New Approaches and Methods for the 1950 Census of Agriculture

By Ray Hurley and Richard K. Smith

The agricultural censuses are one of the basic foundations of not only our statistics relating to crops, livestock, and farms generally but also of large blocks of agricultural economics research. Agricultural statisticians and researchers necessarily have a keen interest in any new methods of obtaining or new developments in tabulating and publishing census data. As State and county materials from the 1950 Census of Agriculture are now being released, the following article is timely. Ray Hurley, Statistician in Charge of the Agricultural Census, Bureau of the Census, and R. K. Smith, Vice Chairman of the U. S. D. A.’s Crop Reporting Board, describe some of the new approaches used by the Census to assure a more complete coverage of farms, some of the new sampling techniques, and the use of State “economic areas” as the basis for publishing certain kinds of census data. The discussion of the techniques used to obtain a more adequate coverage of both farms and subject matter, is not an attempt to evaluate the internal accuracy of the answers obtained—that task is still in process. A note has been added, over the signature of Dr. Hagood, describing the new concept or definition of farm population used in the 1950 Population Census and briefly summarizing its effect.—O. V. Wells.

NEW APPROACHES and methods used for the 1950 Census of Agriculture may be divided into two general groups: (1) Those affecting primarily the enumeration and (2) those relating to office processing and publication.

Approaches and Methods Affecting Enumeration

Several new procedures were introduced to further the completeness of the coverage of the farm census.

For the first time questionnaires were sent to farm operators for filling in answers before the actual start of the enumeration. Through the cooperation of the Post Office Department a copy of the agriculture questionnaire was distributed to every rural box holder and to box holders in selected towns not having door-to-door mail delivery in all States—except North Carolina, South Carolina, Georgia, Alabama, Mississippi, and Louisiana and except 65 out of the 75 counties in Arkansas. Approximately 9 million agriculture questionnaires were so distributed between March 17 and April 1, 1950. Each questionnaire was accompanied by a letter stating specifically the kinds of places for which the agriculture questionnaire was to be filled and asking the person in charge to examine the questionnaire, fill in the answers to as many questions as possible, and give the questionnaire to the census enumerator when he called to take the census of agriculture, population, and housing, in April or later.

Accurate data regarding the extent to which farm operators filled the agriculture questionnaire before the arrival of the census enumerator are not available. Some records were kept in approximately
10 percent of the 450 supervisors' districts; they indicate that, in the areas in which the agricultural questionnaires were distributed through the mail, approximately 20 percent of the farmers had completely filled them out by the time the enumerator arrived and another 20 percent had partially done so.

In another move to improve coverage, the census enumerators were instructed to fill agricultural questionnaires for (1) all farms and (2) all places of 3 acres or more not considered as farms. In previous censuses, enumerators were instructed to complete questionnaires for all places containing 3 acres or more on which any agricultural products were produced and all places under 3 acres on which $250 or more of agricultural products had been produced, during the preceding year. Enumerators had difficulty in applying these instructions. In the first place, the determination of the value of agricultural products produced was difficult, particularly where a large part of the production was for consumption on the place. Second, even the determination of whether agricultural products were produced on places of 3 or more acres was influenced considerably by the enumerator's opinion as to whether he considered the place a farm and the scale of farming on the place.

The new procedure resulted in the taking of more than a million questionnaires that were not included in the final agricultural tabulations. Of these, 778,000 represented places on which there were no agricultural operations in 1949; and approximately 240,000 were places with agricultural production less than that required for retention of the questionnaire in the tabulations as a farm. The enumeration of places of 3 or more acres contributed to the completeness of the enumeration especially in areas where there were large numbers of marginal farms.

The procedure set up to insure a thorough check on the enumeration of large farms aided greatly in improving the coverage. In 1948, lists were prepared of the large farms enumerated in the 1945 Census of Agriculture.

