment back through 1944, based on the interview surveys, were released in the January 1949 issue of "Farm Labor," and are being issued currently. The revised estimates of farm employment, based on the interview surveys of 1947, 1948, and earlier years, differ from the old series partly because of changes in concept. The new series also shows a difference in seasonal pattern which corrects the understatement of seasonal change inherent in the old series based on mailed-survey data.

In preparing estimates of numbers of hired workers from the 1947 and 1948 surveys, the straight expansion of the sample was used without adjustment for the underenumeration in 1947. Farms missed in the identification of sample farms were assumed to have no hired labor. As with tractors, this assumption led to more reasonable results than the higher estimates to be obtained under other assumptions. Wage rates are little affected by methods of expansion and they

were computed from the same expansion methods as hired workers. But family workers, like farm population, could not safely be assumed to be nonexistent on the unidentified farms.

The family worker data from the 1947 survey were therefore expanded by 1945 census numbers of farms in each of three size groups. Analysis of 1948 family-worker data and of wages by type-of-farming area and type of work have been deferred indefinitely.

Less than a fifth of the sample farms have hired workers in selected weeks (table 3). Thus the degree of detail to be obtained in estimates of hired workers is limited. In a few instances in which extremely large hiring farms fell in the sample, expanded results were so excessive that these extreme reports were omitted. As family workers (defined to include the operator) are found on nearly all farms and show a small range from farm to farm, they offer no such problems.

So far as could be ascertained, no response biases were present in the data, and interviewers appeared to have no difficulty in interpreting the questions and obtaining the data on wages, employment, and hours worked during the week.

Livestock Numbers

Three pages of the January 1947 survey questionnaire were devoted to 40 questions on livestock, chiefly January 1 inventory numbers. Most of the questions are identical with the questions asked in the annual Rural Carrier Livestock and Poultry Survey, which is the basis for current official estimates. In addition to the inventory data, information was obtained on the number of sows farrowed and pigs saved in the fall of 1946, and the numbers of sows intended to farrow in the spring of 1947. Three new questions were included on the breeding of cows, intended to separate the calf crop into that coming primarily from cows and heifers 2 years old and older of (1) strictly dairy breeding, (2) dual-purpose breeding or dairy cows bred to beef bulls, and (3) strictly beef breeding.

The information on livestock was intended partly to provide the opening inventory which, together with a projected survey planned for January 1948, would have been used in the opening-closing inventory approach to farm income. The latter survey was not made. Another purpose of

TABLE 4.—*Comparison of indications from the January 1947 interview survey with official estimates, United States*

Item	Unit	Official estimate	Survey indication	
			Census level adjusted for farm size	Sample level unadjusted
		(1)	(2)	(3)
January 1:				
All cattle.....	Thousand.....	81, 207	84, 232	80, 211
Cattle on feed.....	do.....	4, 307	¹ 7, 643	6, 929
All hogs.....	do.....	56, 921	56, 711	53, 806
Sows farrowed fall 1946.....	do.....	4, 713	4, 468	4, 299
Pigs per litter fall 1946.....	Number.....	6. 48	6. 02	6. 02
Sows intentions to farrow spring 1947.....	Thousand.....	8, 626	9, 574	9, 231
January 1:				
All sheep and lambs.....	do.....	37, 818	41, 837	38, 031
Horses and mules.....	do.....	10, 021	10, 992	10, 400
All chickens.....	Million.....	² 474	694	626
Hens and pullets.....	do.....	436	¹ 453	407
Turkeys.....	Thousand.....	6, 650	¹ 5, 842	5, 229

¹ Census level without adjustment for farm size.

² Excludes commercial broilers.

the livestock questions was to provide checks on existing series. In relation to this objective, the results have been generally inconclusive chiefly because of the wide margin of possible errors in the survey estimates due to underenumeration and sampling errors and in some cases because of the lack of comparability of definitions.

The survey indications for various livestock items are compared with official estimates in table 4. Column 2 shows the indications from the survey, based on an expansion to the number of farms shown in the census of 1945, weighted by farm size to correct for the underenumeration of small farms. This is the method of expansion recommended by sampling experts as giving best results for the 1947 survey. As these results are generally above the official estimates, a question arises as to how much error is introduced by the expansion methods used to correct for underenumeration in the survey. The survey indications in column 3 show the results that would have been obtained if no corrections were made for underenumeration (that is, on the assumption that the farms in the sample segments which were not identified by interviewers, had none of the items in question). These would represent the absolute minimum figures that could be derived from the survey. They are generally 5 to 10 percent lower than the recommended indications from the survey.

