1964 UNITED STATES CENSUS OF AGRICULTURE

FARMS
FARM CHARACTERISTICS
LIVESTOCK AND PRODUCTS
CROPS
FRUITS
VALUES

VOLUME III PART 6

Procedural History

U.S. DEPARTMENT OF COMMERCE
C. R. Smith, Secretary
William H. Chartener, Assistant Secretary for Economic Affairs

BUREAU OF THE CENSUS
A. Ross Eckler, Director

Reports for the 1964 Census of Agriculture

Preliminary reports

These reports, issued for each county and State, contain totals for farms, farm acreage, farm operators, land in farms classified by use, land-use practices, equipment and facilities, expenditures, use of agricultural chemicals, poultry, livestock, poultry and livestock products, and crops harvested, including fruits and nuts, nursery and greenhouse products, and forest products.

VOLUME I. STATE AND COUNTY STATISTICS

A separate part was issued for each State, Puerto Rico, Guam, and the Virgin Islands.

VOLUME II. GENERAL REPORT

Statistics by subject are presented, with totals for the U.S. regions, geographic divisions, and States.

VOLUME III. SPECIAL REPORTS

Reports present data for supplementary surveys for farm workers, hired farm workers, for the 1965 Sample Survey of Agriculture, farm debt, and reports on procedures.

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BUREAU OF THE CENSUS

PREFACE

This report presents a comprehensive summary of the operations required to conduct and process the 1964 Census of Agriculture. It was compiled principally from reports prepared by Census Bureau staff members on various aspects of the census, supplemented by information from memorandums, administrative records, and procedural manuals and instructions which were prepared during the census period. Portions of certain sections throughout this report appear also in other publications of the 1964 Census of Agriculture.

The enumeration forms used in the census and in the surveys which were taken to supplement it are presented in Vol. III, Part 1, **Data-Collection Forms and Procedures for Census and Related Surveys,** of the 1964 United States Census of Agriculture, and are not reproduced in this report.

This publication was prepared in the Statistical Information Division by Elma Beynon (July 1964 through December 1967) and Florence R. Haimes (April 1968 to date), Agriculture Census Historians, under the direction of Phyllis Carter, Chief, History and Research Reports Branch, with a major contribution toward the organization and completion of the material by Irvin Holmes, Consultant, Agriculture Division, and with the assistance of many other persons in the Bureau. Much of the material incorporated in this report was prepared by or under the direction of Ray Hurley, Chief of the Agriculture Division until April 1968. Special credit should be given to J. Thomas Breen, present Chief of the Agriculture Division, and Thomas B. Jabine, Special Assistant to the Deputy Director, who reviewed all sections of the report and gave general guidance and coordination to the preparation of the manuscript.

1964 UNITED STATES CENSUS OF AGRICULTURE

Volume III—Part 6

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Chapter I. General

EARLIER CENSUSES OF AGRICULTURE

The 1964 Census of Agriculture was the 18th enumeration of United States agriculture. The first nationwide census of agriculture was taken in 1840 as part of the Sixth Decennial Census of Population. During the intervening 124 years, the census of agriculture developed from a small part of the census of population to a separate large-scale census.

From 1850 to 1920 an agriculture census was taken every 10 years. The Congress of the United States in 1909 provided for a census of agriculture to be taken in 1915 and every 10 years thereafter, in addition to the agricultural enumeration to be done in conjunction with the decennial censuses (36 stat. 10, sec. 31). However, the advent of World War I caused abnormal conditions which prevented taking a 1915 census; therefore, the first mid-decade agricultural census was taken in 1925, and agricultural censuses have been taken quinquennially thereafter.

Beginning in 1954, the census of agriculture has been enumerated in years ending in 4 and 9, rather than in years ending in 0 and 5. The 1954 census set a precedent followed in 1959 and 1964 for the agriculture censuses to be taken in the fall of the year instead of in the spring. It was hoped that most of the enumeration would be completed after harvesting was over and before winter weather set in. In addition, it was believed that the data would be improved in accuracy because a higher proportion of the responses would be obtained from the person actually in charge of the farm during the calendar year for which crop and livestock production data were requested. Since the earlier censuses referred to production in the previous year, the reference year for census purposes was essentially unchanged, although the series for livestock inventories were affected by the change in date of enumeration.

NEED FOR THE CENSUS

Censuses of agriculture are needed to bring facts about U.S. agriculture up to date. Agriculture in the United States during the last five decades has undergone a technological and scientific revolution. Vast new resources of technology and science have been applied to agricultural production. Mechanization and developments in nutritional procedure and sanitary practices among other changes have greatly increased the amount of capital required for farming. The reduction in the number of farms, the migration of farm people to urban areas, and the development of governmental programs have brought about many changes in all parts of the country.

The needs for measures of the economic, productive, and social conditions and changes in agriculture have never been greater. These measures are essential not only for the farmers in the United States, but also for other persons engaged in providing goods and services to farmers and in the transportation, marketing, processing, and distribution of food and other farm products. The census measures are necessary to provide the benchmarks required for enhancing the accuracy of nearly all estimates made by the U.S. Department of Agriculture. The technological revolution, the reorganization of agriculture, and rapid changes in agriculture call for other changes in groups and institutions associated with agriculture. The taking of the 1964 Census of Agriculture was supported by the major farm organizations, State departments of agriculture, the U.S. Department of Agriculture, State agricultural colleges, farm publications, and other organizations.

LEGAL AUTHORITY

The Congress of the United States provided legal authority for the 1964 Census of Agriculture in Title 13, Subchapter II, section 142(a), which states that "... beginning in the month of October, 1959, and in the same month of every fifth year thereafter, [the Secretary shall] take a census of agriculture, provided that the census directed to be taken in October 1959 and each tenth year thereafter, may, when and where deemed advisable by the Secretary, be taken instead in conjunction with the censuses provided for in section 141 [population, unemployment, and housing] of this title."

FUNDS APPROPRIATED

Work on a census, including preparatory work, extends over a period of several years. The total cost of the 1964 Census of Agriculture was estimated at $24,545,000 for the entire period 1963 to 1968. However, three subsequent pay raises increased the total amount to $25,151,000. Fiscal year appropriations for the 1964 Census of Agriculture are shown in table 1.

SCOPE OF THE CENSUS

The 1964 Census of Agriculture covered approximately 3,157,000 farms in the United States. For each State and county, the basic agriculture questionnaire was designed to yield the following data:

1. A count of farms and characteristics of the farm operator such as color, age, years on farm, and off-farm work.
2. An inventory of agricultural land, the ownership of such land, and the manner in which it was used in 1964.
3. The amount of each farm product produced and sold.

4. An inventory of the kinds and numbers of livestock and poultry on farms.

5. A count of the farms with such facilities as telephone and home freezer, as well as a count of important farm machines and equipment such as tractors, motor-trucks, and corn pickers.

6. A record of the number of people living in the household of the farm operator; their relationship to the operator; their age, sex, and education; days worked off the place; and their income from wages, nonfarm business, and other sources.

7. A record of important cash expenditures made for the farm operations during 1964.

The detailed questions asked in each of the 50 States are shown in table 2, Vol. III, Part 1, Data-Collection Forms and Procedures..., of the 1964 United States Census of Agriculture.

Beginning in July 1964 and continuing through March 1966, sample surveys were conducted for the purpose of obtaining weekly data on farm labor by hired workers and by persons living in the farm operator's household. In 1966 there was a sample survey of agriculture and a landlord farm debt survey covering the year 1965. These surveys served as supplements to the 1964 Census of Agriculture.

Table 1. FUNDS APPROPRIATED FOR THE 1964 CENSUS OF AGRICULTURE

(In thousands of dollars)

Fiscal year	Appropriation[1]	Unobligated balance, start of year	Unobligated balance, end of year	Obligations
Total.....	25,151	-	-	25,146
1963.....	700	-	249	451
1964.....	1,345	249	89	1,505
1965.....	16,150	89	707	15,532
1966.....	5,110	707	500	5,317
1967.....	1,846	500	395	1,951
1968.....	-	395	[2]5	390

[1]Includes supplementals for pay raises.

[2]Appropriation terminated on December 31, 1967, with a $5,000 unobligated balance remaining.

DATE OF ENUMERATION

Except in Alaska, the enumeration began on various dates between November 9 and November 23, 1964. In Alaska the enumeration started on October 5, 1964. The beginning date was planned to follow the close of the harvest season in each State or a portion of a State. (See figure 1.) Enumerators' work assignments were planned so as to give each enumerator about 3 weeks of employment. Generally the enumeration was completed within 1 month except for those farms for which the questionnaires were obtained by correspondence from the central processing office.

INNOVATIONS IN THE 1964 CENSUS

Questions on Social and Economic Data Added to Census Form for the Farm Operator's Household

Information regarding age, sex, level of education, hours of farm work, off-farm work, and income from major sources was obtained in 1964 for the first time for each member of the farm operator's household in a nationwide census of agriculture, although some information about the number of persons living on farms and their distribution by age and sex was obtained in the 1925 and 1945 censuses. Age, sex, off-farm work, and other items had been secured for the farm operator in many of the earlier censuses, but there was no simultaneous population census available for the 1964 Census of Agriculture.

New Training Methods for Enumeration Personnel

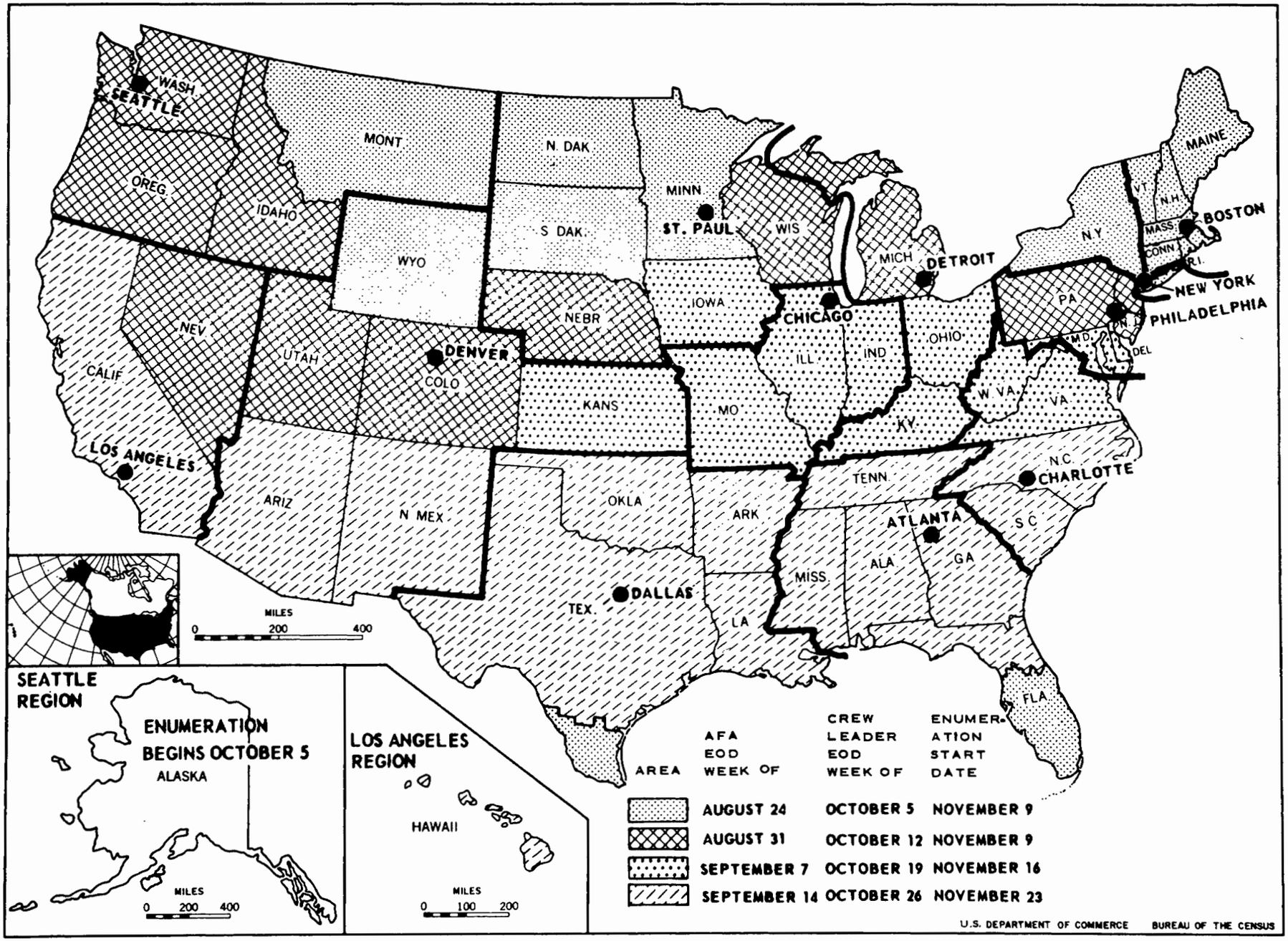
For the first time in a major census, the enumerators were not trained in classrooms but learned how to enumerate by completing a self-study course in their own homes. A special Training Book, with detailed illustrations, was developed to teach enumerators how to do their job using programed self-study methods. (See chapter II, p. 11.) The enumeration self-study materials apparently were quite successful. The number of trainees who failed to complete the training program satisfactorily was less in 1964 than for the 1959 census, thus reducing the crew leader's workload in respect to the hiring and training of replacements for those who failed.

New Methods of Processing the Census

Prior to 1964, U.S. censuses of agriculture were processed using conventional tabulating methods. After the initial clerical editing of the questionnaires, the data for each farm were punched into a series of cards, which were then subjected to a variety of mechanical editing processes using high-speed card-handling equipment. Certain derived data were computed and introduced into the cards by machine; the cards were then sorted and tabulated to produce summary cards which in turn were tabulated to produce the desired tables. For the 1964 Census of Agriculture, however, it was decided to process the results by the large-scale computer equipment available, and accordingly the problem of input preparation was studied to determine possible improvements.

The census of agriculture questionnaire contains many inquiries which apply to only a fraction of the total number of farms covered. Most of the inquiries call for quantitative responses stated in terms of numbers, e.g., number of acres devoted to specific crops and quantities of crops harvested. The practicability of using questionnaires designed for mark sensing by the electronic scanning device employed for the 1960 population and housing censuses was thoroughly explored. However, the decision was made not to use this system for a number of reasons including the size and complexity of the enumeration document that would have been needed for the position marking of several

Figure 1. STARTING DATES FOR THE 1964 CENSUS OF AGRICULTURE: REGIONAL OFFICE COVERAGE



numeric digits for a large number of inquiries. Accordingly, it was decided to use a conventional enumeration document, and various methods for converting the collected data to a form suitable for computer input were considered.

The possibility of clerical transcription from the enumeration schedules to a FOSDIC document was studied and rejected. Agriculture census schedules in the United States require very little postenumeration coding and can be keypunched directly from the schedule easily and quickly. Under such circumstances, a manual transcription that eliminates keypunching has been demonstrated to cost substantially more than the keypunching would cost.

Several choices were considered for producing computer-acceptable input by use of key stroke devices: initial typing of the records or recording them using a 10-key adding machine, then converting them to machine input by means of an optical character reader; producing punched paper tape suitable for direct input to a computer; and keypunching of data into conventional punchcards.

The examination of these choices was aimed at (1) finding the most economical way of preparing the data for computer input; and (2) finding a method that would provide a continuous data record for each farm, or at least a record that could be readily assembled in the computer so that each farm could be processed as a complete unit.

Experiments to determine production factors were carried out using all three methods. The tests showed no major cost differences. However, punched paper tape and initial typing and converting by means of an optical character reader were rejected on the grounds that both would require first-time use of specialized equipment or development of new equipment without compensating economies, or operational advantages sufficient to offset the developmental effort and developmental uncertainties. Instead, a new technique for keypunching cards, using existing equipment, was chosen. This technique made possible the handling of data for each farm on a complete continuous record.

The method employed in the preparation of data files for the 1964 Census of Agriculture was a modification of "string-punching" techniques which could accommodate the variety of questionnaire forms representing essentially one form for each State. The planned use of large-scale computers for the subsequent processing removed the restriction observed for earlier censuses, that the data in preparation for subsequent tabulation be recorded in fixed locations or fields in a series of punchcards. Instead, a new plan was adopted whereby a card having no particular format was punched and data fields were identified by codes punched in the card rather than by the location of the data in the card.

In the "string-punching" process, data from a given farm schedule were "strung" over as many cards as were needed, utilizing the full capacity of each card. The allocation of data fields on a card was dictated by the data themselves rather than by the card design. Furthermore, the operator had the opportunity to correct a mistake by signaling the invalid data and punching the correction immediately following the error.

This signaling was accomplished by punching a one-digit "kill code" whenever an error was detected. The code acted as a signal in subsequent computer runs to replace the preceding data by the data following the code. This deletion and replacement of data was termed the "kill data" process.

After the data were transferred from the census questionnaires to punchcards, the cards were read at one end of a transmitter link and the data were transmitted from Jeffersonville to Washington via communication lines and recorded on IBM tapes. The conversion to tape included a sequence check and other basic tests of the information. A control tape including State, county, enumeration assignment (EA), and enumeration district (ED) codes was used to identify information for geographic areas.

This was the first census of agriculture to be fully processed on an electronic computer, although previously population and housing and economic censuses had been processed primarily on the computers.

The 1964 Census of Agriculture provided the first opportunity to apply the Univac 1107 to the processing of a large-scale census. The capabilities and characteristics of the powerful new computer allowed the introduction of some new processing techniques and approaches which would significantly increase efficiency in processing the data. The underlying concept was to reduce external handling (handling by human beings such as computer operators and clerks) and to maximize internal controls (e.g., computer performed functions such as checking to prevent inadvertent processing of data more than one time).

Another feature of the processing which had considerable impact on the census was the use of the computer to edit the raw data. The literally thousands of inconsistencies which might occur in the raw data had to be anticipated and a rule of correction devised if the benefits of computer processing were to be realized.

Communication of the extremely detailed "edit specifications" to computer programers who were not agricultural specialists presented a problem which was partially solved through the use of decision tables. Decision tables provide a formalized procedure for analyzing a series of conditions and applying rules for appropriate action in a logical sequence. They assist both the writer and the processing staff in organizing the solution to the problem and ascertaining that all the logical steps required for the solution have been accounted for.

CENSUS OPERATIONS OFFICE

The Bureau's permanent Census Operations Office at Jeffersonville, Ind., was used to handle storage and processing operations, distribution of supplies, and clerical and punching operations connected with the census. All the materials to be used for the census training and enumeration were sent to the Jeffersonville Census Operations Office as soon as they were prepared. They were stored there until needed, then distributed through the Crew Leader Training Centers. After the enumeration, the crew leaders (with the exception of

those in a designated group of Florida counties) mailed the completed enumeration records and questionnaires directly to the Jeffersonville Census Operations Office for processing without passing these materials through the regional offices. A special field office was established in Tampa, Fla., to assist in establishing coverage of the citrus grove areas of Florida.

DEFINITION OF A FARM

For the 1964 Census of Agriculture, the definition of a farm was based primarily on a combination of "acres in the place" and quantity of agricultural resources on the place or the quantity of agricultural products produced.

The word "place" was defined to include all land under the control or supervision of one person or partnership at the time of enumeration and on which agricultural operations were conducted at any time in 1964. Control may have been exercised through ownership or management or through a lease, rental, or cropping arrangement.

The computer editing specifications provided for the counting of a place as a farm if the place contained 10 acres or more and had--

1. An estimated value of $50 or more for total value of products sold (TVP) based on applying average prices to the quantities of crops, livestock, and poultry products reported or estimated as sold plus the values reported for sales of other items or,

2. If the estimated TVP was less than $50, any of the following criteria:

a. 2 or more acres of crop failure.

b. 5 or more acres of cropland pasture or improved other pasture.

c. 10 or more acres of other pasture.

d. 5 or more acres of other land in summer fallow.

e. 50 or more chickens 4 months old or over on the farm.

f. 5 or more hogs and pigs on the farm.

g. 5 or more cattle and calves on the farm.

h. 2 or more milk cows on the farm.

i. 0.2 acres or more of tobacco harvested.

j. 100 or more pounds of tobacco harvested.

k. 0.5 acres or more of vegetables or berries harvested for sale.

l. 0.5 acres or more of land in orchards, vineyards, and planted nut trees.

m. 3 or more acres of hay harvested.

n. 2 or more acres of corn harvested, provided there were no hogs or pigs on the farm.

For places of less than 10 acres the computer editing specifications provided for counting the place as a farm if it had--

1. An estimated TVP of $250 or more based on applying average prices to the quantities of crops, livestock, and poultry products reported or estimated as sold plus the values reported for sales of other items or,

2. If the estimated TVP was less than $250, any of the following criteria:

a. 5 or more acres of crop failure.

b. 100 or more chickens 4 months old or over on the farm.

c. 10 or more hogs and pigs on the farm.

d. 10 or more cattle and calves on the farm.

e. 4 or more milk cows on the farm.

f. 0.3 acres or more of tobacco harvested.

g. 500 or more pounds of tobacco harvested.

h. 2 or more acres of vegetables or berries harvested for sale.

i. 2 or more acres of land in fruit orchards, vineyards, or planted nut trees.

j. 5 or more acres of corn harvested provided there were no hogs or pigs on the farm.

For the 1959 census, places of 10 acres or more were counted as farms if the estimated sales of agricultural products for the year amounted to at least $50. Places of less than 10 acres in 1959 were counted as farms if the estimated sales of agricultural products for the year amounted to at least $250.

As in 1964, other criteria were used to retain as farms those places where the estimated sales were less than the minimum, but the place had the potential to produce for sale the minimum value or more.

For both the 1954 and 1950 Censuses of Agriculture, places of 3 acres or more were counted as farms if the annual value of agricultural products, whether for home use or for sale but exclusive of home-garden products, amounted to $150 or more. Places of less than 3 acres were counted as farms only if the annual sales of agricultural products amounted to $150 or more.

For most censuses prior to 1950, census enumerators were given the definition of a farm and were instructed to obtain questionnaires only for places which met the criteria.

The definition of a census farm has been changed several times since 1850. However, in all censuses the essential features of the farm definition have been that (1) the land should be under the control of one person and (2) the land should be used for or connected with agricultural operations.

The requirement that the tracts of land be operated by one person has resulted in the counting of places operated by tenants, sharecroppers, and managers as separate farms. The requirement that all tracts operated by one person be considered one farm resulted in counting as one farm places comprising owned land and rented land and tracts of land operated by one person but widely separated as to location.

Agricultural operations have been considered to include the growing of crops; the raising of domestic animals, poultry, and bees; and the production of other agricultural products, including the production of livestock on public lands and open ranges not under the exclusive control of a single individual. Agricultural operations may vary in size, from the production of a

few home-garden vegetables to the operation of diversified enterprises including thousands of acres of cropland harvested, extensive orchards, livestock numbering in the tens to hundreds of thousands, and sizable dairy and poultry operations. From the very beginning of the agriculture census, it has been necessary to specify some minimum limits for the counting of tracts of land as farms. The criteria for minimum size of agricultural operations to be counted as census farms have included measures of land area, land use, agricultural resources or agricultural output or sales. In earlier censuses the various size criteria for census farms frequently differed for places of less than 3 acres and for places of 3 acres or more. However, in 1959 and 1964 the different criteria applied to places of less than 10 acres and to places of 10 acres or more.

Chapter II. The Enumeration

DEVELOPMENT OF THE QUESTIONNAIRE

The questionnaire for the 1964 Census of Agriculture was developed by the Bureau of the Census staff in consultation with users of the data, research workers, and other experts in the field. Selection of the inquiries was based on demands for specific items of information, recommendations of the Special Advisory Committee for the 1964 Census of Agriculture, results of the 1963 pretest, and experience gained in earlier censuses.

The result was a set of questionnaires, form A1, basically similar in content and design, but with variations for each State and for south Texas and the remainder of that State. The principal variations among the questionnaires used for the different States related to questions on crops harvested. Other differences related to questions on summer fallow, irrigation, individual forest products, maple sirup, goats and mohair, butter churned, and crops fertilized.