These lists were sent to State statisticians of the Bureau of Agricultural Economics, who, as special agents of the Bureau of the Census, checked the lists against existing records and made field checks when possible. In this way, lists totaling 62,800 large farms were prepared for use by census crew leaders and enumerators. So far as possible, the enumeration of these large farms was checked in the field during the period of enumeration. During the editing process after the questionnaires were received in Washington, the enumeration of the large farms was completely checked. For the areas west of the Mississippi River, any large farms located in more than one county were checked to see that they were enumerated only once. Approximately 4,000 letters were written during the editing process to check on the enumeration of large farms, to obtain more information, or to insure the accuracy of the reports.

More accurate and complete coverage of the farm census in the South was insured by the use of a special supplementary questionnaire (Landlord-Tenant Operations). Its use was required when two or more agricultural questionnaires were necessary for an individual land holding. Its use aided in the enumeration of cropper and other tenant farms comprising plantations and the larger land holdings. Enumerators were instructed to list on this questionnaire the name of the landlord and each cropper and other tenant and to give, for each listing, certain items of information such as the acreage assigned, acres in cotton, acres in tobacco, and acres in other crops. This special questionnaire was filled out for approximately 400,000 land holdings located in the 900 counties in which it was used.

**Supervision and Training**

Greater supervision and more training of census enumerators constitute important changes in the approach to the 1950 Census as compared with prior censuses. Approximately one local supervisor was provided for every 14 enumerators in rural areas. These crew leaders were given a week of training by members of the Washington staff of the Bureau of the Census and personnel from State Agricultural Colleges and the U. S. Department of Agriculture. The crew leaders then conducted training sessions for the enumerators. Rural enumerators were given approximately 24 hours of training before they began their actual work. Detailed training on the census of agriculture represented more than one-third of the total training time for the 17th Census. The training was standardized through the use of training materials and film strips and recordings of mock interviews. A rigid time schedule was set up for the crew leaders
to follow so that the training time would be proportioned among the various parts of the census enumerator's work. During the period of actual enumeration the crew leaders were expected to accompany each member of his crew during at least one farm visit. He also visited each enumerator when work got fully under way, inspecting his completed questionnaires on a systematic basis and answering his questions. At the completion of an enumeration district the crew leader checked the enumerator's map to see that the coverage of the district was satisfactory.

The use of State questionnaires represented one of the new approaches. In previous censuses separate questionnaires had been used for the different regions but the number of different questionnaires used in 1950 was almost five times as large. This permitted reducing the number of questions for many States and eliminated the need for farmers to read many questions that did not apply to the area. It also provided for the asking of separate questions regarding crops that were important only in that State. The questionnaire itself was of the interview type. Most of the questions were stated completely and exactly as the enumerator was expected to ask them. This was the first time that an interview-type schedule had actually been used in the census of agriculture.

Sampling was used to a greater extent in the 1950 Census of Agriculture than for prior censuses, thus reducing the time spent by the enumerator. In 1950, sampling was used for two purposes. First, data on farm facilities and equipment, farm labor, farm expenditures, distance to trading center, value of farm land and buildings, taxes, farm mortgage debt, etc., were enumerated only for a sample of farms. Second, a sample of farms, comprising all large farms and one-fifth of all other farms, was used for the tabulation of more than a third of the data to be published for the 1950 Census.

The farms for which some items of information were to be enumerated on a sample basis were selected during the enumeration. These farms were also used for the tabulation of data on a sample basis. Each agricultural questionnaire given to census enumerators, as well as each going to a farmer through the mail, had a serial number ranging from 1 through 5. Census enumerators were required to obtain sample information for farms if the questionnaire had a certain serial number. The determination of this serial number was made on the basis of the number assigned to the enumeration districts in which the enumerator performed the enumeration. For example, if the last digit of the number designating the enumerator's district was 5, then he was required to obtain the sample information for all questionnaires having a serial number of 5.