The official estimates of all cattle and of all hogs on farms January 1 fall within the range of the two survey indications plus a small allowance for sampling error. For the four major regions the departure of the recommended survey indication from the official estimate of cattle numbers, ranges from a difference of less than 1 percent in the South, to an excess of 13 percent in the Northeast. The recommended survey indication for all hogs in the important North Central region is 4 percent below the official estimate—a difference probably within the range of sampling plus expansion errors in the survey. The large discrepancy in numbers of turkeys is undoubtedly due to sampling error, as less than 700 of the 15,000 sample farms reported turkeys.

The large discrepancy in cattle on feed is attributed to difficulties of definition. The survey questionnaire used only two questions on marketing intentions to supplement the question on number of cattle on feed. In the preparation of official estimates of cattle on feed, the reporters are asked about the classification, length of time on feed, weight of animals, and composition of the feeding ration, in order to provide a basis for checking on whether the cattle reported as "on feed for market" should be included in the official estimate. Officially, cattle on feed for market are described as cattle and calves being fed fattening rations of

grain, concentrates, hay and roughage, to prepare them for immediate market as slaughter animals. Such animals are expected to produce carcasses of Commercial Grade, or better. The official definition thus includes cattle being fattened for market as a more-or-less distinct agricultural enterprise and excludes small operations incidental to dairying and general farming. The interview survey, processed by large-scale coding and tabulating methods, was unable to cut this continuum at the same place at which the official definition presumably cuts it. In view of the concentrated geographical distribution of this item and the complexities of definition, it is not believed to be adaptable to a general-purpose survey.

For sheep and lambs and for horses and mules, the official estimates are about 10 percent below the recommended survey indications, and they are even slightly below the rock-bottom unadjusted sample indications. These results are consistent by regions, with one exception, and they remain unexplained, for most of the biases and other errors expected in the surveys would lead to shortages rather than excesses.

The survey number of sows reported as having farrowed in the fall of 1946 was 5 percent less than official estimates for the United States, and for the North Central region it was 11 percent less. Since "fall sows" include those farrowed from June 1 to December 1, memory bias may be responsible for shortages. The survey number of pigs per litter is 7 percent below the official estimate. Sampling error for a biological characteristic such as this is very small. The discrepancy reflects the fact that progressively smaller estimates of pigs per litter are obtained as the survey timing moves away from the pig crop in question, with an increasing disappearance intervening. Intentions for spring farrowings were reported considerably above the number of sows that actually farrowed the following spring. If used as a forecast rather than as a measure of intentions, results would have to be interpreted in a regression analysis, taking account of those factors that later influence a report on breeding intentions, such as death losses and marketing of bred sows and gilts.

The large departure in the survey indication of chickens compared with official estimates results from an incomparability of definition. The survey questions presumably include commercial broilers for no attempt was made to exclude them.

They are not included in census base data and are also excluded from official estimates by selective mailing and by means of an editing rule that eliminates reports showing large numbers of young chickens on farms having few layers. For the subgroup, hens and pullets, which should be unaffected by difficulties of classification, the survey shows 4 percent more than the official estimate.

The new questions on the breeding of cows were hard for many farmers to answer. Results of a mailed questionnaire sent to respondents later showed that many milk cows were reported in June that were not classified in January as either of dairy or of dual-purpose breeding.

Official estimates of livestock numbers are currently based on year-to-year changes shown by the rural carrier survey, which are applied to a benchmark based on census and other data. Some of the uncertainties of the census of agriculture as a bench-mark for livestock have been indicated by C. L. Harlan.⁴ His report shows that considerable adjustment of census data was necessary before they could be used as a bench-mark. For example, to adjust for incompleteness, disappearance between January 1 and the average date of enumeration, and for other enumeration errors, the enumerated numbers of horses, mules, and cattle, were increased 3 or 4 percent for the United States, sheep 13 percent, and hogs 27 percent.

The April 1948 survey of BAE obtained data on livestock that are expected to be subject to much smaller errors of expansion than were the data from the 1947 survey (since underenumeration was negligible). These data have not yet been analyzed.