Advisory Groups

As a first step in the development of the questionnaire, the U.S. Department of Agriculture (USDA), State agricultural colleges, and other major users of census data were invited to recommend inquiries for the census. The number of inquiries submitted from all sources greatly exceeded the number that could be included in the census, considering the total cost, the respondent's time and patience, and the practical value of the resulting data. In selecting inquiries, careful consideration was given to such factors as the availability of data from other sources, the possibility of obtaining data by methods other than a census, the adequacy of the data that might be obtained, and the need for and the usefulness of the data.

Two technical committees provided advice and assistance to the Bureau in planning for the census. Various agriculture-oriented organizations were invited by the Director of the Census to nominate representatives to serve as members to one of these committees, the Special Advisory Committee for the 1964 Census of Agriculture. The Bureau of the Budget was represented at all meetings of this Advisory Committee. Because of the special interest of the USDA in censuses of agriculture, the second committee consisted of 10 working groups established by that agency. Each working group had the responsibility for ascertaining the USDA's need for data in its respective subject-matter fields and for presenting recommendations. The membership of the Special Advisory Committee was as follows:

Organization	Representative
American Farm Bureau Federation	W. E. Hamilton, Director of Research
National Farmers Union	Jay Naman, President--Texas Farmers Union
The National Grange	Wib Justi, Youth Department Director
Agricultural Publishers Association	Richard Pommrehn, Director of Research--Wallaces Farmers
American Farm Economic Association	D. Gale Johnson, Dean, Director of Social Science--University of Chicago
National Council of Farmer Cooperatives	Richard T. O'Connell, Legislative Counsel
National Association of State Departments of Agriculture	Richard D. Chumney, Commissioner of Agriculture--State of Virginia
Farm Equipment Institute	Robert T. Glidden, Assistant Secretary--International Harvester
Association of State Universities and Land Grant Colleges	Elmer R. Kiehl, Dean of Agriculture--University of Missouri
Rural Sociological Society	Douglas Marshall--Department of Rural Sociology, University of Wisconsin

Organization	Representative
American Petroleum Institute	William B. Harper
U.S. Department of Agriculture	Harry Trelogan, Administrator--Statistical Reporting Service
American Statistical Association, Census Advisory Committee	Murry R. Benedict, Professor of Agriculture--Economics, University of California

PRETEST OF OPERATIONS

A pretest of the 1964 Census of Agriculture was designed as a comprehensive test of field operations planned for the full-scale census. It tested the training, enumeration, and other field procedures, as well as the questionnaires and other forms before a final commitment was made to use them in 1964. This pretest was in the nature of a "dress rehearsal" and was conducted in 12 counties of the United States during November and December 1963. The counties selected for the pretest were:

Jefferson, Ark.	Oceana, Mich.
Merced, Calif.	Chippewa, Minn.
Delta, Colo.	Ontario, N.Y.
Litchfield, Conn.	Lane, Oreg.
Coffee, Ga.	Adams, Pa.
Madison, Ind.	Spartanburg, S.C.

Three versions of the agriculture questionnaire--for Northern, Southern, and Western States--were used in the pretest. Each version contained questions appropriate to the type of agriculture in the part of the country where it was used. None of the data obtained were published.

All major aspects of the field operations, from the hiring and training of crew leaders and enumerators to actual interviews with farm operators, were given a "trial run" in each of the 12 counties. Preliminary versions of reporting forms, payroll records, training guides, and instruction manuals were subjected to actual use under conditions simulating those expected in the nationwide enumeration to be conducted in the fall of 1964.

PREPARATORY OPERATIONS

Maps

Before the census was taken, the entire United States was subdivided into areas with boundary lines recognizable to enumerators so that no area would be duplicated or omitted. For the purpose of establishing enumeration districts (ED's), it was necessary to collect up-to-date maps and consult with local officials regarding changes in boundaries of local political subdivisions and to take into account not only changes in political boundary lines but also topography, transportation facilities, travel conditions, distribution of the number of farms, and the amount of work each enumerator could be expected to perform during the enumeration period. Review of boundaries, obtaining of up-to-date maps, and local consultations were completed in 1963.

Advance Mailing of Questionnaires

About 2 weeks before the start of the enumeration, agriculture questionnaires were mailed to nearly 8 million households in rural areas. A letter was attached to each questionnaire asking persons with agricultural activities to fill in the questionnaire immediately and to give it to the census enumerator when he called. The purpose of this procedure was to save time and money in taking the census and to improve the quality of the information obtained from farm operators. By distributing the questionnaires ahead of time, it was hoped the farmer could determine what information would be required and could check his records in advance of the enumerator's visit. However, the enumerator had the responsibility for obtaining an agriculture questionnaire for each place with agricultural operations in his assigned area.

The mailout involved two separate operations, as follows:

First, a "box occupant" mailout of A1 questionnaires was made to boxholders on most rural and star routes and to post office rental boxholders in rural areas. It was based on post office patron records and amounted to about 7,500,000 questionnaires in the 50 States.

Second, a "specified address" mailout of the A1 questionnaires was made to farm operators of large farms, urban farms, and highly specialized types of farming operations. The list of these addresses, nearly 300,000, was generated from current agricultural operations lists and 1959 census records used in the preparation of Special Farm Cards, form A15. (See p. 14.)

The preliminary operations for the "box occupancy" mailout began during the spring of 1964. Negotiations with representatives of the U.S. Post Office Department resulted in the Bureau's obtaining a deck of 35,000 punched cards representing all post offices in the 15 major Post Office regions. The punchcards contained the following information:

Postal region number
State code
County code
County name
County seat post office (yes/no)
City delivery service (yes/no)
Class
Number of rural boxes served
Number of post office boxes rented
Number of star route boxes served
Post office finance number
Post office name
State name
ZIP code

The Post Office Department stipulated that A1 questionnaires for the "box occupant" mailout must be tied into bundles of 50 each and agreed that the proper number of bundles could be placed in mailbags for shipment direct to the postmaster of each participating post office. Following these criteria for bulk mailing and using the data on the post office punchcard decks, the computer was used to produce listings of the number of boxholders and the number of bundles needed for each post office, with summary totals at the county, State, and regional levels.

After a review of these requirements, a second computer run, using continuous form manila cards, produced some 200,000 addressed post office labels. These cards indicated the post office address, quantity of forms to be sent to that post office, and the type of distribution desired, viz, rural route, star route, or post office boxholders. The continuous forms were split apart mechanically, boxed by State, and shipped to the Census Operations Office at Jeffersonville, Ind.

In the early fall of 1964, the Jeffersonville Operations Office completed the last steps in the advance mailing of A1 questionnaires to "box occupants" as follows:

1. Collating the prepared post office label cards to the edited computer listings.
2. Tying and labeling bundles.
3. Sacking and tagging mail bags.
4. Dispatching A1's so that they reached their final destination prior to the following dates for the start of enumeration:

November 9, 1964
Colorado
Connecticut
Florida (southern portion)
Idaho
Maine
Massachusetts
Michigan
Minnesota
Montana
Nebraska
Nevada
New Hampshire
New Jersey
New York
North Dakota
Oregon
Pennsylvania
Rhode Island
South Dakota
Texas (southern portion)
Utah
Vermont
Washington
Wisconsin
Wyoming

November 16, 1964
Delaware
Illinois
Indiana
Iowa

November 16, 1964--Continued
Kansas
Kentucky
Maryland
Missouri
Ohio
Virginia
West Virginia

November 23, 1964
Alabama
Arizona
Arkansas
California
Florida (northern portion)
Georgia
Louisiana
Mississippi
New Mexico
North Carolina
Oklahoma
South Carolina
Tennessee
Texas (northern portion)

The A15 Special Farm Cards were assigned a code, e.g., "D" for urban. The name and address section of each card was microfilmed and a label produced by xerography. The labels generated from the A15 cards were attached to envelopes which were stuffed with an explanatory form letter (A17-L) and an A1 questionnaire.

The mailing pieces were delivered to the Jeffersonville Post Office at the appropriate time so that they would reach their destination just prior to the start of the enumeration.

In dispatching the 7,800,000 questionnaires from the Jeffersonville Post Office, it was necessary to time delivery at destination so that postmasters could distribute the questionnaires about 2 days before the actual enumeration was scheduled to start. The Jeffersonville Post Office established a pickup schedule for optimum delivery timing. Post office trucks loaded and departed in accordance with that schedule. This dispatching was performed from October 28 to November 16, 1964.

Enumeration Districts and Enumerator Assignments

An enumeration district (ED) was a geographic area consisting of one, a part of one, or a combination of more than one township, town, district, or other similar subdivision of a county. The number of ED's for the entire United States totaled 37,124.

To aid in securing a complete enumeration within the time period allotted for enumeration, the United States was divided into 22,899 enumerator assignments (EA's). Each EA was made up of one ED or more and comprised an area that one enumerator could reasonably be expected to canvass within a 3- to 4-week period as indicated by enumerator performance records for the 1959 census.

Prior to the enumeration, the ED's were classified into four groups on the basis of (1) the density of dwellings in relation to the number of farms, as

indicated by the 1959 Census of Agriculture, (2) the 1960 Censuses of Population and Housing maps and State highway maps, and (3) the enumeration procedure to be followed. The use of a different enumeration procedure for each group of ED's was designed to limit the cost of enumeration without increasing significantly the risk of missing farms or other places with agricultural operations.

The ED grouping and enumeration procedures were as follows:

Group A--In general, ED's with no well-defined cluster of dwellings were considered to be open-country areas and constituted group A. For each ED in group A, the enumerator was required to list the name of every head of a household living in the ED and also the name of every person not living in the ED who had agricultural operations there.

Group B--Rural ED's in which the number of dwellings was large in relation to the number of farms were considered to be in group B. For each ED in group B, the enumerator was required to list the head of the household for all dwellings in the ED except for those on less than 1 acre of ground in built-up residential areas having 50 dwellings or more. The enumerator was also required to determine, by observation or local inquiry, whether there were any farms in the built-up areas and, if so, to obtain an agriculture questionnaire for each of them.

Group C--Most incorporated places and unincorporated villages having approximately 150 dwellings or more were designated as separate ED's and were classified in group C. The places enumerated in those areas during the 1959 Census of Agriculture were listed in the Enumerator's Record Book prior to the 1964 enumeration. The enumerator was required to visit and enumerate or otherwise account for each place listed in his record book. In addition, he was instructed to ask at each of these places if there were any farms or other places with agricultural operations in the ED, and, if so, to add them to his list and enumerate them.

Group D--This group of ED's comprised two distinctly different types of areas. This group included enumerator assignments in cities and built-up areas adjacent to cities and also in a few rural areas where farms or ranches were scattered over a relatively large area. Enumerators were given a card listing the name, address, and other information for each person who had a farm in the area in 1959 or who might have agricultural operations in 1964. In cities and built-up areas, enumerators were instructed to contact the persons on the list by telephone to determine if the person had operations on the place in 1964. Enumerators were required to list any other persons having agricultural operations and to obtain agriculture questionnaires from them. In rural areas, the enumerator was instructed to ask each person on his list if there were other agricultural operations in his area and, if so, to secure the name and address of the operator.

FIELD ORGANIZATION

Staff Requirements

The field organization established for the 1964 Census of Agriculture comprised 12 agriculture regional supervisors, 40 regional assistants, 116 agriculture field assistants (AFA's), 1,823 crew leaders, and 22,713 enumerators. The 12 supervisors were career employees of the Census Bureau's Regional Office staffs, as were about one-fourth of the regional assistants. Some three-fourths of the regional assistants were recruited through regional referral sources and qualified through a modified version of the Federal Service Entrance Examination.

Regional office staffs were supplemented with clerical personnel for the processing of personnel actions and for payrolling the AFA's and crew leaders. The total clerical build-up approximated 25 persons, some of them on a part-time basis.

Although the function of the regional assistants was to oversee the AFA's, the demands of the reporting system were so heavy that most regional supervisors found it necessary to utilize one of the regional assistants in the office, thereby reducing the effectiveness of the 1 to 3 ratio of regional assistants to AFA's in the field operation.

The principal duties of the Agriculture Field Assistants were: (1) recruiting crew leaders to train and direct the enumerators, (2) arranging for crew leader training space, (3) obtaining local publicity for the census, and (4) assisting the regional offices in handling administrative problems as they arose during the census. As their jobs required constant travel, they were not provided with an office or clerical assistance.

Firstline supervision was the responsibility of the 1,823 crew leaders who recruited, trained, and assigned enumerators, reviewed completed work for acceptability, and approved enumerators' claims for payment on the basis of the review. Crew leaders reported progress, hours of work, and miles of travel directly to the regional offices.

Recruitment

Primary sources for the recruitment of AFA's, who in turn recruited the crew leaders, were designated by the Federal Administration. Initial contacts with the sources were made in June 1964 by letters requesting nominations of candidates for the 116 AFA positions. Candidates for these top supervisory positions were required to pass a written qualification test, as were all other levels of candidates.

AFA recruitment lagged seriously, placing considerable strain on regional staffs during the early part of September. In several instances, AFA selections were made so late that those selected did not have time to complete the self-study training prior to attendance at group sessions.

Previous census experience had indicated that approximately 8 percent of the crew leader candidates would fail to complete group training. The replacement percentage for the 1964 census was almost precisely the usual 8 percent.

An innovation in recruitment procedures which worked out quite successfully was that the AFA's were instructed to lay the groundwork during their crew leader recruiting to establish enumerator testing sites and to obtain lists of candidates for the crew leaders' use in recruiting enumerators. As a result, the enumerator recruitment period was shortened by about 1 week.

Table 2. ENUMERATION REFERENCE DATA

Regional office and State	Number of agriculture field assistants	Number of crew leaders	Number of EA's[1]	Number of ED's
United States.	114	1,829	22,899	37,137
Atlanta Regional Office.....	16	252	3,323	5,008
Alabama.....	3	49	695	948
Florida.....	2	26	330	759
Georgia.....	3	46	564	1,126
Mississippi.....	4	63	802	1,000
Tennessee.....	4	68	932	1,175
Boston Regional Office.....	3	39	439	688
Connecticut.....	([2])	5	64	80
Maine.....	1	11	111	192
Massachusetts.....	1	9	104	124
New Hampshire.....	1	6	69	120
Rhode Island.....	([2])	1	10	11
Vermont.....	([3])	7	81	161
Charlotte Regional Office.....	16	263	3,413	4,579
Kentucky.....	4	64	840	1,108
North Carolina....	5	86	1,141	1,495
South Carolina....	2	36	466	702
Virginia.....	3	52	676	857
West Virginia.....	2	25	290	417
Chicago Regional Office.....	11	182	2,400	3,862
Illinois.....	4	[4]63	759	1,571
Indiana.....	3	[5]48	650	1,029
Missouri.....	4	71	955	1,262
Dallas Regional Office.....	14	250	3,168	5,340
Arkansas.....	3	45	603	804
Louisiana.....	2	37	473	735
Oklahoma.....	3	50	644	1,198
Texas.....	6	118	1,448	2,603
Denver Regional Office.....	9	133	1,492	2,522
Arizona.....	1	10	91	172
Colorado.....	2	26	293	523
Kansas.....	3	58	720	1,062
New Mexico.....	1	16	159	342
Utah.....	1	12	126	206
Wyoming.....	1	11	103	217
Detroit Regional Office.....	7	124	1,534	2,364
Michigan.....	3	56	681	1,015
Ohio.....	4	68	853	1,349
Los Angeles Regional Office.....	5	63	750	1,259
California.....	4	59	720	1,167
Nevada.....	1	4	30	92
New York Regional Office.....	2	46	533	696
New York.....	2	46	533	696
Philadelphia Regional Office....	5	80	967	1,671
Delaware.....	([6])	3	34	64
Maryland.....	1	15	187	240
New Jersey.....	1	9	111	146
Pennsylvania.....	3	53	635	1,221
Seattle Regional Office.....	7	100	1,182	2,153
Idaho.....	1	19	225	397
Montana.....	2	25	297	477
Oregon.....	2	27	309	584
Washington.....	2	29	351	695
St. Paul Regional Office.....	18	291	3,647	6,606
Iowa.....	4	72	907	1,602
Minnesota.....	4	64	811	1,562
Nebraska.....	3	44	554	795
North Dakota.....	2	33	375	753
South Dakota.....	2	29	341	704
Wisconsin.....	3	49	659	1,190
Alaska.....	([7])	1	5	36
Hawaii.....	1	5	46	80

[1]There were 22,713 enumerators. Some enumerators handled more than one enumerator assignment (EA).
[2]Included with Massachusetts.
[3]Included with New Hampshire.
[4]Number of crew leaders for Illinois includes 5 used in test counties.
[5]Number of crew leaders for Indiana includes 5 used in test counties.
[6]Included with New Jersey.
[7]Included in Seattle AFA.

Training of Personnel

The training of field personnel was accomplished at the following five levels:

1. Regional supervisors
2. Regional assistants
3. Agriculture field assistants (AFA's)
4. Crew leaders
5. Enumerators

The basic item of training, common to all five groups, was the enumerator self-study package. This package was designed to supply all the concepts and procedural instructions required for the conduct of the enumeration. From 12 to 16 hours were required to complete the self-study course and to take a test. The self-study approach to training at all levels was an innovation in major census training.

Nearly 2 calendar years and about 8 man-years were spent in developing the field training materials, including the following:

Record Book (form A9): The Record Book contained the A2 listing form for every dwelling

and place in the ED on which there were agricultural operations at any time in the year; forms for the travel and work record; enumerator's reimbursement and payroll voucher; forms for enumerator's daily report, etc. A similar book was prepared for Puerto Rico (form A9PR).

Reference Book (form A10): This was a guide for the enumerators which contained general instructions about the job; the reasons for the census; definitions; and detailed instructions for filling in census forms and handling problems.

Training Book (form A20): This instruction manual was designed to permit the enumerator to learn his job by self-study methods.

Crew Leader's Instruction Book (form A30): This was also a self-study training manual, with instructions on recruiting enumerators; scheduling assignments; issuing portfolios and assigning self-study training; supervising the census enumeration; and closing out the census.

Crew Leader's Workbook (form A39): This book contained forms for the AFA's enumerator recruitment report; recruitment guide and enumerator orientation; scoring key, selection aid for census enumerators; schedule of crew leader duties; records of enumerators; weekly report; payroll voucher and employee's summary, etc.

Agriculture Field Assistant's Instruction Book (form A60): This manual defined the responsibilities of this position, the primary one being the recruiting and maintaining of a qualified staff of crew leaders and supervising the census to its satisfactory completion.

Agriculture Field Assistant's Workbook (form A69): This record book contained forms for the recruitment checklist; record of applicants and assignments; record of enumerator candidate recruitment; progress report; payroll voucher and employee's summary.

Instructor's Guide (form A90): Every topic the instructor was to cover during training sessions was included in the guide. It contained detailed suggestions for presentation, timetables, and check lists.

In January 1963, after conferences with other government agencies, the initial training for the project was undertaken by an outside consultant and two assistants from the American Institute for Research who participated for 3 months. The first step was a 2-week training course for those who would write the self-study course. The project began with six writers and the two assistants.

The first training package was tested in Minnesota and West Virginia in April 1963. Twelve enumerators in each State were trained, observed, and tested under controlled conditions. Analysis of the results indicated that a new approach was required, one directed toward a typical day in the course of the enumeration rather than an exhaustive discussion of each of the various components, such as the questionnaire and map reading. The material was rewritten, and in June and July 1963 it was tested in Iowa and South Carolina under controlled conditions involving much less supervision and counseling, but including observation of the field enumeration.

Analysis of these tests indicated the need for a second rewrite to rearrange the sequence and to incorporate the 1964 census enumeration materials. (Previously, 1959 census forms had been used.) At this point the writing staff had decreased to three, and an editor from the American Institute for Research was employed. The rewritten materials were used in the November 1963 pretest which was conducted in 12 States, employing 12 crew leaders and 153 enumerators.

During the spring and summer of 1964, the enumerator's training package was again revised, this time to reflect the latest changes in the 1964 census procedures. Printed copies of this package were not available until the end of September. (The writers, meanwhile, had prepared crew leader training materials.)

Approximately 50 persons, including members of the Washington staff of the Bureau of the Census and the U.S. Department of Agriculture, were trained in October to become technical instructors for the training of crew leaders which was scheduled for October and November.

Regional supervisors and their assistants attended a 2-day training session in Washington, took the self-study training course, participated in the 2-day training of AFA's, and observed crew leader training sessions in their respective regions. Some of the regional assistants were selected as crew leader trainers and thus attended an additional week of technical training in Washington. The 2-day group training of AFA's was conducted at 10 locations throughout the country.

Crew leaders were required to complete the enumerator self-study training and also to attend a 4-day group session. One such session was held in each area supervised by an AFA.

Enumerator training consisted of the self-study course plus a half day of on-the-job training by the crew leader. During this half day the crew leader scored the test taken by the enumerator, conducted a mock interview, and accompanied the enumerator on as many actual interviews as time permitted.

FIELD ENUMERATION

Enumerator's Duties

The enumeration of the 1964 Census of Agriculture was the responsibility of the census enumerators. Each enumerator was assigned a specific area--such as a township or a combination of adjacent townships--to enumerate. The enumerator was given a detailed map for the area assigned.

Except in urban and built-up residential areas, the enumerator was required to visit each dwelling (or place) in his assignment, list the head of each household, and obtain answers regarding agricultural operations on the place. For places having agricultural operations, the enumerator was required to obtain a completed agriculture questionnaire. If the agriculture questionnaire had already been filled out by the farm operator, the enumerator examined the agriculture questionnaire for completeness and accuracy and completed the questionnaire as necessary.

A census of agriculture listing form, form A2, was used in the 50 States to insure full coverage and to assist the enumerator in determining when to fill in an agriculture questionnaire. On this form the enumerator was to list, in accordance with prescribed procedures, the heads of households living in his enumeration district and persons not living in the enumeration district but having agricultural operations there. Then, through a series of screening questions, it was determined (1) whether an agriculture questionnaire was required, (2) whether this enumerator or some other enumerator was to fill in the questionnaire, (3) when a callback should be made to complete the questionnaire, and (4) whether the crew leader needed to take any action to complete the enumeration. The A2 forms were bound into a Record Book (form A9), which also contained form A11, Travel and Work Record; form A12, Enumerator's Reimbursement and Payroll Voucher; and a supply of form A14, Enumerator's Daily Report Postcard.

In built-up residential areas outside of urban areas, the enumerator was required to visit and to list on the A2 listing form only places with agricultural operations. In urban areas, the enumerator was given a list of farm operators in 1959 in his assignment and was required to enumerate the places operated as farms in 1959 or to explain why they were no longer in scope for his enumeration. In addition, he was instructed to make diligent inquiries in an effort to locate and enumerate every agricultural operation in his assignment, even though he did not have a listing for the place. He was to ask the respondent listed at each place he visited if there were other places with agricultural operations in his ED. If there were, he was to list and enumerate them. To assist in obtaining an enumeration as complete as possible, enumerators were required to plot on the detailed map of their assignment area the location of each dwelling or place listed on the A2 listing form and, in all or part of nine States (Colorado, Kansas, Minnesota, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, and South Dakota), to indicate on a special map the location of the land comprising each place for which an agriculture questionnaire was filled. Enumerators were also given lists of special and large farms located in their assigned areas. (See p. 14.)

The enumerator was required to plan and follow an orderly route of enumeration within the boundaries of his assigned area in accordance with established written procedures. As the enumerator listed a place in his Record Book, he indicated its location by copying onto his map the number of the line on which he listed it. This numbering system indicated the enumerator's route of travel and helped both the enumerator and his crew leader to determine the extent of the coverage of the enumerator's assignment at any given time.

The enumerator was not given a precise definition of a farm, but was instructed to observe broad criteria to insure as complete coverage as possible. He was instructed to obtain an appropriately filled questionnaire from every "place" considered by its operator to be a farm, and for every other place which reported one or more of the following agricultural operations at any time during the year:

1. One or more head of cattle, 4 or more hogs, 30 or more chickens, or 30 or more turkeys or ducks.
2. Any grain, hay, tobacco, or other field crops grown.
3. A combined total of 20 or more fruit trees, grapevines, and planted nut trees.
4. Any vegetables, berries, or nursery or greenhouse products grown for sale.