In a number of cases the enumerator did not follow perfectly the prescribed method of selecting the sample farms. In order to detect biases introduced into the sample because of this failure, it was necessary to check the selection of farms in the sample at the completion of the enumeration and during the processing of the questionnaire. During the enumeration or before the processing of the questionnaires, enumeration districts in approximately 65 counties were found in which the sampling procedure had not been followed fully. In these counties the sample was corrected by selecting the farms that should have been included and obtaining the missing information either by reenumeration or by mail.

To learn the extent of the sample bias, counts were obtained during the processing of the questionnaires for each county and for each State economic area, for all farms, by size of farm and by economic class. The counts obtained for the sample were compared with the expected number. Where there was a bias in the sample selection, adjustments were made before the tabulation by duplicating questionnaires at random in the sample when the expected number of farms was greater than the actual number of farms in the sample. Likewise, farms were eliminated from the tabulation when the count of farms in the sample exceeded the expected number of farms in the sample. In general, the enumerators introduced a bias into the sample by including the larger and better farms. In adjusting for this bias, 2.1 percent of the farms were duplicated and 3.0 percent of the farms were eliminated from the sample prior to the tabulation of data for the sample. For farms classified as commercial (that is, farms with a value of products sold of $1,200 or more plus farms with a value of products sold of $250-$1,199 and with operators working off the farm less than 100 days and obtaining the major part of this income from the sale of farm products), the percentage duplicated was 1.5 percent and the percent eliminated amounted to 3.7 percent. On the other hand, for
noncommercial farms, the percentage of farms duplicated was 3.4 percent, and the percentage eliminated was 1.5 percent.

**Methods Relating to Office Processing and Publications**

A revision in the census definition of a farm was made for the 1950 Census. For 1950, places of 3 or more acres were included in the tabulation if the value of agricultural products in 1949, exclusive of home gardens, amounted to $150 or more. The agricultural products could have been either for home use or for sale. Places of less than 3 acres were counted as farms only if the value of agricultural products sold in 1949 totaled $150 or more. Places operated in 1949 for which the value of agricultural products was less than these quantities because of crop failure or other unusual situations, and places operated in 1950 for the first time, were counted as farms if normally they could be expected, on the basis of the livestock on hand or the amount of cropland and pasture land available, to produce these minimum quantities of farm products. Questionnaires to be included in the tabulations as farms were determined during the processing of the questionnaires in Washington, as the census enumerator was not given a definition for a farm.

For the 1945 and earlier censuses of agriculture, the definition of a farm was somewhat more inclusive. Census enumerators for prior censuses had been provided with the definition of a farm and instructed to fill questionnaires only for those places which met the criteria. From 1925 to 1945, farms for census purposes included places of 3 or more acres on which there were agricultural operations and places of less than 3 acres that had agricultural production for home use or for sale with a value of $250 or more. For places of 3 or more acres, no minimum quantity of agricultural production was required for purposes of enumeration; for places of under 3 acres all the agricultural products valued at $250 or more may have been for home use and not for sale. The only questionnaires excluded from the tabulations were those taken in error and a few with very limited agricultural production; as only a small home garden, a few fruit trees, a very small flock of chickens. In 1945, reports for 3 acres or more with limited agricultural operations were retained if there were 3 or more acres of cropland and pasture, or if the value of products in 1944 amounted to $150 or more when there was less than 3 acres of cropland and pasture.

The change in definition of a farm seems to have reduced the number of farms included in the tabulations for the 1950 Census as compared with 1945 by not more than 200,000. The eastern States were most affected by this change.

In the office processing of the 1950 Census of Agriculture there has been closer cooperation than ever before between the Bureau of Agricultural Economics and the Agriculture Division of the Bureau of the Census. At the time the tabulations for each State were being edited, summarized, and prepared for preliminary release, the BAE State Statistician for that State was called to Washington and detailed to the Census Bureau to give as much assistance as possible as a special agent of the census. Extensive use was made of his statistical experience and knowledge of agricultural conditions and operations in his State. Usually the detail covered about 2 weeks. Not only was the BAE State Statistician able to help the Census Bureau in its work but he also gained valuable experience with the census data which will be extremely helpful in using and interpreting the 1950 Census results in future BAE estimates and revisions.