Machinery Numbers

The January 1947 survey included a short section on farm tractors. It asked the number of tractors on the farm; and for each tractor it asked the make, year of manufacture, model, and rear-wheel mounting (whether rubber or steel). Results were published in an 8-page mimeographed release of the Bureau in May 1948 titled "Farm Tractors—Type, Size, Age, and Traction." This shows the total number of tractors on farms Jan-

⁴ HARLAN, C. L. THE 1945 CENSUS ENUMERATION OF LIVESTOCK ON FARMS. *Jour. Farm Econ.*, V. 29, No. 3, August 1947.

uary 1, 1947, and the distribution by type for the United States and an eight-region break. For wheel-type tractors, results for each region are classified by age, horsepower, and rear-wheel mounting. Crawler tractors, which accounted for only about 4 percent of the 1947 tractors, were classified by age and horsepower but results were presented only for the United States as a whole.

In preparing estimates of tractor numbers from the survey, it was found that the straight expansion of the sample without adjustment for underenumeration gave more reasonable results than if an upward adjustment were made. This straight expansion or minimum estimate to be derived from the survey, gave a result that was 4 percent above the preliminary BAE estimate which was based on census bench-mark data projected on the basis of sales information available at the time. As there was reason to believe the preliminary BAE estimate was low, it was revised to the number indicated by the survey.

About 6,500 tractors were reported on the sample farms. This gave an adequate sample for distributions by type, age, size, and traction, in most cases. However, the distribution between regions was modified on the basis of estimates previously developed by means of census trends. Results for garden and crawler tractors, when estimated by a straight expansion of the sample, were far too low in the light of available check data. These types, each constituting only about 4 percent of all tractors, are subject to large sampling errors, particularly the crawler tractors which are heavily concentrated in certain areas. Discrepancies for these two types were even greater than could be accounted for by sampling error; they have not been fully explained. Some respondents may have had difficulty in reporting the model numbers of tractors which were used in classification of types. For garden tractors there is some uncertainty in the check data because of lack of information as to how many of the manufactured garden tractors are sold to farmers.

In view of these difficulties, another estimating method was used for arriving at the total number of garden and crawler tractors. This method was roughly equivalent to using the sample age distribution for each of these types to estimate the increase in tractors since 1945, and combining this with 1945 census data to get a figure for January 1947. This gave results which seemed to farm-

machinery experts to be reasonable, and they were published in the May 1948 report. A delay of several months in the publication of results regarding tractors from the January 1947 survey was occasioned by the discrepancies between official estimates and survey results.

The distributions for wheel tractors by age, size, and traction, were found to be reasonable and were published as indicated by the survey. These wheel tractors (exclusive of garden and home-made types) made up about 88 percent of all tractors in 1947.

The 1948 survey included two pages of questions on farm power and machinery. For tractors, information was similar to that obtained in 1947, supplemented by a number of questions on the utilization of tractors. Inventory questions covered nine other kinds of machines, and there were two questions on farm electrification.

Some results of this survey were published by the Bureau in a release of March 1949 titled "Farm Machinery." This included estimates of numbers of tractors and of other farm machines as of May 1, 1948. For tractors, tractor-drawn moldboard plows, and mowers, the sample was adequate to permit publication of State results in 14 States in addition to regional and United States totals. For the remaining machines, which are found on only a small fraction of all farms, results were published in less geographic detail. In addition to estimated numbers of tractors, percentage distributions by age and size were published.

The estimates for the United States prepared by a straight expansion of the April 1948 survey appeared to be reasonable for all items except corn pickers and combines. Some modifications were also made in the tractor distributions for 1948, similar to those for 1947. For corn pickers and combines, the adopted United States total numbers were based on 1945 Agriculture Census data and *Facts for Industry* reports of the Bureau of the Census. The published estimates were about 15 to 20 percent below the straight expansion of the sample. These differences are outside the range of expected sampling error and no explanation has been found, although a careful check was made of the schedules, and of coding and editing. This is one of those cases, occurring from time to time, in which the answer could probably be found only by a field recheck in selected areas, made reasonably soon after the survey.

Information on the utilization of tractors will be used in connection with a study of the use of liquid fuels on farms. Data on tractor use on farms that report no ownership of tractors will be reported, probably in a short article in *The Agricultural Situation*. The survey data on hours of tractor use were found to be too high, according to other known facts. Scrutiny of the schedules suggests that this may be due to the questionnaire wording, which asked for the number of days of use and the average hours per day when working. Some farmers apparently reported the number of days on which any work was done, but the average hours when the tractor was used a full day.

The omission of proposed questions on numbers of horses and mules and extent of their use prevented analysis of some phases of major interest in connection with farm power and machinery.

Part of the information on electrification was used to compute the percentage of farms electrified by States and regions. These results were furnished to the Rural Electrification Administration for consideration along with other data from their own sources, in preparing official estimates of the numbers of farms electrified as of June 30, 1948. The remaining information will aid in special studies of electrification being made under RMA authority.