After the questionnaires for these places were filled out, a computer editing program determined which of them represented farms under the census definition. (See chapter I, p. 5.)

Field Review of Enumerator's Work

A detailed review of each enumerator's work during the enumeration period was made by the crew leader. He had specific instructions and procedures for this review and was required to record the results of his review in order to determine the action to be taken. In order to detect enumerator misunderstanding of instructions or failure to use the correct procedure, the crew leader spent approximately 4 hours with each enumerator on the day on which he started his enumeration. Under this procedure, only two enumerators were to start enumerating each day and the time lag between the start of the first enumerator and the start of the last enumerator varied from 3 to 9 work days. Before the enumerator was permitted to start enumerating, his answers to questions on the written test that he had completed at the end of his training were checked, and the instructions relating to any answers that were incorrect were reviewed with him. The crew leader went with the enumerator and observed his completion of one or more agriculture questionnaires. At each visit, the crew leader was to follow a clearly defined procedure for observing the enumerator's conduct of interviews and for checking and recording the results of his review of the enumerator's listings, maps, questionnaires, and other forms for accuracy and completeness. Enumerators whose work was unsatisfactory were asked to resign or were replaced by other enumerators. Enumerators whose work contained a significant number of errors were given additional instructions and the crew leader made another review of their work sooner than he would have done otherwise.

When the enumerator submitted his questionnaires, records, etc., for his enumerator assignment as complete, his work was reviewed in detail before his claim for payment was approved. Crew leaders were to make specific checks to determine whether the enumerator's work was satisfactory, and the result of each check was recorded.

Administrative Control of Field Operations

The reporting and control system devised for the 1964 census was conceived to provide (1) a means of quickly identifying crew leader districts where progress was slow, so that the regional offices might take remedial action, (2) current information on costs to develop overall budget controls, and (3) a more accurate

basis for planning the next census than had been available previously.

To provide a basis for measurement, each regional office was provided with an "estimate control" showing anticipated progress and costs by crew leader districts and by weeks against which the actual progress and costs would be measured. The reporting system developed for this purpose produced three summary reports: (1) Report of Crew Leader Recruitment; (2) Report of Enumerator Recruitment, Induction, and Review; and (3) Summary of Enumeration Progress.

Crew leader recruitment reports for each region were compiled weekly, based on reports received from the AFA's on form A67 each Thursday. On Monday, the regional summaries were transmitted by wire to Washington where they were consolidated into a national report.

The Report of Enumerator Recruitment, Induction, and Review was compiled at each regional office from weekly reports filed by the crew leaders on form A37 each Friday. Regional and AFA totals were telegraphed each Monday to Washington where national summaries were compiled weekly. The AFA reports (form A72) and the regional reports (form A73) followed by mail. The summary of enumeration progress was obtained from the enumerator's daily report of cumulative progress and costs (postcard form A14). The summary of enumeration progress included such information as assignments completed, questionnaires completed, hours worked and miles driven by the enumerators, hours worked and miles driven by the crew leaders, and callbacks pending.

The reporting system was effective in identifying crew leader areas which were lagging in progress so that corrective measures could be taken promptly. However, the crew leaders and enumerators sometimes failed to meet their reporting deadlines and the reports were frequently incomplete. A survey of 18 States showed that some crew leaders failed to report for the time between the last weekly report and the enumerator's completion of his assignment. The degree of underreporting was estimated at about 1.5 percent. Such information as reported was quite accurate, however, according to the program developed for the validation of progress reporting.

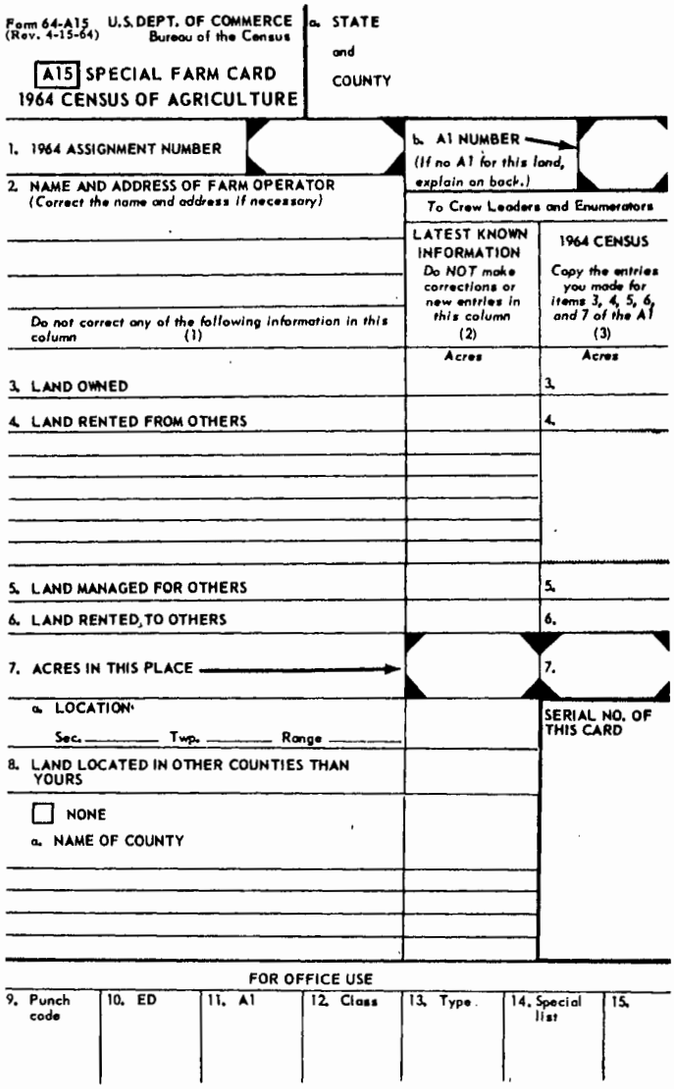
Quality Control

Although crew leaders conducted a formal review of enumerator work in earlier censuses, notably in 1959, a statistical quality control procedure for the field work was used for the first time in an agricultural census in 1964. Crew leaders inspected a sample of items on a sample of questionnaires, tallied errors, and took action on the enumerator as a result of the review. (See chapter V, p. 34.)

PROCEDURE FOR HANDLING LARGE AND SPECIAL FARMS

Because of their large contribution to the total agricultural production, special efforts were made to assure complete enumeration of large and special farms. Prior to the enumeration, lists totaling approximately 737,000 persons were prepared on the basis of records obtained from the 1959 census and from Federal and State agricultural agencies and other sources. The 88,600 farms that in 1959 were being operated in most incorporated places and unincorporated villages having approximately 150 dwellings or more were listed in the Enumerator's Record Book before they were issued to the enumerators.

Figure 2. FORM A15--SPECIAL FARM CARD



Form 64-A15 (Rev. 4-15-64) U.S. DEPT. OF COMMERCE Bureau of the Census

A15 SPECIAL FARM CARD
1964 CENSUS OF AGRICULTURE

a. STATE and COUNTY

1. 1964 ASSIGNMENT NUMBER

b. A1 NUMBER (If no A1 for this land, explain on back.)

2. NAME AND ADDRESS OF FARM OPERATOR (Correct the name and address if necessary)

To Crew Leaders and Enumerators

Do not correct any of the following information in this column (1)	LATEST KNOWN INFORMATION Do NOT make corrections or new entries in this column (2)	1964 CENSUS Copy the entries you made for items 3, 4, 5, 6, and 7 of the A1 (3)
	Acres	Acres
3. LAND OWNED		3.
4. LAND RENTED FROM OTHERS		4.
5. LAND MANAGED FOR OTHERS		5.
6. LAND RENTED TO OTHERS		6.
7. ACRES IN THIS PLACE →		7.
a. LOCATION: Sec. ____ Twp. ____ Range ____		SERIAL NO. OF THIS CARD
8. LAND LOCATED IN OTHER COUNTIES THAN YOURS		
☐ NONE		
a. NAME OF COUNTY		

FOR OFFICE USE

9. Punch code	10. ED	11. A1	12. Class	13. Type	14. Special list	15.

For all other farms for which the enumerator was given a list, appropriate data (see figure 2 above) were entered on the cards. These Special Farm Cards were prepared for the following types of farms:

1. Large agricultural operations enumerated in the 1959 census, usually representing farm operations of 1,000 acres or more.
2. Special farm operations such as nurseries and greenhouses; cattle and sheep feedlots; garbage hog feeders; lessors of 1,000 acres or more of U.S. or State-owned land; operators of dairy farms selling milk directly to consumers; institutions such as prisons, hospitals, schools, etc.,

that had agricultural operations; operators of cranberry bogs; operators of hop farms; operators of large poultry farms; persons raising broilers under contract, etc.

3. Operators of special farms in areas where a considerable proportion of the operators did not live on the place they operated. These included most wheat growers who had a wheat allotment in the States of Colorado and Montana and parts of the States of Utah, Washington, and Oregon; all large producers of rice in California and Texas; owners of citrus groves in California and Florida; and nearly all cotton growers who had cotton allotments in Arizona and New Mexico.

4. Persons who had farms in 1959 (for which an A1 was received) and those who might have agricultural operations in 1964 in cities and built-up areas adjacent to cities and also a few in rural areas where farms or ranches were scattered over a relatively large area.

Photocopies of these card lists for the farms within their assigned areas were issued to the enumerators for use as aids in obtaining complete enumeration. The enumerator was instructed to obtain an agriculture questionnaire for each listed farm in his area or to write an explanation on the card list as to why an agriculture questionnaire was not required.

In most cases the crew leader had a duplicate copy of the lists given to enumerators in his area for use in checking enumeration completeness and coverage. As an aid to checking coverage and enumerator performance the crew leader was given estimates based on the 1959 census of the number of questionnaires required in each enumeration assignment area within his district, and of the estimated mileage and enumeration time required to complete the enumeration.

Chapter III. Processing the Data

PLANNING

Since the 1964 Census of Agriculture was the first U.S. agriculture census to make extensive use of the large computer processing equipment, a great premium was placed on careful advance planning, thus further lengthening the preparatory phase for statistical processing. The efficient, economical, and timely use of this equipment required the preparation and testing of a large part of the data-processing procedures and programs in advance of their use.

Programs were prepared and tested to (1) edit and code the questionnaires received, (2) compute and analyze basic area coverage, (3) prepare analytical tables for technical review, and (4) prepare publication tables. A Master Identification Tape, with codes and names, was prepared to facilitate preprinting of field and internal control lists.

In constructing the system, many subprograms were coded and tested individually. These were then integrated into 16 very large programs. The edit of the data collected for all forms (questions 1 to 306) required more than 25,000 instructions and utilized the entire core memory capacity (65,000 words) of the 1107 computer.

PREPUNCH PROCESSING

Receipt and Check-in of Returns

The initial processing step was the check-in to establish control over the receipt of filled-in questionnaires and the inspection of each enumerator's portfolio to see that all required forms had been filled in and that the enumeration was complete. Cartons of crew leader and enumerator portfolios were forwarded to the Jeffersonville Operations Office by crew leaders throughout the United States, except from the designated Florida counties. As few as 10 or 12 portfolios arrived daily in the early part of December 1964. Later in the month of December and through January and part of February, daily receipts included as many as 1,500 portfolios. Nearly all of the 23,000 enumerator and 1,829 crew leader portfolios had been received by the end of May 1965.

The receipt and check-in operation in Jeffersonville involved unpacking the cartons, verifying identification items of the portfolios, recording the number of portfolios received each day from each State, and inspecting the enumerator portfolios to make sure that all necessary material had been returned. These materials included the A1 questionnaires, a map of the enumeration area, an A9 Record Book which included the enumerator's listing of residents in the area (A2 listing), and the enumerator training kit. If any of these items was missing, a referral record was completed and the portfolio was forwarded to a field liaison staff person for completion.

Enumerator portfolios with no problems and those with resolved problems were sorted by State and county and forwarded to a Special Livestock and Poultry Survey Unit for selection of a sample. (See chapter VII, p. 42.)

Review for Payroll Certification

The major purpose of the operation was to verify the enumerator claims for payment. It also served as a preliminary review of the EA portfolio contents for acceptable enumeration performance.

The crew leader in his final review of the enumerator's work had arranged and counted the A1's. If he found he had to complete the enumeration of any places in the assignment, he kept those A1's separated and called them "crew leader action" A1's. The A1's obtained by the enumerator were separated into two groups--one for "All sections required" questionnaires and the other for "Sections 9-13 not required" questionnaires. The "crew leader action" A1's were to be excluded from the payroll voucher claims. The crew leader completed a reimbursement and payroll voucher for each portfolio containing the A1's filled by the enumerator and mailed the portfolios to Jeffersonville.

The payroll review operation in Jeffersonville occurred immediately after the receipt and check-in of enumerator portfolios from the field. The payroll voucher was examined to assure that claims were reasonable and correctly calculated.

As a part of the claim verification, the payroll review clerk also reviewed for completeness the questionnaires included in the portfolio. A questionnaire was considered incomplete if certain key items were not reported.

Those portfolios having incomplete enumeration or gross misunderstanding of enumeration requirements were further reviewed and in some instances returned for additional enumeration. More than 1,600 EA portfolios were returned to the field offices for further enumeration.

All acceptable questionnaires were separated into three groups as follows:

Certainty A1's --Those A1's which for tabulation of sample data were given a weight of 1. These were generally questionnaires for large farms and for farms with unusual products. They included, but were not limited to, all A1's

for farms having 1,000 acres or more and those designated as "S" farms.[1] The entire questionnaire was to have been completed.

Sample A1's --Questionnaires with an A1 number ending in 2 or 7, and not qualifying as "certainty" questionnaires. The entire questionnaire was to have been completed.

Nonsample A1's --All other questionnaires. Sections 9-13 were not required for these questionnaires.

The significance of these groups is explained later in the section "Estimates Based Upon Reports for a Sample of Farms." A preliminary processing control count for each of these groups was made and posted to the portfolio label. The portfolio was reassembled and the operation verified by reviewing large changes on the payroll voucher and other items significantly affecting the enumerator's pay. After verification, the payroll voucher was sent to the finance unit for payment, and the portfolios were grouped by county and forwarded to the coverage evaluation unit.

Coverage Evaluation

The county coverage evaluation was an operation to review and evaluate preliminary information about each county to determine whether or not agricultural operations were adequately covered, and to initiate correspondence to improve coverage where evidence indicated incomplete or unsatisfactory enumeration. Some 165,000 pieces of correspondence were mailed to farm operators throughout the country in this operation.

The evaluation operation comprised six separate steps:

1. Coverage tabulation.
2. Accelerated screening for correspondence.
3. A15 card match and screening for correspondence.
4. Control operations.
5. Special A15 search.
6. Preparation of tenant search forms.

Coverage tabulation was basically the manual tallying of questionnaires in each county for preliminary data on total farm count, total acreage, acreage of cropland harvested, and number of farms having 1,000 acres or more. These data, which were used for coverage analysis, were posted opposite corresponding 1959 figures previously posted on the county worksheet. In specified counties, tobacco, cotton, and wheat data were also tallied for coverage evaluation.

The accelerated screening for correspondence was developed to identify incomplete questionnaires so that correspondence could be initiated immediately. A set of more than 30 preprinted form letters was developed for use in improving coverage of the 1964 census. In the 1959 Census of Agriculture, three form letters had been used--one for a coverage check, one for referrals, and a special questionnaire for information for sample items. For all other followup correspondence for the 1959 census, letters had been tailored to the individual situation and then individually typed. For 1964 the form letters were designed to simplify and expedite this phase of the work. They included a special "A1A Questionnaire" for obtaining information for the sample items. This form was used extensively since "nonsample" farms would often report information which qualified them for transfer to the "certainty" group, thus requiring sample information. Several other letters were developed which asked for data for specific groups of items printed on the back of the letter. These letters were devised so that reported figures could be entered and the respondent asked to confirm or correct the figures reported for his operation.

The A15 match and screening for correspondence consisted of: (1) matching approximately 600,000 A15 Special Farm Cards to corresponding A1 questionnaires to ensure complete coverage, (2) examining A1's and A2 listing books for completeness, and (3) indicating where correspondence was necessary.

The control operations included: (1) completing the county coverage worksheets by computing percentage changes from 1959 to 1964 and totaling the entries, (2) obtaining counts, by county, of pieces of correspondence which would have to be sent out, and (3) reassembling portfolios for further processing.

A special search for A1's was performed for some counties for which a number of A15's were not matched. This search consisted of examining portfolios for contiguous enumeration areas and, in some cases, contiguous counties in an effort to locate a matching A1.

In 360 counties in the Southern States, agriculture questionnaires for landlords leasing land to others or having land worked on shares by others were matched and checked with questionnaires for the lessee or tenants. The objectives were twofold: (1) to insure that acres in their farms, crops harvested, etc., were not included for the same land on the agriculture questionnaire of the land owner as well as on the agriculture questionnaire of the lessee or tenant, and (2) to insure that all tenants reported by landlords had been enumerated. The following materials were required for this operation: EA portfolios, a list of Southern tenant counties, tenant search cards (form A-51-64), and the county tenant index (form A-51-65). A tenant search card was prepared for every tenant reported on the landlord's A1. On the county index a line was prepared for every landlord reported on a tenant's A1. Each card was compared to the index and matched.

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[1] Questionnaires requiring special handling because of farm size, unusual products, or possible enumeration difficulties were known as Special Farm A1's. These A1's were all associated with A15 cards and identified by a designation on the A15 card. The designations were the following:

S--Indicated a farm of considerable size, large volume of sales, or unusual products. (All certainty farms.)

X--Indicated a farm with possible enumeration complications (duplication, combination, or easily overlooked).

XS--These A1's had properties of both "X" and "S."

"S" farms were isolated in order to confirm the enumerator's request for payment of "all sections completed." These had to be indicated as "certainty" not only for payroll but also for other processing requirements.

This tenant search served in place of the multi-unit questionnaire which formerly had been used to enumerate landlords and tenants in those areas where the local usage does not conform to the census definition of a farm. The tenant operating land on a crop- or share-basis frequently does not consider himself as operating a farm and might be omitted by the enumerator unless identified from a secondary source.

A general review of the materials for each EA, including the arrangement of ED's within the EA in alphabetic order by ED suffix (i.e., F-Z) and the arrangement of A1's within each ED in numeric sequence by type and by ED, was performed as the last step of coverage evaluation. The portfolios were then forwarded for editing and coding.

Verification of coverage evaluation--For the tabulation phase, verification was by means of an independent tabulation of a 2-percent sample of each clerk's work, at first; the sampling was later changed to one EA per clerk per week. There was 100-percent inspection of the county work sheets by a comparison of an independently calculated sum from subtotals to the posted total and by the relationship of the totals of the different types of farms. Approximately 18 percent of the worksheets had posting errors. There was an average of 30 errors per 100 worksheets.

Verification of the work on the A15 Special Farm Cards (and resulting correspondence) was handled as follows: 100-percent verification of all EA's for an operator in training until an EA was found to have five or fewer errors, at which point the operator was considered qualified; for qualified operators, 100-percent verification of a 10-percent sample of the EA's from each county (with a minimum of one EA per county); for special counties where the A15 search was on a county basis (in addition to an EA basis), 100-percent verification.

The acceptance of the A2 listing books was based on a sample check of one-half of the listings from every third page. Rejected listing books were verified 100 percent, as were those for EA's which the professional staff considered suspect.

In the tenant search phase, an operator qualified with two consecutive EA's having less than four errors each, based on a 10-percent sample of the A1's for landlords with tenants. EA's with four errors or more were verified 100 percent. The work of qualified operators was checked by a 10-percent sample of A1's for landlords with tenants from a 4-percent sample of EA's from that operator's work. Statistical quality control of the enumeration is discussed in chapter V. (See p. 34.)

Precomputer Editing and Coding

The precomputer editing and coding operation was essential to ensure that each questionnaire was properly and thoroughly prepared for punching and computer processing. This operation was performed by clerks, technical assistants, and agricultural statisticians.

The editing performed by clerks included the following:

1. Review of questionnaires to select questionnaires without data entered for significant items, for referral to agricultural statisticians.
2. Deletion of fractions and ensuring that data items were entered so that they could be transferred to punch cards.
3. Selection of questionnaires with notations that could significantly affect data for an item or items, for review by agricultural statisticians.
4. Review of correspondence regarding a questionnaire and transfer to the questionnaire of the data corrected or supplied by the correspondence.
5. Entering codes for counties in which part of the farm was located, miscellaneous crops irrigated, animals sold, and farm products covered by contracts.
6. Selection of agriculture questionnaires for review by agricultural statisticians. Selected questionnaires included those for all farms with a value of farm products sold of $100,000 or more, farms with 10,000 acres or more of land in farms, farms operated by managers, etc.

The coding of miscellaneous crops (seed, vegetable, other field crops, berry, and fruit crops for which a specific question was not included on the questionnaire) required the entry of approximately 10,000 codes. The coding of irrigated crops required the entry of 107,000 codes. The coding of miscellaneous livestock and poultry items required the entry of 134,000 codes, and coding of farm products under contract required the entry of approximately 200,000 codes. The coding verification, which was done for a 10-percent sample of the agriculture questionnaires, indicated that 2.7 percent of the necessary codes were omitted and 1.3 percent of the codes were incorrect, before correction of the portion verified.

During the editing and coding process, the clerks assigned a referral code to all problem questionnaires. All A1 referral cases were reviewed by a technical assistant. Those which the technical assistant could solve on the basis of written instructions, either because they involved only operational problems or because standardized solutions had been authorized, were corrected as required. If they involved subject-matter problems or the exercise of personal judgment, the referral cases were forwarded for review by agricultural statisticians. Verification records indicate that approximately 1 percent of the agriculture questionnaires that should have been selected for referral were not referred.

The questionnaires reviewed by agricultural statisticians and corrected when necessary by them or clerks working directly under their supervision included:

1. Questionnaires for farms with a value of farm products sold of $100,000 or more (according to the 1959 census), agriculture questionnaires for farms in the Eastern and Southern States with 1,000 acres or more or for farms in the Western States with 5,000 acres or more. These questionnaires totaled approximately 80,000.
2. Approximately 3,100 agriculture questionnaires for abnormal farms (farms operated by institutions, Indian reservations, grazing associations, schools, etc.).
3. All agriculture questionnaires with 10,000 or more chickens 4 months old or over, 10,000

or more turkeys raised, 500 or more hogs, 100 or more litters farrowed, 500 or more cattle, and 20 acres or more in orchards, vineyards, or planted nut trees. These questionnaires totaled approximately 77,000.

4. All questionnaires for farms reported as operated by a manager. These questionnaires totaled approximately 20,000.

5. Agriculture questionnaires completely blank.

6. Agriculture questionnaires with 1,000 acres or more of land in a county or counties other than the county in which the farm headquarters was located. These questionnaires totaled less than 23,000.

7. Agriculture questionnaires with problems, including those that were incompletely filled, and those requiring correspondence.

Approximately 480,000 questionnaires were referred to agricultural statisticians. Approximately 15,000 letters were written and 3,000 or more telephone calls were made by agricultural statisticians for the purpose of obtaining additional information needed for completing questionnaires or handling problems.

Editing and Coding Verification

The quality of the editing and coding of the agriculture questionnaires was controlled on an individual operator basis. A sample verification of a dependent nature was used for this control, i.e., the verifier saw what the operator had done. It incorporated two principles of quality control: (1) lot acceptance--where lots of poor quality were verified on a 100-percent basis, and (2) process control--where operators failing to maintain the quality standard were retrained or removed from the operation.

This procedure was based on the EA portfolio as the primary unit. The quality decisions were made on the basis of the results of verification of the individual portfolios or on a combination of portfolios. Sampling was of A1 questionnaires within each portfolio. Each sample questionnaire was verified on a 100-percent basis.

Although the sampling unit was the A1 questionnaire, an error was identified with the individual actions required on a questionnaire. Initially, all errors were defined as critical. That is, one error was as important as another and all errors were counted in making a decision. About one-fourth of the way through the operation a distinction was made in types of errors. Deletions and conversion of fractions, alphabetics and units of measures, illegible entries and referral of questionnaires were defined as noncritical. They were recorded but were not considered when making a decision. These noncritical errors accounted for approximately 18 percent of the total errors.