The use of State economic areas or groupings of counties for the presentation of statistics represents a new development for the 1950 Census of Agriculture. Outside of metropolitan areas, State economic areas, in general, are the same as State type-of-farming areas. These economic areas were established by the Bureau of the Census in cooperation with the Bureau of Agricultural Economics, State Colleges, and other interested agencies. The counties comprising a State economic area have similar agricultural, demographic, climatic, physiographic, and cultural characteristics.

Basically, State economic areas have been established for the purpose of presenting statistics not only for the 1950 Census of Agriculture but also for the Censuses of Population and Housing and other types of Census data. The 48 States have been subdivided into 501 State economic areas. (For a description of State economic areas, see the Special Report of the 1950 Census entitled, “State Economic Areas: A Description of the Procedure used in Making a Functional Grouping of Counties
in the United States.’’ For the purpose of presenting agricultural statistics, most metropolitan areas have been combined with adjacent economic areas when the number of farms and the agricultural production of the metropolitan area are of small importance. On the other hand, because of significant differences in the characteristics of the agriculture within State economic areas, some State economic areas have been subdivided when statistics are given for the 1950 Census of Agriculture. Figure 1 shows the economic areas to be used for agricultural data.

More than a third of the detailed data published for the 1950 Census of Agriculture will be for State economic areas. Data to be so published include frequency distributions of farms reporting specified items such as farm operators by age, corn by acreage harvested, cattle by number on hand; detailed statistics on farms classified by size of farm, by tenure of operator, type of farm, and economic class of farm; and tabulation of farms reporting: Potatoes by acreage harvested, milk production by size of herd, poultry items by size of flock, etc. The use of State economic areas as units for the publication of statistics made possible many tabulations that would not have been possible by county because the data on other bases would not have been reliable enough and because of the cost of tabulation, amount of clerical work required and cost of publication. These tabulations include cross tabulations by size of farm, tenure of farm operator, type of farm, and economic class of farm.

*Note on change in definition of farm population.*—Agricultural statisticians and economists will also be interested in the change in definition of the farm population that was introduced into the 1950 Population Census. In the 1940 Population Census and in the current population surveys made during the 1940-50 decade, all persons living on farms were classified as in the farm population. In 1950, two classes of such persons were not regarded as living on farms. The most important of these groups consisted of families living in houses on farms for which they pay cash rent, but who do not rent any farm land along with the house. Most of the workers in these families are employed in non-

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**Figure 1.**
Summerfallowing to Meet Weather Risks in Wheat Farming

By E. Lloyd Barber

Summerfallowing is one of the principal methods used by farmers in the Great Plains to reduce the risk of crop failure. This paper gives some of the results of a study aimed at measuring the extent of the protection afforded by, and the cost of, summerfallow in terms of reducing the frequency with which gross returns per acre fail to cover the direct crop costs. (The research on which this article is based was made under authority provided by the Research and Marketing Act of 1946.)

SUMMERFALLOWING is one of the principal methods that has been used by farmers in the Great Plains to reduce the risk of crop failure. As a cultural practice, fallowing allows the storing up of a reserve of moisture, provides an effective means of weed control, and facilitates early seeding. During years of inadequate rainfall, a much better yield can be expected from wheat sown on fallow than from second crop or "continuous" wheat. In this respect, fallowing affords at least some degree of insurance against crop failure.

How much protection does summerfallow give, in terms of reducing the frequency with which the gross return per acre fails to cover the direct crop costs, and at what cost is the protection obtained? The answer obviously varies with the local situation with respect to yields and costs throughout the Great Plains. It is the purpose of this discussion to suggest a basis for an answer to this problem.

In appraising the effectiveness of summerfallowing as a device for meeting weather risks, two situations should be distinguished. In the drier areas of the Great Plains, the difference in yield between summerfallow and continuous wheat is large enough to make summerfallowing the more prof-