Crop Stocks and Production

In line with the intention to use the January 1947 survey in conjunction with a survey then proposed for January 1948, for obtaining the opening and closing inventories, information was asked regarding the stocks of various crops on hand January 1. For each of 12 crops, a 3-way break in stocks was obtained: stocks on the farm owned by the operator, stocks on the farm owned by the landlord, and operator's stocks elsewhere. This was intended to permit summarization on an ownership basis or on a position basis (on or off farms). Single-entry spaces were provided for recording the operator's stocks of other crops. With the later cancellation of plans to obtain the closing inventory much of this data lost its relevance. However, expanded indications were prepared for five of the more frequent items—stocks of corn, wheat, oats, soybeans, and potatoes.

Only a brief examination of the end results in comparison with official estimates has been possible.

The expanded indications of the survey for the United States, expressed as percentages of the official estimates, were as follows.

<i>January 1947 expanded survey indication as percentage of official U. S. estimate</i>	
Item	
Corn stocks, Jan. 1, 1947	95
Wheat stocks, Jan. 1, 1947	60
Oats stocks, Jan. 1, 1947	82
Soy bean stocks, Jan. 1, 1947	68
Potato stocks, Jan. 1, 1947	¹ 110

¹ Based on official estimate adjusted for comparability.

The survey was expanded by census numbers of farms by size groups to take account of under-enumeration. Differences between survey indications and official estimates for corn and potato stocks are within the range of sampling plus expansion errors. Potato stocks have a large sampling variability because of a few farms having extremely large holdings. For this comparison the official estimate of "merchantable potato stocks held by growers or local dealers in or near the area where produced" was increased about 25 percent to obtain an indication of the probable stocks of all potatoes held by growers.

Survey indications of stocks of wheat, oats, and soybeans are below official estimates by quantities too great to be attributed to sampling or expansion errors. Official estimates are based on inquiries mailed to crop reporters and there are no reliable check data against which to evaluate the differences found.

The April 1948 survey obtained information on the 1947 production of corn, wheat, and hay; stocks of these crops still on hand at the time of the survey; and the quantity of wheat fed or to be fed to livestock from July 1, 1947, to July 1, 1948. As with the earlier survey, only a cursory examination of results has been made. The straight expansion of the sample compares as follows with official United States estimates.

<i>April 1948 expanded survey indication as percentage of official U. S. estimate</i>	
Item	
Corn produced in 1947 ¹	105
Wheat produced in 1947	87
Hay produced in 1947	103
Corn stocks, Apr. 1, 1948	90
Wheat stocks, Apr. 1, 1948	76
Hay stocks, May 1, 1948	125

¹ Comparison is with the official estimate of corn for grain.

As in the 1947 survey, results on corn check more closely with official estimates than do results for other crops. The other items are outside the range of sampling error and only rough speculations about possible reasons can be made. The straight expansion of the sample undoubtedly gives too low an estimate of wheat production. Part of this shortage is explained by a sampling error arising from the small number of sample counties in the wheat-producing areas. An estimating method, that takes account of the fact that sample counties were smaller than average in wheat production (based on 1945 census data), gives an indication which is 92 percent (instead of 87 percent) of the official estimate. There is also evidence that interviewers were not able to interview the operators of some large absentee-owned wheat farms in the North Central region. Some share renters may have failed to report the landlord's share.

Stocks of corn and wheat may have been reported incompletely in the interview survey. In the questionnaire the questions are prefaced by a discussion of sales and storage which might have caused some farmers to overlook those stocks held on the farm for farm use. On the other hand, official estimates of stocks have no bench-mark information to tie in with. Certain editing practices, such as the exclusion of reports that are blank for either stocks or production, may lead to too high a ratio of stocks to production, and therefore to an overestimate of stocks.

Figures for the production of hay show little bias at the United States level, but for an important block of States for which there are State assessors' enumerations the survey shows 8 percent more production than is shown in the official estimates. It is possible that in some parts of this area, where livestock is the main ranch business, operators may consider the small farming too inconsequential to report to the assessor or to the Federal census enumerator, thus making the official estimate low.