Procedures for the editing and coding operations were modified when that operation was about one-third completed. This modification, to broaden the scope of work which the editor-coders were allowed to do, had no noticeable effect on the quality of the work.

There were five phases of verification. Four of these phases dealt with the editor-coders directly. Three of the four were used to control the operator and the operations. The fourth was a retaining phase. The fifth phase was a verification of the verifier's work but is referred to as preverification since the subsample was selected prior to verification:

1. Productive training (100-percent verification)--During the early learning period, 100-percent verification was used. Information on the individual's work was collected and fed back to him as a training exercise. An editor-coder was required to complete one portfolio with an error rate of no more than 5 percent in order to start his sample qualification phase. This had to be accomplished within six portfolios, starting with the third verified portfolio. Approximately 3.4 percent of the EA's were verified in this phase with an average of 9.3 errors for every 100 A1's.

2. Qualifying (10-percent verification)--The requirement to qualify as an editor-coder was established as five consecutive accept decisions within a maximum of 10 decisions. Only one disqualification (less than five consecutive accepts) was allowed in this phase. A decision was based on the verification results from a pair of EA portfolios. This decision was used as the control for both the process and for qualification. Approximately 10 percent of the EA's were verified in this phase with an average of 6.3 errors for every 100 A1's.

3. Qualified (5-percent verification)--The clerical decisions used in the control of the process were based on a sample of questionnaires from five portfolios. The requirements were established as a maximum of two consecutive reject decisions. A clerk was allowed only one disqualification. The EA portfolios were controlled on an individual basis. Approximately 86 percent of the EA's were verified in this phase with an average of 6.3 errors for every 100 A1's.

4. Refresher training (100-percent verification)--This phase was added to the basic procedure for retaining clerks who had disqualified in either the "qualifying" or the "qualified" phases. The requirements in this phase were the same as for productive training. Approximately three-tenths of 1 percent of the EA's were verified in this phase with an average of 4.8 errors for every 100 A1's.

5. Preverification--A two-tenths of 1 percent sample of A1 questionnaires was selected from approximately one-half of the portfolios. This sample was a subset of the verification sample and was selected prior to verification. It is estimated that the verifier missed approximately 22 percent of the errors.

Final Arrangement of Questionnaire

In the final arrangement operation, questionnaires in each of the enumerator portfolios were readied for the card punching operation. An enumerator portfolio included all the questionnaires, sequentially numbered by the enumerator, obtained for the area assigned to that enumerator. Questionnaires from each portfolio were first separated by enumeration district (ED).

Table 3. SPECIFICATIONS FOR EDITING AND CODING VERIFICATION

Item	Phase				
	Productive training	Qualifying	Qualified	Refresher training	Preverification
Verification rate.....	100%	10%	5%	100%	0.2%
Type of control.....	-	Process control lot acceptance	Process control lot acceptance	Process control lot acceptance	Quality check
Unit of measure for decision	EA portfolio	Operator, EA: 2 EA portfolios	(1) Operator: 5 EA portfolios (2) EA--1 EA portfolio	EA portfolio	-
Sample size.....	100% variable lot	Variable av.=24	(1) Variable av.=30 (2) Variable av.=6	100% variable lot	20% sample of Al's from 25% sample of EA's
Quality requirements (average outgoing quality limit--AOQL--95% level)....	1 EA with 5% or less error within 6 EA's but not before the 3rd EA	*5 consecutive accept decisions within 10 decisions. 3 or fewer errors for a sample of 24	(1) *Less than 3 consecutive reject decisions. 3 or fewer errors for a sample of 30 (2) 5 or fewer errors for a sample of 30	1 EA with 5% or less error within 6 EA's but not before the 3rd EA	-

*One disqualification was allowed from each.

Table 4. RESULTS OF EDITING AND CODING VERIFICATION

A. Verification

Phase	Total		Al's verified	Errors[1]	Errors per 100 Al's	Al's with error[1]	Error Al's per 100 Al's
	EA's	Al's					
Total.....	22,797	3,255,381	306,676	208,467	6.40	186,276	5.72
Productive training (100%).....	782	118,523	118,523	11,001	9.28	8,981	7.58
Refresher training (100%).....	76	11,848	11,848	568	4.79	504	4.25
Qualifying (10%).....	2,389	363,080	35,850	2,271	6.33	2,060	5.75
Qualified (5%).....	19,550	2,761,930	140,455	8,845	6.30	7,931	5.65

[1]Weighted totals. Average number of errors per Al in error = 1.13. Distribution of error by type: critical, 82.2%; noncritical, 17.8%.

B. Preverification

Sample rate	EA's sampled	Al's sampled	Coding errors	Missed errors		Miss rate	
				Verified	Preverified	Verified	Preverified
1 in 50 (1 in 25 EA's, 1 in 20 Al's)..	472	3,702	333	73	37	21.92	11.11

For each ED, questionnaires were arranged by processing type (certainty, sample, and nonsample). Within each of these types the questionnaires were sequenced by the number assigned by the enumerator. At the beginning of each ED, an ED "breaker sheet"[2] containing control counts was placed before the nonsample questionnaires, then "separator sheets"[3] were placed before each of the following sample and certainty groups. At this stage, those questionnaires for farms identified as having $100,000 or more value of products sold had been included in the certainty group. In addition, an EA "breaker sheet"[2] was placed in front of each EA with a count of the number of ED's in the EA.

During this operation, unnecessary materials--such as the enumerator's map, A9 Record Book, Problem Referral Slips, etc.--were removed from the portfolio and filed for later reference. A review was made to insure the presence of all questionnaires previously indicated as temporarily removed from the portfolio. Final EA control information was then posted to the EA portfolio label and the portfolios were forwarded to the card punching unit.

For each clerk there was 100-percent verification of the final arrangement of questionnaires until an EA was found with no errors, then a 20-percent sample verification of EA's. If an error was found during sample verification, there was 100-percent verification of the preceding and succeeding EA's for the clerk until one EA in each direction was found free of error. Sampling was repeated at that point. Approximately 7 percent of the EA's had one or more errors; there was an average of 10 errors per 100 EA's.

CARD PUNCHING AND CARD-TO-TAPE OPERATIONS

String Punching

Data from the questionnaires were transferred to punchcards and from the cards to magnetic tape. In this process a technique known as "string punching" was applied to the card punch operations and the verification of punching was performed on a computer. (See chapter I, p. 4.)

To encompass the entire range of agriculture activities, the farm questionnaire contained 355 questions, many of which were in several parts. For any given farm many questions had no answer, since no farm included all activities.

For the 1964 census a new method of recording the farm information on punchcards was inaugurated. An entry was punched for a field on the questionnaire only if it contained an entry. There were no fixed field sizes so the numbers were keyed in as they appeared with no "preceding by zeros." This method necessitated the punching of an identification for the question and the punching of a field separator for those questions which contained more than one field. The questionnaire was divided into segments identified by letters (see p. 22). These letters were always punched, even if there was no answer to a question in the segment. This method was intended to prevent inadvertently overlooking a whole column, or page, of questions.

In order to ascertain the number of cards for a farm, and to keep the cards in the correct order, cards were automatically serialized, starting with 01, in columns 79 and 80. An "end of farm" code, which was punched in column 78 when the space bar was depressed, identified the last card for the farm. The automatic serial number punch device reset to 01 after it punched the serial number in the card identified as "end of farm."

Still another feature of this method was that when an error was recognized the card did not have to be destroyed. A "kill code" was punched and repunching was started in the next column

This method of punching was possible since the data on the cards were put on magnetic tape and processed on an electronic computer. The data on the punched cards were transmitted electronically to Washington through the use of a data transmission system.

Punching Data Files

Punch operations began in February 1965 and continued until February of 1966. Approximately 16.4 million cards were punched, 15.5 million in punching the basic files and 0.9 million in repunching cards to correct data rejected by the computer. These figures include both production files and verifying decks. Due to budgetary requirements, the punch operation was limited to about 30 operators during fiscal year 1965, and was accelerated to about 100 operators in fiscal year 1966 in order to meet the scheduled completion date. The average number of cards punched daily per operator was 1,280 in production files and 1,000 in verifying decks. The average number of cards punched per farm was 4.1. This figure covers both production files and verifying decks, and includes errors flagged as "killed." The folios were released for punching on the basis of complete work units[4] consisting of from one to nine counties.

The Type Separator Sheet, placed in front of each of the three types of farms, was not punched but was used to facilitate the card punching operation. (See preceding section on "Final Arrangement.") The ED breaker sheet, placed in front of the questionnaires for

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[2] An identification sheet that served as a separator and label for enumeration assignments and enumeration districts.

ED breaker sheet. This sheet separated the A1's for each ED in the assignment. In addition to identification information, the ED breaker sheet showed A1 counts by type. This sheet also acted as the separator sheet for nonsample A1's.

EA breaker sheet. Part of the portfolio label. This breaker sheet contained an identification portion and an area for punch unit information.

[3] Identification sheets used in the punching operation to separate the three types of A1's (certainty, sample, and nonsample) in the portfolio.

[4] A unit of work maintained in processing operations consisted of the A1 enumerator portfolios for one or more counties within a State, all of which were in the same economic subregion.

each ED, contained control counts of the number of farms by each type of farm within that ED. The EA breaker sheet, placed in front of the questionnaires for each EA, provided a control count of the number of ED's in the EA.

For punching purposes the agriculture questionnaire was divided into 11 segments. These segments were designated by letters A to H and S, T, Y. The agriculture questionnaires for which data were punched contained more than 17 million segments with data.

Verification

A three-way match of independently punched samples, performed on the computer, was substituted for key verification as the method of measuring errors and making quality decisions. Key verification was not practical because of certain features of the string punching system used. Two verifying decks for each EA were punched by two different operators as a basis for verifying the data files. If the card from the original deck matched that of at least one of the verifier decks, the operator's work was considered correct.

Immediately following the punching of cards for an EA, a control clerk selected and marked a sample of questionnaires for verification punching. When the production puncher was in a status other than qualified,[5] the control clerk selected a 10-percent sample; when she was in the qualified status, the control clerk selected a 4-percent sample.

Each of the two verifying punch operators punched cards for the questionnaires selected by the control clerk, using the same string punch method as the original production operator. In addition to punching cards for farms included in the sample, the verifying puncher punched a card for each ED breaker sheet contained in the EA portfolio. Statistical quality control of card punching is discussed in chapter V. (See p. 34.)

In order for the data from the punchcards to be edited and tabulated on the computer, it was necessary for the data to be arranged by questionnaire item. This operation, known as formatting the record, was performed by a computer. Because of punching errors and coding errors, some of the data from the punchcards could not be formatted, either because the item code was invalid or because the number of data fields which had been punched for the item was inconsistent with the number of data fields required for the item.

Organization of Card Files

The EA breaker sheet, attached to each EA portfolio, was the document used for recording details of punching and verifying the EA. The entries showed the identification of the operator who had punched the production deck and the two operators who had punched the verification decks, the level of verification required, and the status of the particular operator who had punched the production deck, along with the date the cards for the EA were punched. After the production and verification decks were completed, the EA breaker sheet was punched, 100-percent verified, and placed in front of the data cards for the EA. The EA breaker card provided the information needed for the reporting of the operator's quality in the computer runs that were made after the file was transmitted to Washington.

When punching of the second verifying deck was completed, the cards were checked, and the three decks for the EA stacked in order, i.e., the first verifying deck (V1), the second verifying deck (V2), and the production deck (P3). The required checkout was performed and the cards sent to central control for an edit performed on the 491 Census Editing Machine for invalid punch combinations. Minor corrections were made by that office; however, the section that punched the cards for the EA was called upon to reconcile usual errors. An EA passing edit moved on to the work unit assembly area of central control.

The 491 operator who had performed the edit operation copied the 491 reading for the total card count and for the error card count (those cards containing impossible combination of punches in one or more columns). When all errors were identified and marked, normally the questionnaire from which the card had been punched was located in the folio in order to correct the card accurately. Tallies were made of all cards corrected. The total card count was posted as the "491 count."

Final assembly--When the cards for the last EA in a work unit had been sent to the assembly point, the 491 count posted for each EA was accumulated to obtain a total card count for the work unit. This count was posted on the control sheet as "1013 Control" and accumulated a second time to insure accuracy.

Staging for Transmission

Each work unit was prepared for transmission by inserting four special cards in front of the file and one behind the file. These cards were:

1. Two normal cards--These two cards were generated by the 1401 computer program to define card columns 1-60 when printed on the 407 tabulating machine. They represented all 10's and units positions of card columns 1-60, and all positions had to be indicated properly when printed on the 407.
2. Work unit label card--This card contained the State code, from one to nine county codes, Z sentinels, a mnemonic identification, exception code, work unit number, and work unit supplement number. The work unit supplement number was used to identify EA's to be repunched or corrected EA's within a work unit. The exception code was used for special conditions. This record was derived from the original label on the Univac tape.
3. Beginning sentinel record--This card consisted of "Z" characters in columns 1-12, followed by serial number and card number. This record indicated that data would begin with the next card.
4. Ending sentinel card--The last record of each file was an ending sentinel card in the same format as item 3 above and indicated the end of the file.

[5] During the qualifying period, the operator in productive training punched seven EA's. Of these seven, at least three consecutive EA's had to be acceptable for the operator to qualify.

If a work unit contained more than 15,000 cards it was split into two or more parts so that no single transmission exceeded a 15,000 card run. Each part contained the two normal cards, the work unit label card, a beginning sentinel in the front of the file, and an ending sentinel card at the end of the file.

Data Transmission

Pretransmission test--To assist in substantiating the operational readiness of the data transmission program--to read 1964 census data from IBM punch cards and record on Univac tape--a data line system test deck containing 51 cards was the first transmission each day from Jeffersonville to Washington. The test deck was checked on the IBM 1401 computer, and the IBM 7702 Tape Terminal operator informed Jeffersonville of the results of the 51 card test deck processing. If the results were correct the operator indicated the fact in the log. If results were incorrect the test deck was checked and, if it was accurate, the work was retransmitted.

Nondata oriented error checks, notifications, and corrective actions included:

1. File label checks.
2. Input completeness checks, a system employed to insure that there were neither duplications nor omissions of sections of the input data (e.g., processing 14 EA's instead of 15, processing one county twice, etc.).
3. Tape processing errors.
4. Internal processing errors.

Card-to-tape--At a scheduled time each day, completed work units were transmitted to Washington through the 1013/7702 data transmission system. An IBM 1013 Card Transmission Terminal at Jeffersonville read the punch cards and the data were transmitted to an IBM 7702 Tape Transmission Terminal at Washington where they were recorded on IBM magnetic tape. When an entire work unit had been transmitted, the 1013 operator recorded the control count minus 5, to deduct the count of the extra transmission cards, on the work unit control sheet. He called the count to the 7702 operator, and held the work unit and its control sheet in a suspense status until the work unit had been processed on the 1401 computer and a count of cards received was obtained. When the work unit had been processed on the 1401 computer, the operator in Washington checked to see whether or not it was in tolerance. If the 1401 count of data cards was within 0.1 percent of the control count (total of 491 counts) the work unit was accepted, even if the 1013 count was not in tolerance. If the 1401 count of data cards was not in tolerance the work unit was set aside for investigation.

Tape-to-Tape Conversion

Data transmitted over the Data Transmission System and recorded on IBM tape by IBM 7702 Tape Terminal were converted by the IBM 1401 computer to Univac IIA tape for further processing on the Univac 1107 computer. During this operation, the data were sequence checked, reformatted, and edited for basic errors in the identification. Each work unit was a separate IBM input tape.

Input organization--Six types of record images were present in the work unit:

1. Normal records (two records; the first represented the 10's position and the second record represented the units position to form character numbers 0 through 0 by use of the 1 8 two records).
2. Work unit label record.
3. Beginning sentinel record.
4. EA breaker records.
5. ED breaker records.
6. Farm records.

Three decks were present for the EA, and each deck was in sequence by ED.

Transcription program on 1107 computer--The basic farm data, in the compact "string punching" format, were assembled for each farm and then arranged into one continuous variable length farm record with segment codes, item codes, and data fields. EA and ED breaker records containing control counts were retained in the data file and in their original format. Control counts in the ED breaker were checked to the computer count of each type of farm processed in the ED, and differences representing missing or extra farms were used as a factor in tolerance checks. The number of ED's processed in each EA was accumulated and checked to the predetermined counts entered in the EA breaker, and any differences between the counts caused the EA to be rejected. EA's were given all tests regardless of whether they failed previous tests so that all error conditions could be recognized and corrected at one time. Error counts of these types were tabulated at ED and EA levels and excessive errors at either level caused the entire EA to be rejected. Error rates of 3 percent at ED level and 2 percent at EA level were allowed.

The work unit's data, in the expanded format, were transmitted to tape for further processing by the computer in the verification computer run. When data for an EA were rejected by the tolerance tests, they were flagged as invalid but not deleted in order to perform the verification process in the computer run that followed.

A "transcription/consistency run" performed the following functions: transcription from IIA to IIIA tapes; removal of "killed" data; error checking; and the establishing of the EA diary to provide a history of error counts, control counts, and information needed in the final analysis of each EA.

The data sort program was used to sort data tapes which had been found to be out of sequence during the 1401 tape conversion.

Verification run--A geographic control tape for each State was used as input to the verification run to ensure that acceptable data were written for all portions of a work unit. This format control tape specified the geographic entity comprising the work unit, such as the ED's required in each EA and the EA's required in each county. In subsequent processing, the work unit identification in the input data had to agree with the control tape, or the work unit was rejected.

In the verification run, a three-way match of independently punched samples of the input was performed. This was a scheme by which errors were measured and quality decisions made. The diary record

was updated with additional error counts and other decisions made on the acceptability of the data from the standpoint of quality and completeness.

A "Tailored Operator Sort" was made to: (1) establish and update records of the keypunch operators; (2) establish and update summary records of the three types of decks; (3) provide a tape to be printed which contained operator and deck summary records; (4) accumulate tapes of production deck error items; and (5) provide daily notification of operators' change in status and invalid status codes for new and rejected operators.

Tolerance checks--Data for each work unit were subjected to various tolerance checks at the farm, ED, and EA levels. Each farm record was examined for missing or duplicate segment codes, missing or extra end-of-farm codes, and missing or duplicate serial numbers. Data for an ED were rejected if (1) the number of certainty farms counted in the processing differed from the count stored in the ED breaker, (2) the ED composite error count, increased by one for each farm with three or more errors, exceeded four errors, or (3) the percentage of errors in the ED exceeded 3 percent (derived from dividing the ED composite error count by the total farms in the ED). Data for an EA were rejected if (1) the EA composite error count, accumulated for all ED's in the EA, exceeded six, or (2) the result of the division of the EA composite error count by the total number of farms in the EA exceeded 2 percent.

A county composite error rate was obtained by dividing the number of composite farm errors for all acceptable EA's by the number of farms in the county. If the county tolerance rate was greater than 1 percent, the county failed the tolerance. The individual EA's were then subjected to the same check. If the error rate for an EA was greater than 1 percent, the EA was returned to the key punch section for correction.

The 1107 program performed edit and evaluation operations which resulted in three separate reports. They were titled Diary Format, Operator Status, and Operator Report, printed out from 1107 report tapes, then sent to the 1401 computer for conversion to IBM tapes and transmission to Jeffersonville by the 7702 Tape Terminal. There the data were punched into cards by the 1013 Card Transmission Terminal and the cards listed on an IBM 407. At the end of each conversion, the 1401 printed the total number of input and output records and blocks for each report as well as the total number for the entire report tape. These totals were used as control figures and were relayed during voice communication between the 7702 and 1013 operators at the time of transmission.

Costs

Punching--The total cost of all Jeffersonville punching and control operations concerned with transcribing data from agriculture questionnaires to punchcards and transmitting the data to Washington was $617,000. This figure includes: (1) planning and developing procedures; (2) punching the data files and verification decks; (3) correcting or repunching rejected data; (4) machine editing of invalid card codes; (5) assembling, controlling, and transmitting data by phone; (6) listing on the IBM 407 tabulating machine the computer generated reports of quality control information; and (7) related services such as modifying card punch machines, renting the Jeffersonville data transmission terminal, applying overhead charges, etc.

Computer processing costs associated with punching--The total cost of all work associated with computer processing was $390,000. This cost includes: (1) planning and development of specifications; (2) computer operations; (3) development and testing of computer programs; (4) rental of the Washington data transmission terminal; and (5) related costs such as magnetic tape rentals, applied overhead charges, etc. Computer time used was 800 hours, in total, on the 1401 computer, and 198 hours on the 1107 computer.

COMPUTER PROCESSING

Basic System

The system for processing the more than 3 million questionnaires consisted of three main phases, each with several subparts. Phase I involved edit of the raw data, imputation for certain specified classes of missing responses, and production of county diaries[6] for professional review and evaluation. Phase II involved making the corrections generated from the professional review and producing a set of preliminary tabulations by counties. These were used for the preliminary reports which were published by counties, States, regions, and for the United States. The other major product of this phase was a corrected, edited, weighted file of the detail data to be used in preparing the final tabulations. Phase III involved preparing the required tabulations for the final publication.

The processing chart in figure 3 (Edit, Diary, and Preliminary Report Production Sequence) depicts Phase I and Phase II. (See p. 25.) Phase I involved the following steps:

1. The basic data tapes produced by the card-to-tape operations were organized by county. These contained both the data for all farms (questions 1 to 306) and the sample data (questions 307 to 355). Hereafter, these are referred to as "100-percent data" and "sample data." These data, plus geographic control information (ED control tape), reference data (initial or "cold deck" parameters and Data Dictionary), and the program instructions were fed into the computer as input.

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[6]Computer printouts of the county totals for all 1964 data. MCD totals were shown for some items. Also shown were (1) ratios, computed from the 1964 and 1959 census totals, which showed the relationship considered by the subject-matter specialists in their review of the material, (2) summaries of changes to raw data introduced by the computer edit, (3) listings of specified individual AI's (usually very large operations), and (4) listing of individual AI's with unreasonable entries discovered during computer edit.