The survey information on wheat fed to livestock was obtained as an indication of the part of the wheat crop that is utilized in this way. Such information is not available elsewhere. Official estimates show the disposition of wheat from the viewpoint of the farms where it is produced. Thus the wheat fed to livestock is partly covered in the category "wheat fed on farms where produced"; another part is in the "wheat sold" category. An

official estimate of all wheat fed to livestock is obtained by using the residual left after allowance for milling, seed, exports, and industrial uses, but such an estimate is, of course, subject to considerable error and overestimates wheat fed to livestock because it attributes all waste to the "fed to livestock" residual. For the 1947 crop, the latter estimate was 182 million bushels or nearly twice the official estimate of wheat fed on farms where produced. The survey indication, when computed to take account of the fact that sample counties were below average in wheat production, was about halfway between these two official estimates. There is no way of evaluating its accuracy.

No results will be published from the survey data on crop stocks and production.

Crop Acreage

In the 1948 survey, farmers were asked their acreage of 15 crops. These figures were obtained for use in a study of variability to be used in planning for sample agricultural census work. This is a long-range interest and no tabulations have yet been prepared.

Farm Income and Farm Expenses

The most difficult part of the 1947 questionnaire to fill out was the 15 pages of questions on farm income, farm expenses, family living expenses, and nonfarm income, which attempted to cover all transactions of the previous calendar year in these fields. The questions on farm operator's and landlord's farm cash receipts were asked on all sample farms. Those on farm expenses, family living expenses, and nonfarm income of members of the operator's household, were asked of only a subsample of about one-fourth of the sample farmers. This survey is the only source of information on individual farms available on these subjects for 1946.

Data on farm income and farm expenses were analyzed by the Division of Statistical and Historical Research. Those on family living expenses, discussed in the next section, were analyzed by the Division of Farm Population and Rural Life. Information on nonfarm income was obtained primarily for use by the Census Bureau, and will not be included in this article.

The information on farm income and farm expenses will be used in two ways. First, estimates of aggregate farm cash receipts and expenses have

been made for those items from the survey which can be compared with regular BAE estimates. The survey estimates will be used to improve the official estimates where the latter are based on sketchy or out-of-date material.

The second use of the farm income and expense data has been in the construction of the size distribution of farm operators' income in 1946. The data were used to construct size distributions of farm operators' gross cash farm income and net cash farm income. They were also used in conjunction with data from the schedule section on nonfarm cash income to obtain the distribution of total net cash income. Materials from other sources were used to indicate the distribution of nonmoney income from housing and from farm products consumed on the farm, to obtain the distribution of total income. A preliminary and restricted report containing these distributions for the United States was prepared for the annual meeting of the Conference on Research in Income and Wealth, in April 1949. A final report showing distributions for the United States is planned for publication by the BAE.

Data were expanded to the level of the census number of farms by three farm size groups to take account of the underenumeration of small farms. Data on income were expanded separately by eight tenure groups, but only two tenure groups were used in expanding the smaller sample of schedules regarding expenses.

This survey, like others in the past, was subject to limitations which are characteristic of surveys that collect data on income. Receipts were generally understated, partly because of the operators' inability to remember all of the many transactions of the farm enterprise and partly because of reluctance to give information on income.

These biases operate with greater force on the reporting of farm operators' income than on the reporting by most other occupational groups. Table 5 shows the comparison of survey results with official estimates for farm income, expenses, and net income. Slightly less than half of the estimated net cash farm income received by farmers was accounted for in the survey, even after the upward adjustment for census number of farms. This is not an unusual result from farm-income surveys. Nevertheless, it raises serious questions as to the reliability of the size distributions finally computed from the survey.

TABLE 5.—*Comparison of 1947 survey results with official estimates for gross cash farm income, production expenses, and net cash farm income, by regions, 1946*

Region	Survey estimate as percentage of BAE official estimate		
	Gross cash farm income	Production expenses	Net cash farm income
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Northeast.....	74	89	38
North Central.....	75	96	53
South.....	70	90	45
West.....	71	87	49
United States.....	72	91	49

The table shows that expanded survey indications of gross cash farm income and of production expenses were substantially below the official estimates. There is considerable consistency by regions in the percentage of the BAE estimate of gross cash farm income which was found by the survey. There is also considerable consistency in the percentage of production expenses reported. The latter apparently were reported much more fully than were the gross receipts from farming. The distribution of gross cash farm income is roughly comparable to the distribution of the value of sales reported in the 1945 Census of Agriculture, after allowance is made for the higher level of income in 1946 and for differences in definition of income. It should be mentioned that the census of agriculture, which was based on reports from all farmers, also understated the value of sales by approximately the same proportion as the BAE survey.

Because of the large amount of income missing, an attempt was made to show what the distribution might be if the income had been reported fully. Data from other sources indicated that the relationship between average gross cash farm income and average production expenses at the several income levels could best be represented as a linear relationship. In adjusting the distribution of gross cash farm income to the BAE aggregate, this relationship was used as a guide. The resulting adjusted distribution was used as the base for building the adjusted distributions for

net cash farm income, total net cash income, and total net income, which were obtained chiefly by means of a series of cross tabulations and relationships derived from other sources.

On the basis of the adjustments described above, it was noted that most of the income missing from the survey distribution apparently occurred in the higher income groups. The evidence appears to support such an adjustment but it is not conclusive. We have not yet devised a means of overcoming the biases in the reporting of income by farm operators. Hence the estimates are not of the precision which would permit complete reliance on the results.

The major inadequacies in questionnaire content relate to the fact that the survey was restricted to the money income of farm operators. Results would have been much more useful if they could have included the nonmoney income from farming, such as the value of products produced and consumed in the farm home and the value of the change in inventory. The inclusion of these items could significantly change the distribution of income for farm families, as has been demonstrated in the preliminary report prepared for the Conference on Income and Wealth.

Family Living Expenses

Data on family living expenses, like those on farm expenses, were obtained on only a subsample of about 4,500 farms, in the 1947 survey. This information was obtained to be used, in conjunction with data from other parts of the schedule, in a comparative analysis of income tendencies of farm family living expenses, farm production expenses, and savings. Information on farm production expenses and on family living expenses were tabulated by gross-cash-income groups derived from another section of the schedule. This treatment is unique in that it brings together average expenditures for both farm family living and farm production, and then relates these two sets of data to the gross cash income of the farm family. The average net savings or loss can thus be calculated. These data have been analyzed by major regions.

Tabulations were also made of each item included in family living expenses showing average expenditures by gross cash income class. These data are being analyzed for tendencies in marginal expenditure and for income elasticities. Publication of both reports is planned.

There is little outside information available to use as a check on the accuracy of survey results on family living expenses. At the same time as the BAE study, a survey of income and expenses was made on a parallel sample of farms in Illinois, by the Bureau of Human Nutrition and Home Economics. A more detailed questionnaire was used. A comparative analysis of these data will be reported later. Preliminary results indicate that the shorter form of questionnaire break-down used by the BAE resulted in less complete reporting than that obtained in the BHNHE schedule. Family living expenses were apparently under-reported more seriously in the BAE survey than were farm production expenses, probably because of less detail being included in the schedule of family living items. The latter section of the schedule contained about 20 single-celled questions, while the former contained 43 questions requiring about 140 cells for answers. It is common experience in mailed inquiries on crops and livestock, that when a quantity is obtained by asking for several subgroups separately, a larger total is obtained than when a lump sum is asked for.

However, insofar as the solution of the problem of getting income and expense information depends on moving in the direction of still more detailed questionnaires than that used in the BAE 1947 survey, it becomes impracticable to try to get such information in multipurpose surveys of the kind here considered. The excessive burden that these sections of the schedule put upon interviewers and respondents undoubtedly detracted from the validity of all the other information obtained in this survey. Not only was the rate of interview adversely affected but our analysis shows that the number of farms *counted* in the sample segments was also reduced, with a consequent widening of the margin of uncertainty and error in expansion methods applying to all parts of the schedule.

Financing of Farm Machinery and Equipment

Data were obtained in the April 1948 survey on farmer purchases of new and used farm machinery and equipment during 1947 and on the amount, sources, and terms of the credit obtained by the farmers who made such purchases. Results are now available in a mimeographed report "Financing Farm Machinery and Equipment Purchases, 1947." This report contains an analysis of the

extent to which purchases were financed by credit, sources of credit, and kinds of credit arrangements. Results are reported separately for new and for used machinery purchases with comparisons between nine regions, by types of farm and by tenure.

The only check available on the accuracy of results from this section of the schedule is a single national estimate of the amount spent in new purchases of farm machinery and equipment. The latter figure is obtained by combining data from various sources such as census information on manufacturers' domestic shipments and wholesale prices, retail price data collected by BAE, and Commerce Department data on imports. The estimate of 2 billion dollars for 1947 purchases of new farm machinery arrived at in this way is nearly twice the survey indication. Publication of survey results was delayed several months in order to investigate this discrepancy. It was finally concluded that a major part of the difference was the result of the failure of the survey to define effectively "machinery and equipment" in a way comparable with the independent estimate. For example, parts and attachments, which account for about one-fourth of the 2-billion-dollar figure, were largely omitted by the survey. Stationary equipment, particularly of the types installed in buildings, was apparently often omitted. Moreover, memory errors arose because of the lapse of 4 to 16 months between the time when purchases were made and the time they were reported to interviewers. Survey interviewers were in the field around May 1, 1948; the questions concerned all purchases made in 1947. Smaller purchases, of course, were less likely to be recalled than large purchases. A break-down of the check data by types of machinery revealed that the expanded survey results probably covered 80 percent of the larger and more expensive machines, but not more than 50 percent of the smaller and less expensive machines. The analysis also brought to light some possible sources of error in the existing series on new machinery purchases.