Figure 3. EDIT, DIARY, AND PRELIMINARY REPORT PRODUCTION SEQUENCE (FLOW CHART)

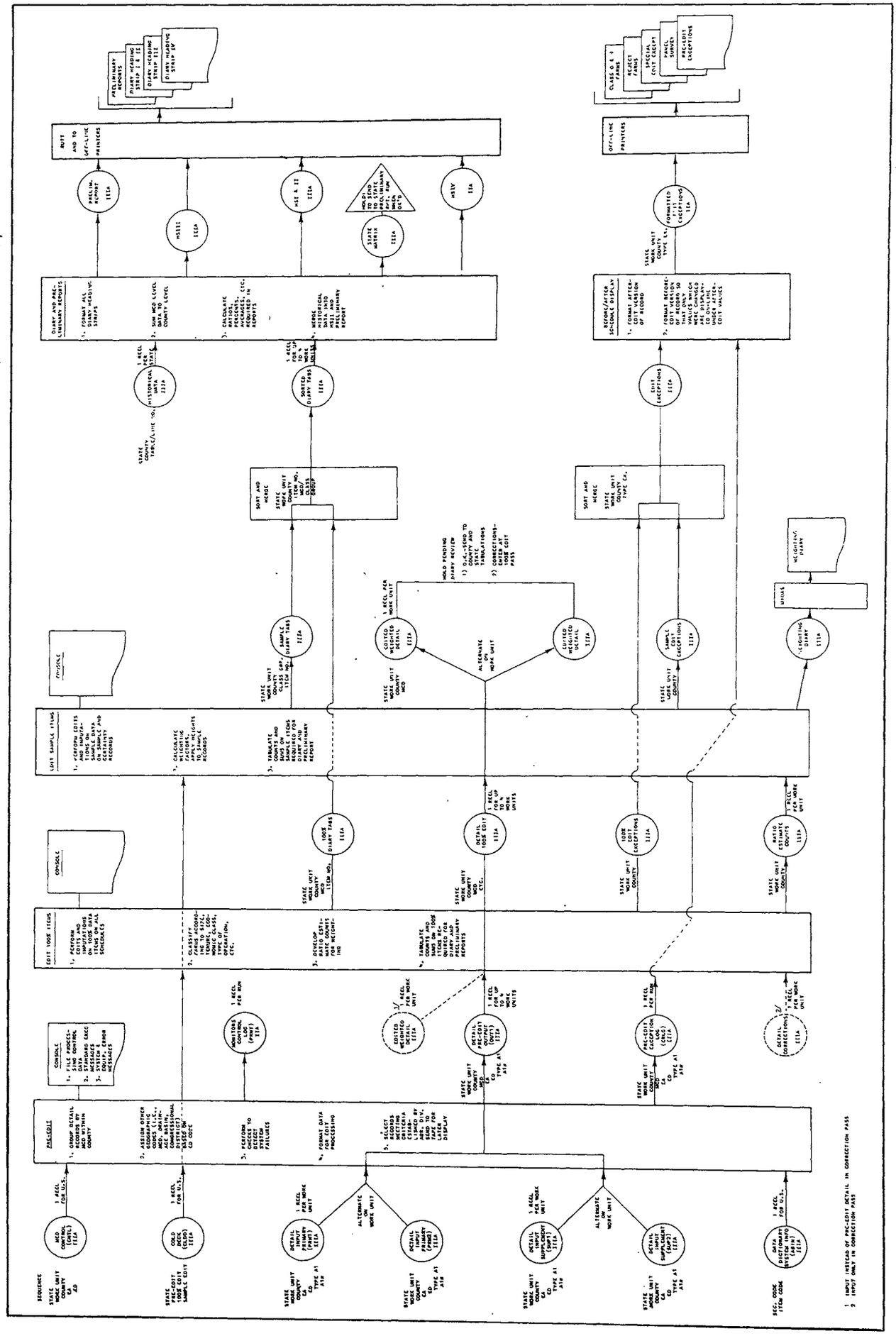
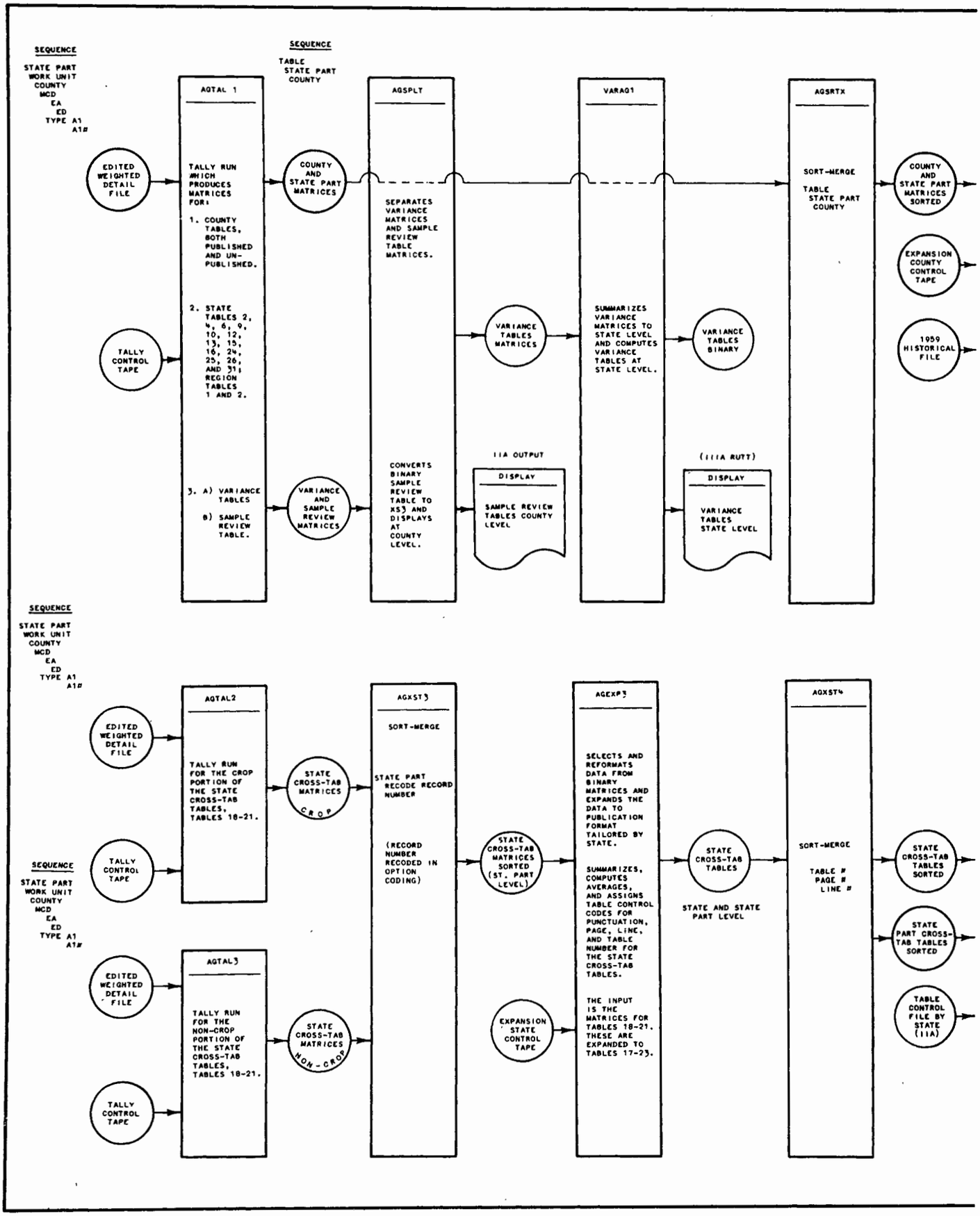
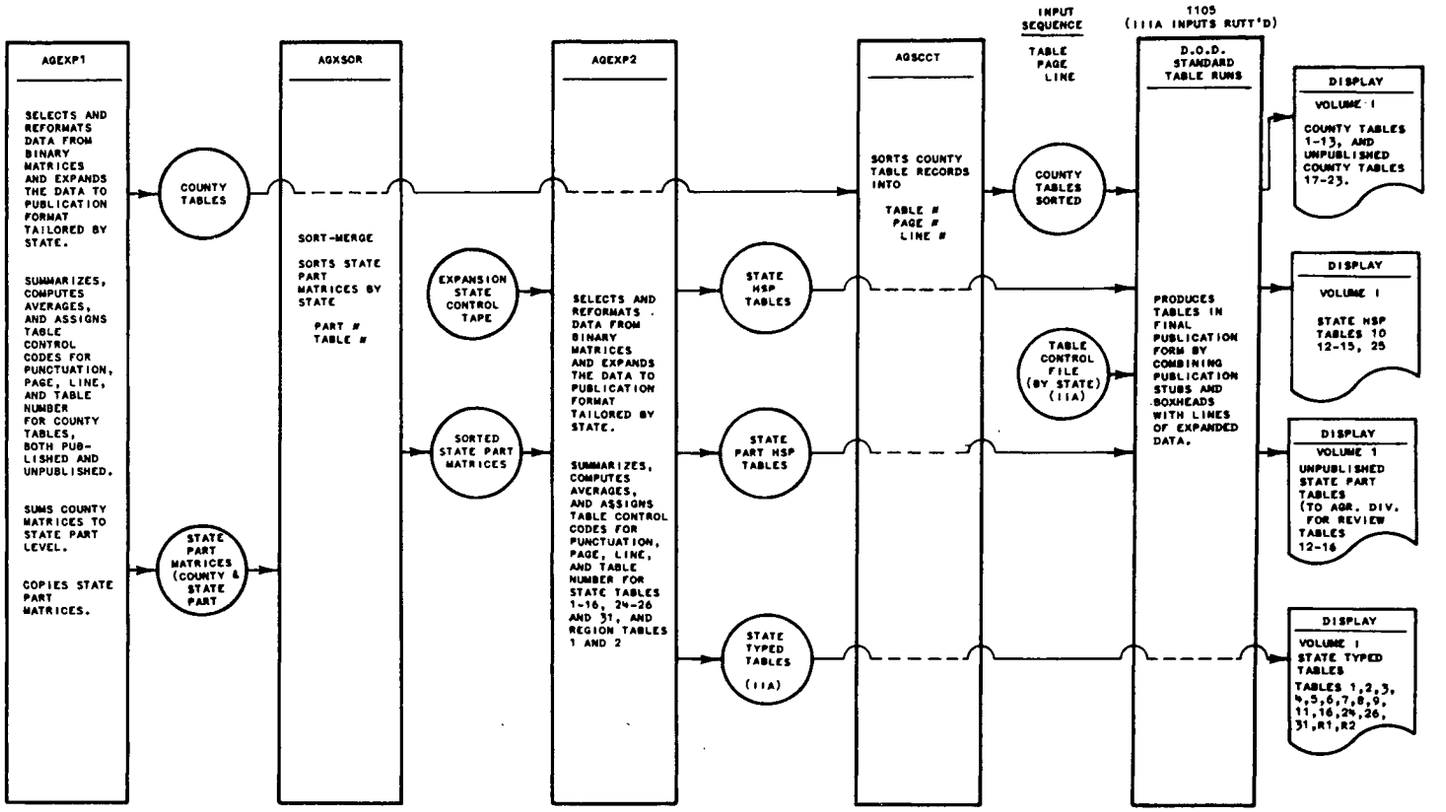
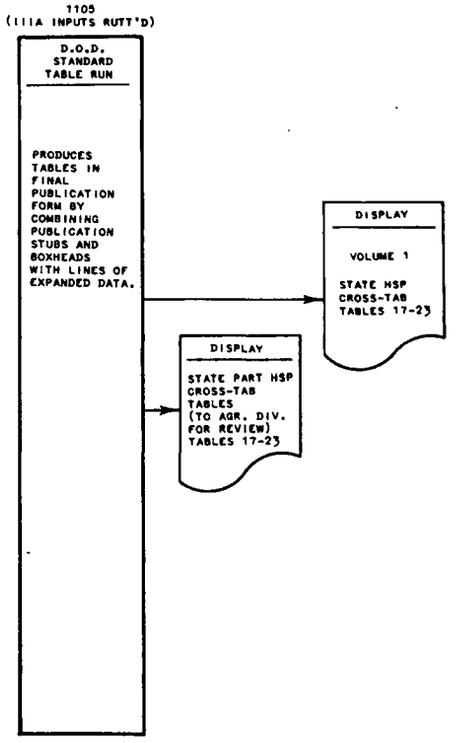


Figure 4. TALLIES THROUGH



TABLES SEQUENCE (FLOW CHART)





FUNCTIONS OF EXPANSION PROGRAMS

1. SELECTS TALLIES FROM COMPOSITE MATRICES.
2. BUILDS FROM INPUT MATRX PIECES THE OUTPUT TABLE RECORDS.
3. ARRANGES DATA IN PUBLICATION SEQUENCE, I.E., TABLE, PAGE, LINE, COUNTY.
4. SUMMARIZES DATA, I.E., DISTRIBUTION TOTALS, ITEM TOTALS, STATE TOTALS.
5. CALCULATES AVERAGES AND PROPORTIONS.
6. CALCULATES VALUES USING INVENTORY AND/OR SALES PRICES AND VARIOUS CONVERSION FACTORS REQUIRED BY TABLES (MILK, FIGS, ETC.)
7. ADDS 1959 HISTORICAL DATA WHERE APPLICABLE.
8. DETERMINES PAGE BREAKS USING PAGINATION PARAMETERS.
9. ASSIGNS TABLE CONTROL CODES FOR PUNCTUATION, PAGE, LINE, TABLE, ETC.
10. ALL OF ABOVE FUNCTIONS VARY BY STATE.

[1] EXPANSION COUNTY CONTROL.--THIS TAPE CONTAINS A FILE FOR EACH STATE. EACH FILE CONTAINS THE FOLLOWING DATA:

(1) TRUE COUNTY CODES
(2) PSEUDO COUNTY CODES
(3) HISTORICAL CONVERSION FACTORS
(4) MILK CONVERSION FACTORS
(5) TALLY MATRIX CONTROL BITS
(6) EXPANSION INPUT CONTROL
(7) EXPANSION OUTPUT CONTROL
(8) PAGINATION PARAMETERS

[2] EXPANSION STATE CONTROL.-- THIS TAPE CONTAINS A FILE FOR EACH STATE. EACH FILE CONTAINS THE FOLLOWING DATA:

(1) NUMBER OF STATE PARTS
(2) TALLY MATRIX CONTROL BITS
(3) EXPANSION CONTROL FACTORS
(4) INVENTORY PRICES

[3] TALLY CONTROL TAPE.-- THIS TAPE CONTAINS A FILE FOR EACH STATE. EACH FILE CONTAINS THE FOLLOWING DATA:

(1) COUNTY AND PSEUDO COUNTY CODES
(2) SALES PRICES FOR EACH STATE

2. The first computer program, known as the preedit, prepared the data for the main edit and imputation runs. The major functions performed were:

a. Grouping detail records by minor county divisions (MCD)[7] within county.

b. Assigning MCD, drainage basin, and congressional district codes based on ED code.

c. Performing checks to detect system failures.

d. Arranging data for edit processing.

e. Selecting records meeting criteria established by the Agriculture Division. These included reports of large or unusual items, system errors, inconsistencies, etc. These were printed out, with questionnaire identification, for professional review.

3. The control system on the Univac 1107 was used to obtain continuous processing of a work unit from the preedit through production of the diary. All of the detail data for a given work unit were processed by the preedit program and stored temporarily on magnetic tape. Without any intervention or setup operation, the program for edit of the 100-percent data was read into the computer, and processing of the detail data began from the intermediate magnetic tape which was not dismounted. This edit program had the following functions:

a. Performing edits and imputations on the 100-percent data for all questionnaires.

b. Classifying farms according to size, tenure, economic class, type of operation, etc.

c. Developing ratio estimate counts for weighting.

d. Tabulating counts and sums on the 100-percent items required for diary and for preliminary reports.

4. The system again allowed a continuous operation, and the process moved automatically to the next program, that of editing the sample data. This program performed the following functions:

a. Performing edits and imputations on sample data for sample and certainty questionnaires.

b. Calculating weighting factors, and applying weights to sample records.

Phase III, the tabulation phase (see figure 3), consisted of a series of computer tabulating runs followed by table preparation runs as follows:

1. Three passes of the edited, corrected, and weighted file developed in Phase I and Phase II were necessary to accumulate all of the tabulations required for publication and analysis. These three computer runs, called Tallies 1, 2, and 3, were built around a common framework. This framework utilized certain features of the Univac 1107 to allow accumulation of up to 80,000 sums with one pass of the detail file. These tally passes summed the data for individual farms at either the county level or State economic area level, depending on the type of data involved.

2. Once the data had been summed to the county level or State economic area level, they had to be manipulated to form tables and further summed to larger geographic areas such as States and economic regions. This was accomplished through a series of sorts and expansion runs (formatting for publication runs). In addition to formatting the tables for publication, these expansion runs calculated percentages, averages, etc., and inserted historical data for comparison purposes where required. Figure 4 depicts this flow.

3. In cases where many copies of the same basic table format were required, the actual production of the table in its finished format including stubs, headers, footnotes, etc., was accomplished in the computer. A special program designed to operate at about two-thirds normal speed was used to produce publication copy on the high speed printers. This copy was corrected by cutting and pasting and was photographed; plates were made; and the pages were printed.

Estimates Based Upon a Sample of Farms

The data for questions 307 to 354 of the A1 agriculture questionnaire were collected for: (1) all farms having 1,000 acres or more in the place; (2) all farms with a value of farm products sold of $100,000 or more; and (3) a sample of approximately one-fifth of the remaining farms. Since (1) and (2) included all farms in these specified categories, they were designated "certainty farms." Those in (3) were designated "sample farms." The enumeration procedures provided for enumerators to obtain the information for questions 307 to 354 for farms in categories (1) and (3). This was accomplished by two screening questions immediately preceding question 307. One asked if the questionnaire number ended in "2" or "7." The other asked if there were 1,000 acres or more in the place. If either was checked "yes," the enumerator was to obtain the sample information. The sample information for farms in (2) which were not in (1) or (3) was obtained by crew leaders, by mail, or by telephone inquiry to the farm operator at the time of office processing.

The data published for counties and States for questions 307 through 354 of the agriculture questionnaire are estimates for all farms. The estimating procedure, i.e., the ratio-estimation technique, used for computer weighting of the sample reports for the 1964 Census of Agriculture reduced the effect of possible biases introduced by enumerators, and the number of farms estimated on the basis of the sample was made exactly equal to the number of farms enumerated in each county. (See Introduction, Volume II, 1964 Census of Agriculture, p. XXVI.)

[7] These MCD's consisted of an ED or group of ED's and were used for the first level of tabulation and analysis beyond the ED/EA level; not to be confused with Minor Civil Divisions.

PRODUCTION CONTROL AND PROGRESS REPORTING

The progress reports for the precomputer processing operations provided a summary review of the many and varied processing steps being performed by the Census Operations Office at Jeffersonville, Ind. For the computer operations at Washington, the initial effort was concentrated on reporting and control of the planning, procedural programing, and necessary peripheral aspects to keep the staff and other interested parties fully aware of detailed progress in these categories. As computer production got underway, reports were generated to provide benchmark information on key operations on a continuous basis.

Chapter IV. Review of Tabulations and Tables

REVIEW OF TABULATIONS FOR PRELIMINARY COUNTY REPORTS

Scope and Materials Used

As part of the computer edit of questionnaires, a series of evaluation diaries was prepared to enable analysts to evaluate preliminary county results, to detect apparent inconsistencies in the data, and to initiate necessary corrections. The diary printouts consisted of preliminary county summaries; heading strips which displayed summary data for MCD's,[1] classes of farms, and counties; preedit diaries and edit diaries. Preliminary county summaries displayed county data for 1964 in table form and, where available, comparable data for 1959. The other printouts displayed A1's, segments of A1's, and summaries of the data displayed. The following printouts were used in the review:

Preliminary county summaries.

Heading strip I for nonsample items--Heading strip I displayed amounts, ratios, and magnitude of computer changes. The State, county, and item-field code appeared at the top of each page. For each item there was a line for each minor civil division (MCD) in the county. The last MCD line was followed by a county summary line.

Heading strip II--This strip displayed comparisons of county totals between 1959 and 1964. The data followed the county summary line of heading strip I.

Heading strip III--Certain specified items were printed. Some were punched items; others were derived. The State, county, and item code were shown at the top of each page. The format of the heading varied according to the item being displayed.

Heading strip IV--Information on irrigation for various crops was shown by State, county, and item-field code. For some items, data for both MCD's and counties were displayed. For others, only a county line was shown. All data for heading strip IV were after edit.

Preedit diary--The preedit diary was referred to as a "preedit exception listing." There were two types of conditions shown on the listing: (1) special reports (items exceeding the preedit limits) and (2) format exceptions (errors). The listing provided identification of certain conditions within an A1 and summaries of such conditions at the MCD, county, and work unit levels. Where a specified condition was discovered in the A1 record, all segments of the A1 were printed out. The identification of the exception preceded the A1 printout. After the last A1 printout for the MCD, an MCD summary was printed; after the last MCD, a county summary was displayed.

Special reports resulted when information in a data field exceeded the stipulated limit for an item. Conditions of this type were shown at the A1 and MCD levels.

Format conditions, displayed at the A1, MCD, county, and work unit levels, were classified by type of exception as shown in the list below:

Code	Explanation
1	Data could not be associated logically with the segment, or the data were missing.
2	An illegal or nonsequential item code had been transposed and accepted, or an item code was duplicated.
3	Item code was illegal within State being processed.
4	Illegal item code.
5	Excessive number of data fields for the specified item code.
6	Data format not acceptable for other reasons.
7	Data associated with segment E of the A1 (EV99).
8	A nonnumeric character found in data field.
All dups	Number of duplicate A1 numbers.

Edit diary--The edit exception listings provided identification of certain characteristics about the A1. When a specified characteristic was discovered, the listings for either certain segments of the A1 or the entire A1 were printed. The edit diary listings consisted of the following general categories:

Tag and store--This listing displayed A1's or segments of A1's having questionable entries that might or might not have been changed by the edit. This printout was later replaced by a "change directory" which identified most of the items changed by the edit and the questionnaires on which such changes had been made.

Class 0/9--The entire A1 record was displayed for each farm classified as "zero" or "nine." A "class zero" farm was one which had a total value of products of $100,000 or more. A "class nine" farm was one which was "abnormal." The A1's were displayed within an MCD by type and A1 number within that type.

Reject farms--The entire A1 record was displayed for each farm classified as "reject." A reject farm is one that did not meet the basic

[1] ED's or group of ED's used for first level of tabulation and analysis beyond ED/EA level; not to be confused with Minor Civil Divisions.

definition of a farm. The A1's were displayed within an MCD by type and A1 number within that type.

AV19 panel questionnaire--The AV19 panel questionnaire consisted of A1's that were coded 2-5 in the units position of item code AV19. These A1's had been previously designated as being part of the evaluation program. The different codes represented the A1's which were included in the various parts of the evaluation panel. They were displayed within MCD by type and A1 number within the particular type. The entire A1 record was displayed for each A1.

Not categorized--There were several conditions which, if present on the A1, caused it to be classified as "not categorized." If there was any illegitimate code punched in AV19, the A1 fell into this category. Also, any A1 that was nonmatched on the correction pass was displayed in the postcorrection edit listing under "not categorized." The entire A1 record was displayed, by type and A1 number within type.

The following information was displayed on the edit diary for each data item on the A1:

1. Number of farms reporting and quantity before edit.
2. Number of farms reporting and quantity after edit.
3. Number of changes made.
4. Net change in quantity.
5. Percent change.
6. Number of farms with entry supplied.
7. Number of farms with entry increased.
8. Total amount of increase.
9. Number of farms with entry deleted.
10. Number of farms with entry decreased.
11. Total amount of decrease.
12. Derived figures needed for analytical purposes such as averages per farm or per acre, percent of farms reporting, proportion of production sold, etc.
13. Corresponding 1959 data showing the 1959 farms reporting quantity and percent of increase or decrease from 1959 to 1964.

Professional Review

The professional staff reviewed the diaries, listings, and preliminary summaries for each county, and questionable data were noted. Instructions were sent to the clerical processing units to pull all A1's meeting criteria specified by the professional personnel. In some instances, when the problem questionnaire could not be located, it was necessary to pull all questionnaires that had the item in question.

The A1's pulled were forwarded to the professional staff who determined whether corrections were necessary. If changes made during the computer processing appeared to be in error or unreasonable, or when inaccuracies had not been corrected by the computer and the errors were significant, changes were made for those computer records. During this review the staff frequently discovered new problems which required the pulling of additional A1's. After the initial review, county figures were reexamined by a senior professional who, in some instances, would also request that other A1's be located.

In the initial stages of this operation substantial numbers of questionnaires were pulled and referred for many counties. Later the numbers declined for several reasons as follows: (1) Gain in experience by both the professional and clerical staffs; (2) correction of programing errors in the computer-edit program; and (3) revision of the computer-edit specifications.

Diary correction--After analysis of the computer diaries, corrections were entered on formatted sheets. These sheets were used as the source for punchcards which entered the corrected data into the computer system. Through the use of check-digit calculators and specially modified 026 punch machines, all corrections were subject to a check-digit system of verification.

The correction process consisted of four major operations:

1. Preparation of correction sheets.
2. Check-digit calculation.
3. Correction control and preparation of EA correction breaker sheets.
4. Punching of corrections.

Corrections were punched and carried to the computer record, the corrected records reedited, and a new diary and publication copy for the preliminary county report prepared. These reports were reviewed, new problems investigated, and necessary changes were carried to the publication copy without changing the individual computer record. The preliminary county report was cleared for publication and the tapes released for the processing of volume I tables.

REVIEW OF TABLES FOR FINAL PUBLICATION

Organization and Responsibilities of Staff

The initial printouts of the volume I tables were first reviewed in August 1966, but it was not until late in September that a full staff was available for this work. The last States were sent to the publisher on October 10, 1967. A total of 12 agricultural statisticians and five technical assistants was responsible for the professional review in Washington. In addition, about 10 clerks were employed on this work in Jeffersonville.

The professional staff was divided into the three major subject-matter areas--crops, livestock, and farm economics. In addition, one person was assigned the responsibility for the review of data on prices and values. During most of the processing period, one professional was in Jeffersonville on a rotation basis to guide the work done there.