It is believed that the information on methods of financing was satisfactory for those purchases reported in the survey. As credit is chiefly used for the larger purchases, the 1,000 or so cases of credit-financed purchases reported in the survey provided adequate data for the analysis of sources and terms of credit. To reduce possible distortion of results caused by the shortage of small

purchases, results on credit were reported separately by size of purchase.

Sickness of Operator

A single question in the April survey asked how many days the operator had been unable to work since January because of sickness. The survey found that farm operators averaged about 5 days of disabling illness for the 4-month period. Results were published in a two-page release of June 1949, showing the incidence of illness by States, age groups, and by the size of farm operated. The percentage of operators reporting sickness during the survey period varied from 15 percent to 31 percent, between States, with sampling errors of 2 to 4 percentage points for most of the States. No outside information is available to use in checking for biases but it is probably true that if all illnesses were remembered and fully reported results would show slightly more illness than indicated by the survey.

Fire Damage

The single question on the 1948 survey as to whether any property on the farm was damaged by fire in 1947 was asked to obtain a sample list from which more detailed information about fires on farms could be obtained. Each of the 325 farms that reported fires was mailed a questionnaire asking about the circumstances of the fire: the cause, the nature and extent of damage, insurance coverage, and availability of fire department equipment. Publication of results is planned.

Marketing Channels and Transportation Methods

Four of the 23 pages in the April questionnaire were devoted to information on the methods by which farmers move their products from the farms. There were four principal objectives:

(1) To learn approximately the extent to which farmers can be independent of for-hire truckers and buyers.

(2) To learn the approximate relative importance of farm-owned, buyers', and for-hire vehicles in moving farm products to the initial markets.

(3) To learn whether trade barriers had a direct impact upon farm-owned vehicles.

(4) To establish a bench-mark against which the direction of future trends in transportation methods can be appraised.

Two analytical reports of the survey findings transportation methods have been published and a third, more detailed, descriptive report is in preparation. General economic aspects were presented in the April 1949 issue of *AGRICULTURAL ECONOMICS RESEARCH*, which covered the extent of farm ownership of trucks and trailers, and the tonnage hauled by farmers compared with haulage by others. Results were shown for four major regions and by commodities. The leading data from a marketing standpoint were presented in the June 1949 *Marketing and Transportation Situation* issued by BAE. Results are shown for regions, by type and size of farm, and by commodities.

The basic data relied upon each farmer's memory for the volume of sales for the preceding year and the distribution of those sales between various means of transportation. Thus the data are subject to a considerable range of error. But as the purpose in asking most of the questions was to ascertain relationships rather than to establish totals, the principal results appear to be reasonably reliable, so far as can be judged. There is no objective basis for testing them, but discussions with commodity specialists indicate that results conform with their general knowledge of the marketing of the various products. An exception occurs in the case of those commodities where automobile haulage is widely prevalent, particularly poultry and eggs. After considerable debate during the planning of the questionnaire it was decided not to include transportation by automobile. The omission is a definite weakness if one wishes to know the full picture with respect to transportation by all methods.

Questions regarding the number of motortrucks and trailers on farms related to the survey date and thus were not susceptible to memory errors. These two items were expanded to total estimates. No previous information was available regarding trailers. The survey found that about one-fourth of all farms owned trailers; there is no means of measuring the reliability of this result. The definition of a trailer aimed to distinguish it from a wagon. The large number of trailers found by the survey and the fact that many were reported to be normally hauled by tractors, suggest that many of them were used exclusively on the farm. This detracts from the value of the results as a measure of haulage equipment used between the farms and the markets. The simple question regarding size

of trailers met with failure, showing that size information can be obtained only through a detailed description of trailer elements.