The five technical assistants were mainly responsible for reviewing the table printouts for consistency within and among tables, locating problem questionnaires, carrying routine data changes to tables, and checking the consistency of tables before release. The clerical unit in Jeffersonville was responsible for locating problem questionnaires, making hand tabulations for special projects, correcting tabulating errors, and making statistical tables of unpublished county data.

The professional staff was responsible for locating tabulation errors, analyzing the data for reasonability and accuracy, reviewing problem questionnaires, deciding what and how data changes could be most efficiently carried to the tables, and carrying the more difficult changes to the tables. Sometimes it was necessary to decide whether changes to individual record data were necessary or whether adjustments to the totals would suffice.

Preproduction Processing

During the period August to December 1966, the professional staff reviewed preliminary table printouts for errors in sourcing and in programing. Tabulations for Rhode Island, Wisconsin, and Louisiana were reviewed for this purpose. For some of these States two or more reruns of all tables were reviewed for errors. Also, numerous test (partial) printouts were reviewed. For data on land values, a new computer listing was prepared to provide a quick means of locating errors for this item.

From the experience gained in reviewing these preproduction tables, it was found necessary to review all tables for all States and compare totals from one table to another in order to detect and correct tabulation errors.

Processing Procedures

Tabulations for actual processing were obtained for the first States late in December 1966. By this time the remaining tabulation errors could generally be corrected by hand, although in some cases, where hand corrections were not possible, data in error were noted as "not available" in the published volume. Each State had a number of tables which required significant hand corrections, but in only one State were the data corrections of a magnitude which required a correction pass of the tape and a rerun of the tables.

The work schedule called for completing the work on two States per week on the average. The flow of work was generally as follows:

1. Before a State was processed, technical assistants would quickly review the tables for obvious tabulation errors and compare some totals between tables. The tables were then divided into subject-matter areas and given to the professional staff.

2. An experienced member of each subject-matter branch would then make a detailed review of the tables for consistency and reasonableness of the data. In doing so, he would make up a criticism sheet describing the problem, error, or questionable data.

3. The senior professional in each branch then generally made a quick review of the tables for other problems. At this time he would also evaluate the problem items already listed on the criticism sheet and then decide what work, if any, was necessary on the data. It was necessary that specific instructions be provided on the criticism sheet to enable the technical assistants or the Jeffersonville clerical unit to locate problem questionnaires.

4. It was also necessary to review data changes which were to have been made as a result of the diary operations. These were in the form of actual printouts. The number varied from only a few in some States to several hundred in other States.

5. The questionnaires which were changed during the diary operation were on file in the Washington office. All other questionnaires were in the Census Operations Office at Jeffersonville. Therefore, the technical assistants first reviewed the criticism sheets and searched for the questionnaires in Washington. Problem items not located were then forwarded to Jeffersonville by mail or by phone.

6. When problem questionnaires were located, the professional analyst examined the data reported in relation to the totals in the statistical tables. Problems were of two general types--either (1) one or two questionnaires accounted for the problem, or (2) the questionable data were the cumulative result of items on, or handling of, a number of questionnaires. The situation was further complicated by the fact that errors were often buried in county totals but were obvious in State tables showing cross-classifications. If data were found to be in error, the decision on whether or not to correct was based on the significance of the error in relation to the county totals and cross-classifications, and on the time and resources available to carry the changes. Often the specific questionnaire causing an error found in the cross-classification tables could not be identified. In such instances necessary adjustments were made directly to the table.

7. Changes which could be handled by the technical assistants were made by them. Other more difficult changes were handled by the professional analysts. Because of limited clerical personnel and time, little or no verification of changes was possible. This resulted in some errors being published; the number was small and the errors generally were minor.

8. Upon completion of the changes, a quick review of the criticism sheets was made to insure that all problems had been satisfactorily resolved. The corrected tables were then released for publication.

Summary

Although no exact account of the total changes is readily available, it is estimated that one or more actual data changes were made on 100 to 200 questionnaires in the average State. In many cases errors in data were not significant at the county level and therefore were not easily located during the county review of the edit diary, but they were significant when farms were cross-classified at the State level. It was realized at the diary stage that not all errors had been located and that some correction procedures would be necessary at the volume I stage. Originally it was

planned that these corrections would be carried to the computer tapes and that hand corrections would not be necessary.

As both time and money were short, and there were unexpected difficulties in getting usable table printouts, shortcuts were necessary to meet the deadline. As a result, only the more significant and obvious errors were corrected for the preliminary reports. As it turned out, the large number of data changes made at the edit diary stage saved substantial time and effort in the preparation of tables for volume I of the final reports.

Chapter V. Statistical Quality Control

ENUMERATION

Although crew leaders conducted a formal review of enumerators' work in earlier censuses of agriculture, notably in 1959, statistical quality control of field work was used in a U.S. agricultural census for the first time in 1964. Crew leaders inspected a sample of items on a sample of questionnaires, tallied errors, and took action regarding the enumerator as a result of the review. Every assignment received a first and final review. If necessary, an assignment received a second review or a second final review.

For first and second reviews, the inspection included some items obtained by observing the enumerator rather than by inspecting A1's. All reviews included a check on the ED map, the A2 listing, nonsample A1 questions, and sample A1 questions. About 130 items were inspected on first review and about 400 on final review.

To simplify the computation of error rates, errors were divided by nonerrors rather than by items inspected. The maximum tolerable error rate decreased with each additional review to take into account the fact that retraining should progressively reduce the errors.

On first review, the enumerator was to be released if the error rate was .15 or more. If the error rate was between .10 and .15, the enumerator was to be scheduled for a second review and told that he had to improve by second review. If the error rate was between .05 and .10, the enumerator was to receive no further review until final review but was to be told that he had to improve before final review. If the error rate was less than .05, the enumerator was to be told that he was doing well and needed no review until final review.

On second review, the enumerator was to be released if his error rate was .10 or more. If the error rate was between .05 and .10, the enumerator was told that he had to improve some more in order to pass final review. If the error rate was below .05, the enumerator was told that he was now doing well.

On final review, there was only one standard of .05. If the enumerator was below that, the assignment was accepted. Otherwise, it was returned to him for correction and given a second final review. On all reviews until the last, enumerators were told what their specific errors were so that they could improve.

Table 5. PROPORTION OF SEGMENTS PUNCHED IN ERROR OR OMITTED AND PROPORTION OF ERROR REMAINING AFTER VERIFICATION

Category	Average	Productive training	Qualifying	Qualified	Disqualified
Number of segments verified	714,315	73,467	56,627	461,597	19,614
Proportion of error in keypunch operation:					
Keypunch error	.038	.071	.051	.038	.069
Omitted segments	.004	.011	.008	.005	.011
Proportion of error remaining after verification (and repunching of rejected EA's):					
Keypunch error	.036	.040	.041	.036	.049
Omitted segments	.003	.003	.001	.004	.003

CARD PUNCHING

The specifications for controlling the quality of the punching of data cards from agriculture census questionnaires allowed a maximum of 6 percent of the records for each section of the questionnaire to be in error and a maximum of one-half of 1 percent of each of the sections to be omitted. Operators unable to attain or maintain the level of quality specified were removed. Cards were repunched for EA's rejected during an operator's qualifying period, and for EA's with a high error rate after an operator was qualified.

The verification procedures, which were on an EA basis, have already been described in general terms in the section on "Card Punching and Card-to-Tape Operations" in chapter III.

There were two checks of the work: a consistency check and a quality check. The consistency check was performed on the production deck before the quality match with the two verification decks. This was a check of tolerances and of the consistency of specific types of data such as identification, control counts, missing or duplicated segment codes, card serial numbers, etc. Error counts were tabulated at the ED and EA levels.

Excessive errors at either level resulted in an EA rejection. Error rates of 3 percent at the ED level and 2 percent at the EA level were allowed. Once the EA's and ED's passed the required tests at those levels, they were combined and subjected to a 1-percent tolerance error check at the county level. If the county grouping failed, then each EA having tolerance error of 1 percent or greater was repunched.

The quality check was applied to each EA individually. Each EA had to pass two tests to be accepted. One test was for keypunch errors and the second was for omission of segments containing data. Failure in either resulted in an unfavorable decision. The number of segments and the number of error segments in the sample were compared to acceptance tables. Based on this comparison, a favorable (accept) or an unfavorable (reject) decision was made concerning the operator and the cards punched for the EA. After an operator was qualified, separate tables were used for the operator and the EA's.

Sampling was performed at two levels--4 percent for qualified operators and 10 percent for all other phases. There were five basic and four supplemental phases for verification. The first four phases (training, productive training, qualifying, and qualified) made up the sequence required of the operators. There was also a disqualified phase for operators failing in the qualifying or qualified phase. The four supplemental phases (requalifying, reinstated, retraining, and change to productive training) were for correction of erroneous actions and for operators on extended leave. Once the operator reached the second phase (productive training), the computer controlled the status and indicated the changes in the phase of verification, with the exception of assignment to the supplemental phases.

The production and the corresponding verification data were transmitted to Washington daily by the Data Transmission System. Quality data and decisions were transmitted back to the operation on an overnight basis by the same method. Quality data consisted of two reports--an Operator Status Report and an EA Diary Report. The Operator Status Report showed clerical and computer changes in an operator's status. This was used by the punch unit to determine sampling rates and actions required for the operators. The EA Diary Report gave a summary of error conditions in rejected EA's. The Operator Quality Report, a summary of each operator's current and cumulative quality rating, was prepared by the computer on a weekly basis.

VERIFICATION OF DIARY CORRECTIONS

The clerks transcribed to Diary Correction Sheets the corrections which professional analysts had indicated on the A1 questionnaires, and posted the identification codes and computer-action codes. These data were then punched into cards for conversion to tape.

The purpose of the quality control program was to assure that the analyst's corrections to an A1 questionnaire were properly transcribed to the correction sheet. This was controlled by an independent 100-percent verification of the transcription. The corrections were independently transcribed to a set of correction sheets, and this verification set was matched to the production set. The differences found during the match were reconciled and the errors corrected. Matching of the first 30-40 percent of the job was manual. For economy and speed, machines were used for matching the remainder of the transcriptions.

Table 6. QUALITY PHASES AND REQUIREMENTS

Quality assignment phase/status	Verification rate	Quality requirements
Training.....0	10%	A prescribed period of punching--around 5 days. Dummy questionnaries used in this phase only.
Productive training....1	10%	Automatic transfer to qualifying phase upon punching of 1,000 forms (A1's). EA's with less than 10-percent error accepted for processing.
Qualifying...2	10%	Three consecutive accept decisions within seven decisions to qualify. Operators failing to qualify were transferred to disqualified phase. Rejected EA's were repunched.
Qualified....3	4%	A maximum of two consecutive reject decisions was allowed. Operators failing to maintain this standard were transferred to disqualified phase. Rejected EA's were repunched.
Disqualified.4	10%	Three consecutive accept decisions within seven decisions. Only one disqualification was allowed. Operators were removed from the job if they failed to qualify in this phase or if a second disqualification was received. Rejected EA's were repunched.

For the manual match of the two sets of transcription sheets, matching on the sum of the check digits for each A1 correction sheet was required. Since omission of zeros would not be detected by the check-digit computation, two additional sums were obtained for each transcription sheet--the total number of data fields and the total number of ending zeros in the last data fields which contained nonzero digits. These three sums were independently obtained for each sheet in both sets and then matched. Control sheets and breaker sheets were similarly verified.

The machine match was performed with an IBM 056 verifying machine during the 100-percent verification of the data-punch operation. The cards punched from the original (production) transcription sheets were matched to the cards punched from the second (verification) transcription sheets. Consequently, the punch

operation and the transcription operation were verified simultaneously. This verification made unnecessary the computation of check digits and the posting of check sums. However, the order of transcribing the corrections to the sheet became all important. This ordering requirement, when introduced into the instructions for the transcribers, resulted in a reduction of the omission type of error by about one-third to one-half.

Quality summary reports of the transcription operation were maintained on an every-other-week basis from a 20-percent sample of the verified work. The error rates shown in table 7 below are the medians (M) from the biweekly summary reports. The error rates associated with the first (Q1) and third (Q3) quartiles are also given.

Table 7. A1 DIARY CORRECTION SHEET PREPARATION ERROR RATES

A. Error Proportions for Various Units

Unit	Error proportions		
	1st quartile	Median	3d quartile
Counties with error.....	.778	.826	.878
Correction sheets in error.	.037	.041	.050
Corrections in error.....	.013	.015	.020
Punched data fields in error[1].....	.005	.006	.009
Check digits in error[1].....	.001	.002	.005
Breaker sheets in error[2]...	.025	.032	.042

Table 7. A1 DIARY CORRECTION SHEET PREPARATION ERROR RATES--Continued

B. Errors per 100 Units

Unit	Number		
	1st quartile	Median	3d quartile
Per 100 corrected A1's.....	6.37	9.37	11.02
Punch data only.....	6.33	8.64	10.97
Correction fields only...	4.84	5.78	9.07
Per 100 corrections.....	2.73	3.70	4.06
Punch data only.....	2.73	3.42	3.85
Correction fields only...	2.09	2.55	3.36

C. Proportion of Error by Type

Type	Proportion		
	1st quartile	Median	3d quartile
Omission errors.....	.510	.565	.649
Transcription errors.....	.262	.313	.429
Commission errors.....	.042	.072	.086
Omission of correction lines.....	.243	.321	.411
Transcription of correction field.....	.098	.162	.183
Omission of correction field.....	.098	.133	.139

[1]From manual match only.
[2]From machine match only.

Chapter VI. Census of Agriculture for Outlying Areas

AUTHORITY

The census of agriculture is authorized by an act of Congress, "Title 13, United States Code--Census." Section 191 of Title 13 specifically provides that the censuses shall include each State, the Virgin Islands, Guam, and the Commonwealth of Puerto Rico. It also provides that the census data for the latter areas may be collected by the Governor or highest ranking Federal official in accordance with plans prescribed or approved by the Director of the Bureau of the Census.

CENSUS OF AGRICULTURE FOR THE VIRGIN ISLANDS

Enumeration

The census of agriculture was taken under the direction and supervision of the Governor of the Virgin Islands, according to procedures prescribed by the U.S. Bureau of the Census. In 1964, at the time of the census enumeration, there were 466 farms in the Virgin Islands. The enumeration began on November 9, 1964, and was completed in approximately 8 weeks. Enumerators followed a procedure similar to that used for the agriculture census in the United States, except that in the Virgin Islands the agriculture questionnaires were not distributed to farm operators prior to enumeration. Procedures included:

a. Listing the name of the head of the household on a Special Listing Form.

b. Asking questions to determine if there were any agricultural operations on the place.

c. Filling in a questionnaire for each place with agricultural operations.

For enumeration purposes, the place was considered to have agricultural operations if:

a. Any field crops or vegetables were harvested or gathered on the place during the 12 months (November 1, 1963, to October 31, 1964), or a combined total of 10 or more fruit or nut trees or plants were on the place.

b. Any livestock or 10 or more chickens, turkeys, or other poultry were kept on the place at the time of enumeration.

For purposes of enumeration, the Virgin Islands were divided into eight enumeration assignments (EA's). Each of these EA's comprised an area that one enumerator could reasonably be expected to enumerate within a 3- to 4-week period. Each EA was made up of one or more enumeration districts (ED's). Each of the 22 quarters (political subdivisions) was a separate ED, as was each of the three cities (Charlotte Amalie, Frederiksted, and Christiansted).

Prior to the enumeration, special cards were prepared for all farms with 100 acres or more enumerated in 1960. Each enumerator was given the cards for all places located in his assignment and instructed to obtain an agriculture questionnaire for each place for which he had a card or to write an explanation as to why a questionnaire was not required.

All farms that were located in the three cities and in towns on the Islands in 1960 were listed in the enumerator's record book before the enumeration. The listing included the name and address of the 1960 operator and the ED in which the farm was located. Again, the enumerator was instructed to obtain a questionnaire or explain why one was not required.

As an enumerator completed his assignment, he turned his portfolio over to the supervisor who made a final review of the work. When all portfolios were reviewed they were mailed to Washington, where each portfolio was checked to see that the enumeration was complete.

Office Processing

Each enumerator's work was examined and checked for completeness by the professional staff in Washington. All questionnaires were individually edited and coded prior to tabulation of the data. In the editing process, questionnaires that did not represent farms, according to the census definition, were withdrawn from further processing. The remaining questionnaires were then examined for completeness and consistency. Errors in calculations and units of measure, inconsistencies, and misplaced entries were corrected. Incomplete reports were adjusted on the basis of related information on the same questionnaire or on questionnaires for nearby farms of similar size.

In the coding process, numerical codes were entered on all questionnaires to classify farms by size in terms of total area, by tenure and birthplace of operator, and by total value of agricultural products sold. In addition, codes were entered on questionnaires for commercial farms to indicate type of farm.

After the questionnaires had been edited and coded, the information was posted on tabulation sheets. These tabulations were examined by subject-matter specialists for reasonableness and consistency. The specialists made all necessary corrections on the basis of a further reappraisal of the original reports before approving the data for publication.

Census Definition of a Farm

For the 1964 census in the Virgin Islands, a farm was defined as any "place" on which any field crops or vegetables were harvested or gathered during the year; or on which there was a combined total of 10 or more fruit or nut trees or plants, any livestock, or 10 or more chickens, turkeys, or other poultry at the time

of the enumeration. The word "place" designates all land in the Virgin Islands under control of one person or partnership. Control of the land might be through ownership, management, lease, rental, or cropping arrangement.

CENSUS OF AGRICULTURE FOR GUAM

Enumeration

The 1964 Census of Agriculture for Guam was directed by the Governor of Guam and supervised by the Director of Commerce in Guam, according to procedures prescribed by the U.S. Bureau of the Census. Questionnaires were mailed in advance to all known farm operators. In 1964, at the time of the census enumeration, there were 2,529 farms in Guam. Most of the field enumeration was completed during the period November 18 through December 24, 1964, by 17 enumerators. The forms and procedures were generally similar to those used in the 50 States. However, the screening questions, to determine when a questionnaire should be obtained, were different.

An enumerator was assigned a specific area, such as an election district or part of an election district, to enumerate. The enumerator was given a detailed map for the area assigned. Except in cities and the larger villages, the enumerator was required to visit each occupied dwelling (or place) in his assignment, list the head of each household, and obtain answers regarding agricultural operations on the place. For places having agricultural operations, the enumerator was required to obtain a completed agriculture questionnaire. In urban areas, the enumerator was required to enumerate only the places operated as farms. He was given a list of farm operators in 1960 in his assignment.

To assist in obtaining an enumeration as complete as possible, enumerators were required to plot on the detailed map of their assignment the location of each occupied dwelling or place listed on the A2 listing form. Enumerators were also given lists of special and large farms located in the assigned area and were required to obtain an agriculture questionnaire for each special or large farm, or to write an explanation as to why an agriculture questionnaire was not required.

Office Processing

Agriculture questionnaires and A2 listing forms were forwarded to Washington, where they were reviewed for completeness, checked for consistency of entries, and coded. Errors, inconsistencies, and misplaced entries were corrected. Incomplete reports were adjusted on the basis of related information on the same questionnaire, or on the basis of questionnaires for nearby farms of similar size. In the coding process, numerical codes were entered on all questionnaires to classify farms by size and by tenure of operator.

After the questionnaires had been edited and coded, the information was added and transferred to tabulation sheets. Tabulations were reviewed for reasonableness and consistency before the data were released for publication.

Census Definition of a Farm

For the 1964 census, a farm was defined as any "place"--regardless of size and of value of production--on which any crops, vegetables, fruits, or nuts were grown and harvested or gathered during the year November 1, 1963, to October 31, 1964, or on which any livestock or five or more chickens or other poultry were kept on or about November 1, 1964. The word "place" was defined to include all land under the control of one person or partnership, exclusive of land used by the U.S. Military Services. Control of the land might be through ownership, management, lease or other rental agreement, permit or other government arrangement, or by occupation without permit.

CENSUS OF AGRICULTURE FOR PUERTO RICO

Background

The various phases of the census program were developed by members of the U.S. Bureau of the Census in consultation with an Agricultural Advisory Committee established in the Commonwealth of Puerto Rico. The Agricultural Advisory Committee was composed of members of different agricultural agencies and the Puerto Rico Planning Board of the Commonwealth Government.

Enumeration

In 1964, at the time of the census enumeration, there were 44,859 farms in Puerto Rico. Except for some large farms, the enumeration of the 1964 census was conducted in November and December 1964 by census enumerators. Since Spanish is the predominant language in the Commonwealth, enumeration schedules and instructional materials used in the 1964 Census of Agriculture were in Spanish. An enumerator was assigned a specific area--a barrio or group of adjacent barrios--to enumerate. The enumerator was given questionnaires, with content similar to that of the U.S. questionnaire, and a detailed map for the area assigned. Except in urban and built-up residential areas, the enumerator was required to visit each dwelling (or place) in his assignment, list the head of each household, and obtain answers regarding the size of the place. For places of 3 cuerdas (2.9 acres) or more, the enumerator was required to obtain a completed agriculture questionnaire. In urban places and built-up residential areas outside of urban areas, enumerators were required to visit and list on the A2 listing form only places with agricultural operations.

In urban areas, the enumerator was given a list of 1959 farm operators in his assignment and was required to enumerate those places and complete a listing form A2. He was instructed to ask these farmers if they knew anyone else who had farm operations in the area and, if there was anyone, to note his name and list the place on the listing form for enumeration.

Since boundaries of villages and cities had changed since the 1959 census, there were villages which had increased in territory and included land formerly not

included in the urban zone. Those lands were included if they had agricultural production and were added to the list from the 1959 census and in the listing book of the corresponding ED.

To assist in obtaining as complete an enumeration as possible, enumerators were required to plot on the detailed map of their assignment the location of each dwelling or place listed on the A2 listing form, including new farms added to the listing form.

Enumerators were also given lists of large farms located in the assigned area and instructed to list any large farms or parts of large farms found in the assigned area on the A2 listing, but not to obtain an agriculture questionnaire for the large farms.

Special and large farms--Special arrangements were made for the enumeration of farms containing 200 cuerdas or more, dairy farms with licenses to sell milk, poultry farms with 200 or more laying hens or 1,000 broilers sold, beef cattle farms with 30 or more head of cattle, hog farms with 15 or more hogs or 10 or more sows, and farms operated by government agencies, schools, and institutions. Lists of these farms were prepared before the beginning of the enumeration from the records of the 1959 census and from records obtained from various agencies of the Commonwealth of Puerto Rico. Special farm cards (A15) were prepared from these lists for the enumerators.

A special agriculture questionnaire was used for large farms (version B of the A1). Agriculture questionnaires were mailed to the operators of large farms, and these operators were asked to fill in the questionnaires and keep them until a special enumerator called. These special enumerators were usually persons who had been municipio agricultural agents, experienced interviewers, or professional employees of the University of Puerto Rico or of other agencies of the Commonwealth.

All questionnaires received for large farms were reviewed individually by agricultural economists or statisticians. Questionnaires that were not complete and questionnaires with questionable data were given to special enumerators for completion or for verification of reported data by a personal visit to the farm operator.

Office Processing

Receipt and check-in--Check-in, labeling, and other record-keeping steps were performed by the office in Puerto Rico and the coverage review was completed for all version A questionnaires before they were forwarded to Washington for processing. The coverage review steps for the version B questionnaires (large-scale agricultural operations) were performed by the Washington staff.

Questionnaires for each ED were sorted into the following groups:

Certainty--A1's for all special farms, usually involving 200 cuerdas or more in the farm or producing certain quantities of major crops, poultry, or livestock. All sections of these A1's were required to be filled. All farms reported on version B of A1 questionnaires were processed as "certainty" farms.

Sample--A1's with numbers ending in "2" or "7," except those included among certainty A1's. All sections of the A1 were required to be filled.

Nonsample--All A1's not included in "certainty" and "sample" categories. Sections 7 to 10 were not required.

Editing and coding-- In the clerical phases of the census processing, editing and coding clerks examined all version A questionnaires for errors and/or missing data. A1's were reviewed for tentative rejects--farms with less than 3 cuerdas and those not meeting the criteria for the definition of a farm--and for duplicates; inclusion of the same land and operations on two A1's; combinations of two or more A1's covering parts of the same land or agricultural operations; tentative certainty farms; and incomplete A1's; and were reviewed for other specific A1 questions which might affect the computer coding of the questionnaires.

During the editing and coding operation, all tentative rejects, tentative certainty questionnaires, and questionnaires with certain specific problems were referred for review and possible correction by the professional analysts.

Some of the data were coded for transcription to punchcards.

Punching--Cards for the Puerto Rico agriculture questionnaires were punched in Washington, utilizing the modified punch (024) and verifier (056) machines equipped with multiple program and standard check-digit devices. The keypunch control systems (developed for the 1963 Economic Censuses) were used. Special keypunch features were: automatic left zeros, automatic field punching, self-detected error correction, field size check, check-digit calculation and verification, automatic program selection, and separate programs for three card types. New features added to the above were (1) end-of-farm code and (2) an additional three programs to make a total of six possible card types.

The verifiers were modified to contain all of the above features plus a 10-digit electronic numeric display which gave a visual indication of the number entered for verification.

Computer editing and coding-- Data were transferred from punchcards onto magnetic tape for computer processing. A mechanical edit included the selection and listing of individual cards that appeared to be duplicated or to have impossible punches, missing data, and data outside specified limits.

The coding of size of farm, tenure of farm operator, economic class, and type of farm was performed on the computer. The economic class and type of farm codes were verified on a 10-percent sample basis.

When the review of the computer indicated data were inconsistent or missing, or when the review indicated a possible error, the data on the questionnaires were reviewed by an agricultural statistician and corrections were made if necessary.

Preliminary county tabulations-- A printout of county summaries was prepared from the punchcards. The related punchcards were listed on the reverse side of each tabulation. A clerical staff reviewed the county summaries for punching errors, tabulation errors, and consistency errors. Problems which could not be resolved were referred to the professional staff for possible corrections.

County tables-- After the preliminary tabulations had been corrected, historical data and 1964 data were

posted in table form, reviewed by the professional staff, and typed.

Census Definition of a Farm

Places of 3 cuerdas or more were counted as farms if any agricultural products, other than vegetables for home use, were produced or if any livestock or 15 or more chickens or other poultry were kept on the place. In 1964, 70 places of less than 3 cuerdas were included in the census.

All the land under the control of one person or partnership was included as one farm. Control might have been exercised through ownership, management, sharecropping arrangement, or lease or rental agreement.

Chapter VII. Special Surveys Based on the 1964 Census of Agriculture

1965 SAMPLE SURVEY OF AGRICULTURE

The 1965 Sample Survey of Agriculture was undertaken to provide additional data which were not obtained in the 1964 Census of Agriculture, which were not needed for county and State, and for which national totals would be acceptable. The data obtained in the survey included information on new agricultural practices; farm equipment and machinery on farms; the purchase of automobiles, motor trucks, and farm equipment by farm operators; the use of insecticides and pesticides; the use of gasoline and other petroleum products; the construction of new farm buildings; and the amounts and sources of debt owed by farm operators.

The 15,150 farms included in the 1965 Sample Survey of Agriculture were selected primarily from lists of farms enumerated throughout the United States in the 1964 Census of Agriculture. The basic sampling rate for farms in the survey was approximately 1 in 420 with some variation of sampling rates for vegetable, fruit, and nursery farms. Farms with large values of farm products sold or large expenditures for hired labor in 1964 were sampled at higher rates; these farms comprised about half the sample.

The 1965 Sample Survey of Agriculture was conducted by mail beginning in February 1966, with personal followup, as necessary, to obtain missing information. Each of the 12 regional offices designated a staff member to be the program supervisor for the sample survey. There were approximately 200 enumerators; they were given a 2-day self-study training course and then worked 2 or 3 weeks in covering their assignments. Most of these enumerators were Current Population Survey enumerators or had previously worked on the 1964 Census of Agriculture. Field followup was completed in December 1966.

The Nation was divided into three areas of enumeration--Northern, Southern, and Western--with a variation of the basic questionnaire for each.

LANDLORD FARM DEBT SURVEY

In 1966 a sample survey was undertaken for the purpose of obtaining data on debts related to their farmland for the landlords of those operators included in the 1965 Sample Survey of Agriculture who operated rented land or managed land for others. This survey was conducted by mail using form A7, with personal followup as necessary.

SPECIAL FARM LABOR SURVEYS

Two special surveys were undertaken to obtain data on the number of persons employed on farms and the hours they worked. Inasmuch as the number of persons employed on farms is affected by weather and seasons for planting, harvesting, and the like, data relating to farm employment in the 1964 Census of Agriculture were limited to the number of regular workers and cash expenditures for hired farm labor. The two special farm labor surveys obtained data on persons performing farm work, by weeks, for a 12-month period beginning April 1965.

The Special Survey of Farmworkers was designed to cover the farms on which the farm operator and members of his family provided the major part of the hours of farmwork on the farm. The Special Survey of Hired Farmworkers was designed to provide data for farms on which the major part of the hours of farmwork was provided by hired farmworkers. The survey of farmworkers covered more than 98 percent of the farms and the survey of hired farmworkers covered approximately 1.5 percent of the farms.

Special Survey of Farmworkers

The Special Survey of Farmworkers, using form A8A, obtained data on hours of farm work, hours of farm work for cash wages, and hours of off-the-farm work for a 1-week period for each person 10 years old and over living in the house of the farm operator and for other farm workers. The sample for this survey comprised approximately 8,500 farms selected from the records of the 1964 Census of Agriculture in 447 primary sampling units comprising 838 counties. The sample was limited to farms with a cash expenditure of less then $10,000 for hired farm labor in 1964.

The sample was divided into five panels, and the farm operators in each panel were asked to fill in a questionnaire once during each 4- or 5-week period, in order to obtain data for every week during a 1-year period. Questionnaires were mailed to two panels for 12 selected weeks--March 21-27, April 18-24, May 23-29, June 20-26, July 18-24, August 22-28, September 19-25, October 24-30, November 21-27, December 19-25, January 23-29, and February 20-26; these weeks were selected to coincide with the weeks covered by the U.S. Department of Agriculture survey.

The first week covered by the survey was the week ending March 27, 1965, and the last, March 19, 1966. Thirteen reports were obtained from 79.9 percent of the farm operators and 12 reports were obtained from 20.1 percent of the farm operators.

Special Survey of Hired Farmworkers

The questionnaire for this survey (form 8A) obtained information on the number of hired workers, hours of work by hired workers, and number of workers by method of payment, for a sample of approximately

4,500 farms selected from records of the 1964 Census of Agriculture. Only farms with a cash expenditure of $10,000 or more for hired farm labor were included in the sample. The sampling rate for these farms varied according to the amount of the expenditure reported for hired farm labor in 1964; all farms with expenditures of $100,000 or more in 1964 were included in the sample.

Each questionnaire covered a period of 4 or 5 weeks and 12 questionnaires covering a period of 52 weeks (April 1965 to March 1966) were obtained from each farm. The questionnaires were mailed to each farm at the end of each 4- or 5-week reporting period.

SPECIAL LIVESTOCK AND POULTRY SURVEY

A special livestock and poultry mail survey (SLP) of approximately 96,800 places was conducted during December 1964 and January 1965. The purpose was to provide the U.S. Department of Agriculture with data to adjust the 1964 census State livestock and poultry inventory figures to a January 1, 1965, base. The 1964 census inventory figures relate to the date of enumeration which averaged December 2 for the country as a whole. Because of memory bias in reporting, it was essential that the survey be made as near to January 1 as possible.

Selection of the SLP sample was made just prior to the payroll review operation of the 1964 agriculture census. Farms for the SLP survey were selected by taking, for the 48 conterminous States, a systematic sample of the 1964 Census of Agriculture questionnaires, certainty and sample. From the questionnaires selected, mailing information and certain data were transcribed to a special control card.

For the SLP survey, one of three different questionnaires was used, depending on geographic location of the agriculture operation. The questionnaires were prestuffed into open window envelopes and mailing labels were prepared by microfilming and reproducing the address portion of the control card. Using the "wing mailer" technique (a mechanical process for affixing address), the address labels were attached to questionnaires through the envelope window. A sampling check was made to assure the proper mailing of questionnaires to each State.

All questionnaires that had been microfilmed, reproduced, and labeled by the close of business December 23 were sent out by airmail (except for the nearby States of Indiana, Illinois, Kentucky, Tennessee, and Ohio) on that day. The excepted States were surface mailed on December 27. Questionnaires addressed after these two dates were mailed by airmail (except those for the nearby States) each day. Mailing continued until the close of business on January 6, 1965.

Upon receipt of the completed SLP questionnaires from the respondents, the questionnaires were grouped into the following three categories: (1) Good receipts; (2) refusals, deceased, moved; and (3) postmaster returns. Good receipts were sorted by State, matched to the control cards, and the lower portion of both the control card and questionnaire torn off, leaving only the geographic identification and assuring the anonymity of the respondent. Control cards and the completed questionnaires were accumulated by State for shipment to the Department of Agriculture. Receipts in the second category were annotated with the reason for no response. Addresses on questionnaires returned by the post office were corrected if possible and new questionnaires mailed.

A followup questionnaire was mailed between January 5 and January 7 to farms included in the first mailings on December 23 and 27 and from which no questionnaire had been received.

OFFICE PROCESSING

Most of the questionnaires for the various surveys were reviewed for acceptability upon receipt from the field offices or by mail. Correspondence was then initiated for all incomplete or questionable cases. Some telephone followup was performed during the later review stage of processing. Questionnaires were edited and coded in Washington by clerical and technical staffs. The data contained on each questionnaire were first punched on cards, then converted to magnetic tape. Data for each questionnaire were reviewed by the computer to check for punching errors, completeness, and consistency. Corrections were carried to a final edited tape prior to tabulation of all sample survey data.

Chapter VIII. Evaluation Studies and Research

PRETEST OF MAIL COLLECTION PROCEDURES

A pretest was conducted in March and April of 1963 in six counties. The primary objectives of this pretest were to measure the coverage obtainable from the use of the lists of addresses available, to find out the response rates for "mail-out/mail-back" questionnaires, and to determine the quality of data obtained from agriculture questionnaires which were filled in and mailed in by respondents, under conditions where this procedure might be used for a large proportion of the farms. The counties were in Florida, Idaho, North Carolina, Ohio, and Texas.

For each of the six counties, farm listing cards were prepared from the 1959 census questionnaires and from lists obtained from the Internal Revenue Service (IRS) and Bureau of Old Age and Survivors Insurance (BOASI) of the Social Security Administration. The IRS list contained the names of persons with post office addresses in these counties who had filed a Form F with their 1961 income tax returns. The BOASI list contained the names of persons with post office addresses in these counties who were reported during the second quarter of 1961 as employers of agricultural workers. A farm listing card showing the name and address of the operator and limited information about the operation was prepared for each 1959 census questionnaire. The IRS and BOASI lists were checked against these cards and each other to eliminate duplications. A positive match was required at this stage to delete a name. Farm listing cards were then prepared for the unmatched names on each list. Three different procedures were tested:

1. In Williams County, Ohio, an enumerator canvass determined where a census of agriculture questionnaire, Form A1,[1] was required, and A1's were left to be filled in and mailed in to the local office. One mail followup was made. A mailout was also made to those names on the farm listing cards which had not been included in the enumerator canvass.

2. In Runnels and Tom Green Counties, Tex., an initial mailout and one followup mailout were made to the names on the farm listing cards. A1's received were sorted by enumeration districts (ED's) and reviewed for completeness and acceptability. Then an enumerator canvass was made in seven selected ED's to determine where A1's were required and to see if an acceptable A1 had been received, to verify and complete those A1's which had been received, and to obtain an A1 where one was required but had not been received.

3. In Marion County, Fla., Cassia County, Idaho, and Northampton County, N.C., an initial mailout and one followup mailout were made to the names on the farm listing cards.

The use of certified mail for a selected group of the mail followups was also tested in each of the three procedures.

The results showed the most promising procedure among those tested--when costs and completeness of coverage and content were jointly considered--was that followed in Williams County, Ohio. It was decided that further experience was needed before this procedure could be used for a nationwide census. It was tested further in the Agriculture Field Procedure Study during the 1964 census.

THE AGRICULTURE FIELD PROCEDURE STUDY

Background

Because the results of the pretest in Williams County, Ohio, indicated further potential for this procedure and because of the Bureau's increasing interest in self-enumeration techniques using the mail, the Bureau conducted a more elaborate test of the Williams County method as part of the 1964 census. This test was called the Agriculture Field Procedure Study (AFPS).

The purposes of the AFPS were threefold: to test the feasibility of collecting agriculture census data by self-enumeration using the mail; to determine some of the time and cost parameters associated with this method; and to reveal special problems.

This study was made in 17 "test" counties in Illinois and Indiana. The AFPS was not designed to provide a direct comparison between two data-collection methods. Nevertheless, some comparisons were necessary to determine whether the AFPS obtained agricultural data of reasonable quality at a reasonable cost. For this purpose, a set of "control" counties was designated.

It was decided to select the test and control counties in northern Illinois and Indiana, in the area under the supervision of the Chicago Regional Office. Also, it was agreed to have two groups of counties, one in each State, with five crew leader districts in each group. The selection was limited by the desire to include not only entire crew-leader districts but also entire counties and to exclude the major urban area in Chicago.

[1]For facsimiles of the questionnaires and listing forms used, see Vol. III, Part I, Data-Collection Forms and Procedures for Census and Related Surveys, 1964 Census of Agriculture.

The 17 AFPS counties, or test counties, were selected first; designation of the 27 control counties was a second and separate operation.

Test Counties

Illinois	Indiana--Con.
De Kalb	Carroll
Grundy	Cass
Kane	Fulton
Kendall	Jasper
La Salle	Newton
Livingston	Porter
	Pulaski
Indiana	Tippecanoe
Benton	White

A set of 27 control counties was selected for which the importance of selected agricultural products, relative to the number of farms, was similar to the set of test counties:

Control Counties

Illinois	Indiana--Con.
Bureau	Clinton
Carroll	De Kalb
Iroquois	Grant
Kankakee	Howard
Lee	Huntington
Marshall	Jay
Ogle	Kosciusko
Putnam	La Porte
Whiteside	Marshall
	Miami
Indiana	Noble
Adams	St. Joseph
Allen	Wabash
Blackford	Wells
	Whitley

Two features of the selection method should be especially noted. First, neither test nor control counties were selected by probability methods. Second, the counties were deliberately selected from those considered to have the most favorable conditions (such as level of education) for a self-enumerative method.

Field Office Procedures

In the AFPS test counties there was no bulk mailing of agricultural questionnaires. In fact, crew leaders visited all post offices near the perimeters of the AFPS areas and reminded their postmasters of the different procedure for the test counties. Enumeration in the test counties began with an enumerator canvass. Enumerators followed the census rules in listing all places in their assigned areas and in determining which places required agricultural questionnaires. At such places enumerators left questionnaires and written instructions on how to complete them. Enumerators requested the farm operators to mail the completed questionnaires to a census office in preaddressed postage-paid envelopes that were provided.

For all questionnaires left to be completed in the test counties, enumerators filled in control cards showing the names and addresses of farm operators, the serial numbers of questionnaires, and the dates questionnaires were left. They mailed these cards daily to the census office.

A few days after leaving questionnaires, enumerators mailed reminder postcards to the farm operators. The postcards thanked the operators for returning their questionnaires if they had already done so, and requested them to return the questionnaires if they had not yet done so.

In the census office, incoming questionnaires were matched with control cards. If, after a reasonable length of time, no questionnaire had been received from a particular farm operator, a mail followup was sent to him. The followup mailing piece contained an agricultural questionnaire, an instruction booklet, a postage-paid return envelope, and a letter urging prompt completion and return of the questionnaire. Mail followup was withheld for a random one-fourth of those cases eligible for it, so as to obtain a control group for assessment of the effect of followup.

Questionnaires received in the census office were thoroughly examined for completeness and consistency. Questionnaires failing this examination, or edit, were returned to enumerators who completed and corrected them by telephone interview. Questionnaires so incomplete as to represent, essentially, nonresponse were completed by personal visit. Enumerators also obtained, by personal visit, questionnaires from farm operators who had not returned them by a certain cutoff date.

Comparison of Census and AFPS Forms and Procedures

In many other respects the census and AFPS methods were much alike. AFPS administrative procedures and forms, for example, differed from the census only to the extent necessary to accommodate the basic differences between the data-collection methods. All definitions were identical, and, as mentioned above, the entire AFPS listing procedure was the same as in the census. Also, at the end of field operations the AFPS questionnaires were subjected to the same data processing--editing, reviewing, and tabulating--as questionnaires obtained by census method. There were, however, a few notable differences in the details of field procedures:

1. Both AFPS and census enumerators were trained by home-study methods. But, whereas census enumerators were trained once at the beginning of their job, AFPS enumerators were trained on listing at the beginning of listing and on followup at the beginning of followup. They also attended a brief group-training session at the beginning of followup. The 10 AFPS crew leaders were also trained in two stages.
2. Census enumerators were paid once at the end of their job. AFPS enumerators received payment at the end of each stage.
3. The census and AFPS agricultural questionnaires were identical in content but not in format. The census questionnaire opened to one large single sheet while the AFPS questionnaire was in booklet form.

Comparison of Test and Control Counties

Because the results (see p. 48) compare characteristics of the data-collection methods in the test and control counties, table 8 presents some of the important agricultural characteristics of the two areas for 1959 and 1964. The ratios in the last two columns of the table indicate that farms in the test and control counties differ to varying extents on the characteristics shown. However, a major factor in the "per farm" differences between the two areas is the difference in average size of farm; that is, the "per acre" ratios are in general closer to unity than the "per farm" ratios. Regardless of differences between the areas for a given year, it seems from comparison of the two sets of ratios that the 1959 to 1964 trends in the two areas were generally similar as measured by the two enumerative methods.

Table 8. COMPARISON OF AFPS TEST AND CONTROL COUNTIES FOR 16 SELECTED STATISTICS: 1959 AND 1964

Statistics	Test counties		Control counties		Ratio of test to control	
	1959	1964	1959	1964	1959	1964
Number of farms	25,909	21,573	47,225	40,991	-	-
Acres in farms	5,132,943	5,011,498	7,591,237	7,453,362	-	-
Average size of farm in acres	198.1	232.3	160.7	181.8	1.233	1.278
Value of land and buildings:						
Average per farm	$74,160	$101,056	$53,735	$66,809	1.380	1.513
Average per acre	$367.7	$434.2	$324.3	$367.3	1.134	1.182
Value of all farm products sold:						
Average per farm	$14,249	$19,260	$10,660	$14,255	1.337	1.351
Average per acre	$71.93	$82.91	$66.33	$78.41	1.084	1.057
Value of all livestock and livestock products sold:						
Average per farm	$8,060	$9,039	$6,780	$8,007	1.189	1.129
Average per acre	$40.69	$38.91	$42.19	$44.04	.964	.884
Cropland harvested:						
Acres per farm	163.2	177.7	126.1	133.8	1.294	1.328
Percent of total acres	82.38	76.50	78.47	73.60	1.050	1.039
Feed for livestock and poultry:						
Dollars per farm	$2,307	$2,766	$2,174	$2,444	1.061	1.132
Dollars per acre	$11.65	$11.91	$13.53	$13.44	.861	.886
Corn harvested for grain:						
Bushels per acre	70.6	81.7	68.6	78.8	1.029	1.037
Soybeans harvested for beans:						
Bushels per acre	27.1	26.1	26.5	25.4	1.023	1.028
Vegetables harvested for sale (other than Irish and sweet potatoes):						
Sales per farms reporting	$4,011	$6,793	$4,185	$6,625	.958	1.025

Source: Preliminary Reports, 1964 Census of Agriculture, Series AC64-P1. Some of the statistics shown are based on samples and are, therefore, subject to sampling error.

Interpretation of Results

The following point should be kept in view during interpretation of the results: Almost every characteristic of the followup stage of the AFPS was dependent on the editing rules by which incoming questionnaires were examined for completeness and consistency. A different set of editing rules might have produced changes in the proportion of questionnaires returned for followup, in the time required to complete the enumeration, in the average cost of obtaining a complete questionnaire, and in other characteristics of the enumeration.

Cost Analysis

Table 9 shows cost data for the AFPS test counties and comparable figures for the control counties. The most striking difference between the two sets of figures is in the piece-rate earnings per hour: piece-rate enumerators in the test counties earned $1.40 an hour on the average while those in the control counties earned an average of $1.68 an hour. This difference is reflected in the figures for cost per A1. It was thought that piece-rate enumerators would average $1.75 an hour, but evidently the pay rates were not set high enough. The source of data on hours worked is the enumerators' reports of the time they spent on the job.

When the cost figures are converted to what they would have been, had all piece-rate enumerators actually earned $1.75 per hour, it appears that the listing and followup procedures tested were more expensive than the regular agriculture census procedures. If all enumerators earned $1.75 per hour, the cost per A1 would be $2.02 for the test counties and $1.89 for the control counties.

Table 9. COSTS IN AFPS TEST AND CONTROL COUNTIES FOR LISTING AND FOLLOWUP STAGES

Area	Listing			Followup			Total		Converted cost per A1[2]
	Cost[1] per A1	Cost[1] per A2 listing	Piece-rate earnings per hour	Cost[1] per A1	Cost[1] per A1 followed up	Piece-rate earnings per hour	Cost[1] per A1	Piece-rate earnings per hour	
AFPS test counties, total	$.84	$.39	$1.42	$.90	$1.27	$1.39	$1.74	$1.40	$2.02
Indiana	.85	.35	1.43	.95	1.33	1.36	1.80	1.40	2.10
Illinois	.83	.45	1.40	.84	1.20	1.42	1.67	1.41	1.92
Control counties, total	-	-	-	-	-	-	1.83	1.68	1.89
Indiana	-	-	-	-	-	-	1.83	1.64	1.92
Illinois	-	-	-	-	-	-	1.84	1.77	1.82
State of Indiana	-	-	-	-	-	-	1.89	1.68	1.94
State of Illinois	-	-	-	-	-	-	1.92	1.71	1.95

[1]Excludes field office and post office costs.
[2]Cost if all piece-rate enumerators had earned $1.75 per hour.

Not included in these comparisons are the field office costs and the post office costs for both procedures. In the test counties the post office costs included the mailing in of A1's by the farmers, the sending of reminder post cards to all those who received A1's, and the mailing of followup packages to all who had not returned their A1's as of a certain date. Post office costs in the control counties included the distribution of A1's to all rural box holders.

In the test counties, enumerators were paid in two installments--once for listing and once for followup. For listing, piece-rate earnings consisted of the sum of payments for A2 listings completed, A1's left, and time enroute (based on number of miles driven). For followup, piece-rate earnings consisted of the sum of payments for A1's completed by telephone followup, A1's completed by personal-visit followup, and time enroute. All enumerators also received training fees and reimbursement for mileage and telephone charges.

Mail Return Rates

The mail return rate obtained in the AFPS was 86 percent. The base of this figure is all farm operators who were requested to return agricultural questionnaires by mail. These operators were divided, however, into several groups treated to different enumerative procedures for an experiment on the effect of mail followup for nonresponse. Results indicate that, had all AFPS farm operators been followed up for nonresponse, their mail return rate would have been 91 percent. If none had been followed up, the return rate would have been 84 percent.

Caution should be exercised in generalizing the 91-percent return rate obtained for the AFPS followup groups. For example, the AFPS questionnaires were not mailed to farm operators, but were left with them during personal interviews by enumerators. The 91-percent return rate was obtained for farm operators contacted by enumerators relatively early in the enumeration period; and it is possible that enumerators may contact the most cooperative operators first. This possibility is supported by the finding of a 79-percent return rate for farm operators contacted later in the enumeration period and not followed up.

It should also be noted that the return rates given above are for all returned questionnaires regardless of quality. Some of them were grossly incomplete.