The expanded estimate of number of motor-trucks on farms is the only item for which an estimate from other sources is available. State estimates of 1948 farm trucks were made by the Bureau of Agricultural Economics in connection with studies of the consumption of liquid petroleum fuel on farms. These estimates of truck numbers were based on census data, truck-registration data for 13 States, and information obtained from crop reporters, as well as some information on age distribution of trucks shown by the April 1948 survey. For the United States as a whole, the straight expansion from the survey was 1,905,000 for May 1, 1948, as compared with the official estimate of 1,920,000 for January 1, 1948. Although this discrepancy is small, the survey found a considerably larger number of trucks in the South and fewer in the Northeast. This has given rise to some debate as to which set of data reflects more accurately the true geographical distribution of farm trucks. The interview-survey data represent a more objective method of estimation, but are based on a technique which is still somewhat experimental, and in which certain sources of nonsampling error can not yet be fully evaluated. Farm machinery experts believe that the geographic distribution shown by the estimates developed for the fuel consumption study are more reasonable than those obtained from the interview survey. On the other hand, transportation analysts who have worked with the survey data believe that the debatable aspects of the interview-survey results are amply accounted for by certain abnormal marketing practices followed between 1945 and 1948, which include the heavy purchases of used trucks in the North for resale in the South and the heavy sales of surplus army trucks in the South.

In addition to the principal questions on methods of haulage and ownership of trucks and trailers, several supplementary questions were included to find out about special aspects of transportation from farms. A group of four questions intended to get a better insight into the ways that growers tried to alleviate the effects of railroad-car shortages failed to get satisfactory results. The concept was vague and the wording was misunderstood. Three questions designed to disclose the impact of

trade barriers on operations of farm-owned vehicles gave satisfactory results; they showed that trade barriers had practically no effect on farm-owned vehicles. A question concerning farmers' methods of picking up certain farm supplies provided only a part of the desired information, since the interviewers' entries often neglected to distinguish between farmers using none of the supply in question and those not hauling their own supplies. A question on the distance to the nearest all-weather road was asked to obtain further information on the general need for improved farm-to-market roads. The usefulness of results is limited by the inexactness of the term "all-weather road."

Farm Construction

The section of the April survey regarding farm construction was designed primarily to locate farms in the sample that had construction work during 1947. It was planned to follow with a mailed survey to obtain detailed information on expenditures for farm construction, to be used in deriving weights for the building materials subgroups of the Index of Prices Paid by Farmers. For budgetary reasons the follow-up survey could not be made.

Six "yes or no" questions were asked. The questions referred to houses, other buildings, fences, and other construction work, separately. In addition, the respondent was requested to list buildings, other than houses, built new or repaired or remodeled in 1947.

Partial results were published in a two-page release in December 1948 called "Survey Indicates Approximately 160,000 New Homes Built on Farms in 1947." That release shows the percentage of farms reporting buildings started or completed and repaired or remodeled, with separate results for houses and other buildings.

Percentages are shown for 32 States, for census geographic divisions, and for the United States. Samples for the remaining 16 States were not adequate to give individual State indications, but results for these States are included in the averages for their respective geographic divisions.

Machine tabulations have been made to show building activity by kinds of buildings (for other than houses) by tenure groups, etc. It has not been possible, as yet, to complete the summarization and analysis of these results.

It is believed that the survey was successful in locating the farms within the sample on which there was construction activity during 1947. But in order to measure annual building activity, the questionnaire should have distinguished between starts and completions. Undoubtedly some of the reports include buildings started in 1946 and other buildings completed in 1948. The survey results were deflated by one-third in arriving at the published estimate of annual number of houses built. This deflation factor assumes that the average construction period was 6 months with no seasonal variation in "starts." Deflated estimates of annual activity were not published for categories other than new houses built. Somewhat shorter periods are usually involved in the completion of other buildings and for repairing or remodeling jobs, so it is unlikely that the survey results greatly overstate annual activity in these cases.

Commercial Fertilizer

This section was included in the April survey to get information on the amounts and kinds of fertilizer applied to different crops. Results have not yet been tabulated.

Conclusions

Most of the problems and difficulties discussed above are inherent in the many compromises involved in planning a multipurpose interview survey. Such a survey cannot be designed, timed, and carried out, in the way that would be most appropriate for each of its objectives, considered separately. So long as such surveys are not a part of the Bureau's regularly scheduled work, they must depend on a rather small staff for direction. Under these circumstances, a longer period for planning, studying plans for tabulation, and pretesting, appears to be the only cure for some of the difficulties. But to increase the usefulness of results and permit a better coordination of the post-survey phases, the period spent in processing data after the surveys should be shortened. This can be accomplished only if the timely services of an analyst are definitely provided for when it is decided to include a section of subject matter in the schedule, and if necessary funds for machine processing are arranged as part of the budgetary planning for the surveys.