The following groups of farm operators were defined for an experiment on mail followup for nonresponse:

1. Farm operators with whom enumerators had left A1's between November 11, 1964 (the beginning date of enumeration in the AFPS counties), and November 14, inclusive. A random three-fourths of these farm operators were designated as a "followup" group, while the remaining one-fourth formed a "control" group. Each farm operator in the followup group whose A1 had not been received in the census field office by November 21 was mailed a followup on either November 21 or 23. There were 2,346 farm operators in this November 21 followup group. No followup was made on the control group composed of 750 farm operators.
2. Farm operators with whom enumerators had left A1's between November 15 and November 21, inclusive. These farm operators were randomly divided into followup (75-percent) and control (25-percent) groups and treated the same

as the first group except that the followup date was November 28 rather than November 21. There were 9,179 farm operators in the November 28 followup and 3,073 in the November 28 control group.

3. Farm operators with whom enumerators had left A1's after November 21. No followup packages were sent to any of these farm operators since the schedule of activities in the AFPS field office required that mail followup operations end on November 28. There were 6,608 farm operators in this group.

It should be noted that the number of farm operators in the two followup groups described above is not the number to whom followup packages were mailed. Approximately 70 percent of the farm operators in the November 21 followup group returned their A1's by November 21, and therefore were sent no followup packages. For the November 28 followup group, this figure is 71 percent.

The followup groups described did not include all farm operators in the AFPS counties. Approximately 542 were purposely excluded as follows: (1) 112 farm operators in the enumeration district used for crew-leader training where questionnaires were left with some operators 3 weeks before the beginning of regular enumeration; (2) 27 farm operators who, due to clerical error, were sent followup packages on both November 21 and November 28; (3) 203 farm operators who, through procedural errors, were excluded from the followup mailings; and (4) approximately 200 farm operators with whom A1's were left so late in the enumeration period that regular field procedures could not be applied. Although excluded from the followup groups, these 542 questionnaires are included in the overall return rate.

As mentioned earlier, 86 percent of all farm operators who were asked to return A1's by mail did so. For both the November 21 and 28 followups and control groups, the return rates were 91 percent and 84 percent, respectively. Thus, for farm operators with whom A1's had been left relatively early in the enumeration period, one mail followup for nonresponse increased the return rate by 7 percentage points. The return rate for farm operators with whom A1's had been left later in the enumeration period was 79 percent.

Effects of Followup and Computer Edit on Census Data

In the AFPS field office, microfilm copies were made of a sample of all returned questionnaires so that it would be possible to identify, for questionnaires in this sample, the changes made as a result of the followup. To study the joint effects of the enumerator followup and the processing through computer edit, this sample was processed twice, once using the microfilm copies and once using the actual questionnaires. Four sets of tabulations were made, as follows:

From microfilm copies (no followup)
1. Prior to computer edit
2. After computer edit

From actual questionnaires (with followup)
3. Prior to computer edit
4. After computer edit

Insofar as possible, the effects of punching errors were eliminated from these tabulations, so that differences (1 vs. 3 and 2 vs. 4) arise almost entirely from the fact that the microfilm copies were processed exactly as received from respondents, with no followup except for completely blank questionnaires, whereas the actual questionnaires reflect the changes made as a result of the enumerator followup for questionnaires that failed edit.

Some detailed comparisons of these tabulations have been made or are in process. Aside from some specific suggestions for improvement in future computer-edit procedures, two general results have been obtained:

(1) The followup substantially reduced the amount of computer-edit imputation required.

(2) If the enumerator followup had not been conducted, the tabulated results would not have been substantially different for most items. The major exception was for land use items other than cropland harvested.

COVERAGE CHECK

Objectives

It is not easy to obtain a complete and unduplicated count of all farms and farmland in a census. Large numbers of temporary personnel must be employed to collect and to supervise the collection of complex data in a prescribed manner. Factors such as the variety of arrangements under which farms are operated, frequent changes in these arrangements, questionnaire items requiring recall or estimation of future transactions by the farmer, the difficulty of locating some farm operators to obtain information from them, and the difficulty of locating and identifying the farm itself--all of these complicate the task and affect the accuracy of the census results.

The Bureau of the Census attempts to provide measures of accuracy of the statistics it produces in all major censuses. Beginning in 1945, and in each subsequent quinquennial census of agriculture, a coverage check has been conducted to provide measures of the accuracy of the census farm count and of the census totals for a limited number of items, such as land in farms and cropland harvested. One goal of these evaluation studies has been to identify factors associated with coverage errors, as an aid in planning future censuses. A second goal has been to inform users of errors in the data which might affect their uses of the data.

Survey Procedure and Techniques

The basic aim of the coverage checks has been to obtain measures of response bias. This is done by using the best means available and feasible to collect highly accurate information for farms associated with a small area sample. These results are then compared with census results to determine the accuracy of the latter.

The procedures used to collect information in a coverage check are too costly to be used in the census itself.

In spite of the intensive procedures used in the coverage check, the results are not perfect. However, it is believed the results are more accurate than those obtained in the census and provide a useful standard against which to measure the quality of the census enumeration.

The principal operations in the 1964 Coverage Check were as follows:

Step 1. An enumeration, using the most reliable techniques available and without reference to the census results, of farms associated with segments in a probability area sample.

Step 2. Matching of the results obtained in step 1 against the census materials in order to identify farms missed in the census and differences in census and coverage check data for farms included in the census.

Step 3. Mail, telephone, and field followups, as needed, to clarify and check the results obtained in steps 1 and 2 and to obtain additional data for missed forms.

Step 4. Final processing, tabulation, and analysis of the results. (Coverage check results could be compared with unedited census data or with census data which had been subjected to clerical and computer edits to remove inconsistencies and supply missing values. The estimates presented in the results section which follows are based on comparisons with edited census data.)

The principal techniques for obtaining the farm data used as a standard against which to measure the accuracy of census results were:

a. Use of more intensive canvassing and screening procedures to identify farm operators and agricultural operations associated with coverage check sample segments.

b. Use of a more detailed questionnaire limited to the investigation of a few items.

c. Use of aerial photos and sketches as an aid in determining the acres in each farm.

d. Selection of the best available census crew leaders and enumerators as supervisors and enumerators for the coverage checks.

e. More intensive training of supervisors and enumerators than was given in the census.

f. Comparison of data supplied by farm operators against data from other sources, such as landlords and tenants.

g. Comparison of preliminary coverage check and census results, and further investigation of differences when it was not clear why the difference occurred.

h. Use of specially trained personnel to process the data.

Sample Design

The sample for the coverage check was selected in three stages as follows:

1. A set of 200 primary sampling units (PSU's) was selected. Each PSU was a county or group of adjacent counties.

2. Census enumeration areas (EA's) were then selected within the 200 sample PSU's. An EA was an area normally canvassed by a single enumerator in the census.

3. Area segments within EA's were selected. The segments were constructed so as to contain an average of three to four farms with headquarters (the operator's residence or some other uniquely defined point in the farm) in the segment.

Each segment had a 1/1333.33 probability of being selected. About 800 sample segments were selected. In the selection of the sample, a balance was maintained between predominantly rural EA's and EA's which contained, or were adjacent to, urban areas.

Data for this sample of area segments served as a basis for estimates of the number of farms missed in the census, the number of farms undercounted, and the number of correctly counted farms (the terms "missed," "undercounted," and "correctly counted" are described in the results section which follows).

To obtain an estimate of the number of farms overcounted in the census (as may have happened, for example, when a single farm was enumerated twice or a place counted as a farm in the census had insufficient agricultural operations to qualify as a farm), a second sample, called the segment list sample, was selected. In the census enumeration, the approximate location of the headquarters of each place contacted was "spotted" on a map by the enumerator. The segment list sample consisted of the census questionnaires obtained from those households whose headquarters were spotted inside the boundaries of the segments in the area sample. There was, of course, considerable overlap between the two samples and only those list sample farms not contacted during the area sample canvass needed to be enumerated separately in the coverage check. If, in the processing of the data, it was discovered that a census questionnaire had been included in the tabulations as a farm when the coverage check results indicated it should not have been, it was classified as an overcounted farm.

In previous coverage checks, only farms with headquarters in the sample segments were included in estimates based on the area sample. In the 1964 Coverage Check, an alternative estimation method, called the "weighted segment" estimate, was used. Data were obtained for all farms with any land in the sample segments, regardless of headquarters location. In making estimates, each farm was assigned a weight equal to the proportion of that farm located inside the segment boundaries. Using this method, the average number of coverage check farms per segment was about twice as large in 1964 as it had been in 1959. Studies have shown that the weighted segment procedure is more efficient than the headquarters (or closed segment) procedure.

Results (Net Error)

Measures of net error have been obtained by comparing edited census results with those obtained from the coverage check. The difference between results from the two sources can be taken as an estimate

of net error. The sum of the estimated net error and the corresponding census total provides an estimate of the total that would have been obtained if the intensive, more precise, coverage check procedures had been used in the census. Estimates of net error for number of farms, acres of land in farms, acres of cropland harvested, and numbers of farms by size and economic class are presented in table 10. Comparable estimates

Table 10. ESTIMATES OF NET ERROR FOR NUMBER OF FARMS, LAND IN FARMS, AND CROPLAND HARVESTED FOR THE UNITED STATES: 1954, 1959, AND 1964

Census and item	Estimated total (1,000)	Reported in census		Estimated net error				
						Sampling error of estimate		
		Amount (1,000)	Percent of estimated total	Amount (1,000)	Percent of estimated total	Amount (1,000)	Percent of estimated total	Percent of estimated net error
1964:								
Farms.....number..	3,559	3,158	88.7	401	11.3	32	0.9	8.0
Land in farms.....acres..	1,181,706	1,110,187	93.9	71,519	6.1	14,570	1.2	20.4
Cropland harvested.....acres..	305,333	286,892	94.0	18,442	6.0	1,964	0.6	10.6
1959:								
Farms.....number..	4,045	3,704	91.6	341	8.4	49	1.2	14.4
Land in farms.....acres..	1,191,706	1,120,158	94.0	71,548	6.0	10,967	0.9	15.3
Cropland harvested.....acres..	325,110	311,285	95.7	13,824	4.3	2,892	0.9	20.9
1954:								
Farms.....number..	5,201	4,782	91.9	419	8.1	49	0.9	11.7
Land in farms.....acres..	1,223,891	1,158,192	94.6	65,699	5.4	22,798	1.9	34.7
Cropland harvested.....acres..	346,580	332,870	96.0	13,710	4.0	3,907	1.1	28.5
1964:								
All farms.....number..	3,559	3,158	88.7	401	11.3	32	0.9	8.0
Less than 10 acres.....	241	183	75.9	58	24.1	16	6.6	27.6
10 to 49 acres.....	768	637	83.1	130	16.9	26	3.4	20.0
50 to 99 acres.....	616	542	88.0	74	12.0	16	2.6	21.6
100 to 219 acres.....	890	824	92.6	66	7.4	21	2.3	31.8
220 acres or more.....	1,044	971	93.1	72	6.9	13	1.2	18.1
1959:								
All farms.....number..	4,045	3,704	91.6	341	8.4	49	1.2	14.4
Less than 10 acres.....	298	241	80.7	58	19.3	33	11.1	56.9
10 to 49 acres.....	890	811	91.2	79	8.8	34	3.8	43.0
50 to 99 acres.....	745	658	88.3	87	11.7	21	2.8	24.1
100 to 219 acres.....	1,038	998	96.1	40	3.9	26	2.5	65.0
220 acres or more.....	1,074	997	92.8	78	7.2	13	1.2	16.7
1964:								
All farms[2].....	3,559	3,158	88.7	401	11.3	32	0.9	8.0
Class I, II, and III (sales of $10,000 or more).....	900	871	96.9	28	3.1	9	1.0	32.1
Class IV and V (sales of $2,500 to $9,999).....	1,002	949	94.6	54	5.4	10	1.0	18.5
Class VI and other (sales of $50 to $2,499).....	1,657	1,338	80.7	319	19.3	30	1.8	9.4
1959:								
All farms[2].....	4,043	[1]3,701	91.6	341	8.4	49	1.2	14.4
Class I, II, and III (sales of $10,000 or more).....	817	[1]794	97.2	23	2.8	8	1.0	34.8
Class IV and V (sales of $2,500 to $9,999).....	1,328	[1]1,270	95.6	58	4.4	13	1.0	22.4
Class VI and other (sales of $50 to $2,499).....	1,897	[1]1,637	86.3	260	13.7	47	2.5	18.1

Note: Numbers may not add to totals due to rounding.

[1]Data based on census 20-percent sample.
[2]Abnormal farms included with Class I, II, and III.

from the coverage check for 1959, and in some cases for 1954, are also presented. These series of estimates provide an indication of the size of, and trends in, errors which may be present in published census totals.

Some of the principal results which may be noted from table 10 are:

1. Relative net errors for acreage items are smaller than the relative net errors for number of farms.
2. The estimated relative net error for number of farms was larger in 1964 than it was in 1959 and 1954. However, the estimates of relative net error for acres of land in farms were not significantly different for the 1964, 1959, and 1954 censuses.
3. Relative net errors for number of farms by size were largest for "small" farms, whether size is defined in terms of acres or dollar value of sales.
4. For farms with sales of $2,500 and over (classes I to V), the estimated net errors for 1964 and 1959 did not differ significantly. However, for farms with sales of less than $2,500, the estimated net error was 19.3 percent in 1964 compared with 13.7 percent in 1959. It appears, therefore, that the increase in the estimated relative net errors for total farms resulted primarily from less complete coverage of marginal farms in 1964. Farms in this category, i.e., those with sales of less than $2,500, accounted for only about 3 percent of the total value of farm products sold in 1964. The larger net error for marginal farms in 1964 may have resulted from one or more of the following factors:
   a. The screening questions used in the 1964 enumerator canvass to identify persons with agricultural operations were less detailed and used higher cutoffs than those used in 1959. For example, horses, sheep, and goats were not mentioned in 1964, and cutoffs were raised from 20 to 30 for poultry and from 1 to 4 for hogs.
   b. On the other hand, the criteria used in the 1964 computer edit to determine which enumerated places should be retained as farms were more lenient than those used in the corresponding clerical operation in 1959. For example, a place with 10 acres or more was retained as a farm if it had 50 chickens, compared with 100 in 1959; or five hogs and pigs, compared with 10 in 1959. Places with sufficient operations to be retained in 1964 but not in 1959 were, in all probability, more likely to have been missed than other farms with sales of less than $2,500.
   c. An increasing proportion of the marginal farms is located in areas which are primarily nonfarm residential. Farms in these areas are more difficult for census enumerators to locate.

The estimates presented in table 10 are accompanied by estimates of sampling variability, expressed as standard errors. The chances are about two out of three that the difference between an estimate based on the coverage check sample and the figure that would have been obtained by applying the coverage check procedures to all farms would be less than the sampling error shown. The chances are about 99 out of 100 that this difference would be less than two and a half times the sampling error.

Results (Components of Net Error)

The estimates of net error for number of farms and for acreage items are presented in table 10. This table does not provide information about gross errors in coverage as, for example, the number of farms missed in the census and the number of places called farms in the census which were, in fact, not farms according to the census definition. For acreage items, these estimates of net error do not provide information about how much of the error resulted from farms being missed in the census and how much was due to reporting errors for farms included in the census.

Tables 11 and 12 present estimates of the components of net error for number of farms by size of farm and for the principal acreage and value items. An advantage of the type of coverage check which involved matching of individual records from two sources is that estimates of components of net error can be made. In 1964, each coverage check farm in the area sample was classified as missed, undercounted, or correctly counted in the census; and each census farm in the segment list sample was classified as correctly counted or overcounted.

Missed farms were those for which none of the land was included on any farm counted in the census questionnaire. Undercounting of farms occurred when two or more separate farms were counted as one farm in the census. Overcounting of farms resulted from the counting of a single farm as two or more separate farms in the census, and from inclusion in the census of places not qualifying as farms. Correctly counted farms were those from the census and the coverage check which matched or corresponded to each other. Some results which may be noted from tables 11 and 12 are:

1. Except for farms of 220 acres or more, the missed farms component accounts for most of the estimated total net error for farm counts. The missed farm component as a percent of the estimated total decreases as the size of the farm increases (table 11).
2. For correctly counted farms there was a tendency in the census to underreport the land in the farm, as shown by the excess of census farms over coverage check farms in the first four size classes and the excess of coverage check farms in the size class 220 acres or more (table 11). The overall net effect of this tendency may be seen in table 12, which shows a positive net error of 2.8 percent (the census figure was too low) for correctly counted farms.
3. That the positive net error for correctly counted farms of 3.5 percent for cropland harvested compared with only 2.8 percent for total land (table 12) is somewhat surprising, because earlier coverage checks have shown cropland harvested to be more accurately and fully reported than total land. The corresponding estimates of net difference for correctly counted

farms from the 1959 Coverage Check were plus 2.0 percent for total land in farms and plus 0.3 percent for cropland harvested. The procedure used to determine the acres of cropland harvested in the 1964 Coverage Check was less intensive than that used in 1959, in that data were obtained on a tract-by-tract basis rather than on a field-by-field basis. It is possible that this component of total net error for cropland harvested may have been overestimated as a result of the procedures used.

4. No attempt was made in the coverage check to measure reporting error for the individual data items used to calculate total value of farm products sold for each correctly counted farm. However, data on sales were obtained for farms classified as overenumerated, underenumerated, and missed, and on this basis it is estimated that there was a relative net error of 2.9 percent for total value of farm products sold (table 12).

Table 11. COMPONENTS OF NET ERROR FOR NUMBER OF FARMS BY SIZE OF FARM: 1964

Component	Number of farms (000)						Percent of estimated total					
	Total	Less than 10 acres	10-49 acres	50-99 acres	100-219 acres	220 acres or more	Total	Less than 10 acres	10-49 acres	50-99 acres	100-219 acres	220 acres or more
Estimated total.	3,559	241	768	616	890	1,044	100	100	100	100	100	100
Reported in census....	3,158	183	637	542	824	971	89	76	83	88	93	93
Plus net difference for correctly counted farms[1].....	0	-12	-21	-5	-2	+40	0	-5	-3	-1	(Z)	+4
Minus overcounted farms.....	-79	-10	-27	-14	-14	-13	-2	-4	-4	-2	-2	-1
Plus undercounted farms.....	+23	+5	+8	+4	+4	+2	+1	+2	+1	+1	(Z)	(Z)
Plus missed farms.....	+456	+76	+170	+89	+78	+44	+13	+32	+22	+14	+9	+4

Note: Numbers and percents may not add to totals due to rounding.
(Z) Less than 0.5 percent.
[1]Minus if number in census greater than number in evaluation survey.

Table 12. COMPONENTS OF NET ERROR FOR TOTAL LAND, CROPLAND HARVESTED, AND VALUE OF SALES: 1964

Component	Total land		Cropland harvested		Value of farm products sold[1]	
	Acres (1,000)	Percent of estimated total	Acres (1,000)	Percent of estimated total	Dollars (1,000,000)	Percent of estimated total
Estimated total.....	1,181,706	100.0	305,333	100.0	36,354	100.0
Reported in census.....	1,110,187	93.9	286,892	94.0	35,306	97.1
Plus net difference for correctly counted farms.....	+33,447	+2.8	+10,715	+3.5	(NA)	(NA)
Minus amount on overcounted farms.....	-13,445	-1.1	-4,697	-1.5	-470	-1.3
Plus amount on undercounted farms.....	+2,801	+0.2	+1,099	+0.4	+121	+0.3
Plus amount on missed farms.....	+48,716	+4.1	+11,324	+3.7	+1,396	+3.8

Note: Numbers and percents may not add to totals due to rounding.

[1]Coverage check did not measure reporting error for correctly counted farms. Estimated total reflects only errors resulting from overcounted, undercounted, and missed farms.

Results (Selected Farm Characteristics Associated with Match Status)

Table 13 presents some results based solely on the coverage check area sample. Each farm in the area sample was classified in one of the following three "match status" classifications:

1. Enumerated in the census, complete match --A census questionnaire was found for the same operator and for the land covered in the coverage check farm. Small differences between acres reported for the coverage check farm and for the census farm were allowed.
2. Enumerated in the census, partial match -- There was a census questionnaire for the same operator and/or for some of the land covered in the coverage check farm. However, the differences between the coverage check farm and the census farm were too large for a complete match.
3. Missed in the census --No census questionnaire was found which was filled for the operator of the coverage check farm or which accounted for any of the land in the coverage check farm.

In table 13, the percent distributions of farms by these three match status classifications are shown for several different characteristics of farms and farm operators. These results show that several factors are associated with failure to find and enumerate farms and, once a farm is located, failure to identify correctly the land included in the place.

Some types of farms most frequently missed were small farms (32.2 percent of the farms under 10 acres and 24.0 percent of the farms with 10 to 49 acres), farms in enumeration districts which were urban in character (25.3 percent), farms with nonresident operators (24.7 percent), and farms started in 1964 (22.6 percent). Farms operated by part owners and managers were less likely to be missed (5.9 percent) than those which were either tenant-operated (15.0 percent) or owner-operated (16.3 percent).

During the initial coverage check interview, each farm operator was asked whether a census questionnaire had been filled in for his place. Of those who answered "no" to this question, an estimated 61.2 percent had actually been missed in the census.

The difficulty of determining total acres correctly increased in proportion to the number of separate tracts in the place, in proportion to the number of landlords, and in proportion to size of the place. Land changes during the census year (1964) also increased the likelihood that the census enumerator would get an incorrect figure for total acres. Farms operated by individuals were enumerated correctly more often than those operated by partnerships and organizations, and fully owned farms were more often described correctly than partly owned farms, with tenant farms occupying an intermediate position.

EVALUATION PANEL SURVEYS

Background

Before 1959, evaluation studies for the censuses of agriculture were restricted to coverage checks similar to the one described above. In these studies, which started in 1945, emphasis was placed upon the independent reenumeration of a carefully chosen sample of farms in order to obtain measures of omissions and other errors in the enumeration. Although in 1959 and earlier years attempts had been made to investigate reporting errors for several items, the published results of evaluation surveys up to that time were limited to estimates of undercounts in numbers of farms, land in farms, and acres of corn, wheat, cotton, and total cropland harvested.

For the 1964 census the work was divided into the following two phases: (1) The coverage check of number of farms, land in farms, and cropland harvested (described in the preceding section), and (2) the evaluation of data for additional items (described in this section). The additional items covered in 1964 included livestock inventories and sales, crop production and sales, and selected expenditures. It was clear that the study of errors in these categories of items would necessarily involve the gathering of data currently during the census year, and that a considerable variation from the methodology used previously would be required. From a pretest it was concluded that the needed vehicle for the study would be a "panel" of farms from which data could be gathered periodically during the census year. For the pretesting a contract was arranged with the Statistical Laboratory of Iowa State University, the project to include the development of suitable evaluation questionnaires as well as experimentation with their use in scattered counties in various parts of the United States during the first half of 1963. The pretest involved the use of a "beginning" questionnaire in January 1963 and subsequent quarterly questionnaires on April 1 and July 1 of that year. No attempt was made to carry on the pretest during the last half of the year since the plans for the evaluation surveys proper had to be developed during that time in order to be ready for the mailing of the first questionnaire by January 1, 1964.

Purpose of the Evaluation Panel Surveys

The Evaluation Panel Surveys had as their purpose to study reporting errors and, to the extent possible, to obtain measures of gross and net errors for a limited set of content items in the 1964 Census of Agriculture. Specifically, the items to be studied were: inventories, sales, and purchases of cattle, hogs, and sheep; production (yield per acre) and sales of corn, oats, and alfalfa hay; and expenditures for machine hire and for hired labor. The definitions and periods of reference of all these items agreed with those in the census, and periodic reports were obtained from members of the panel during the required period, which was generally the calendar year 1964. The general plan of the Panel Surveys was to select a sample of farmers and to accumulate information from them for subsequent comparison with the corresponding answers later supplied by these same farmers on their individual census questionnaires.

Selection of the Sample

For the selection of the sample, major reliance was placed on use of the files of the 1959 Census of

Table 13. DISTRIBUTION OF AREA SAMPLE FARMS BY COVERAGE STATUS, FOR SELECTED CHARACTERISTICS

Characteristic	Number of farms (1,000)	Percent of total	Percent distribution by match status		
			Complete match	Partial match	Missed in census
Total area sample farms	3,453	100.0	60.9	25.9	13.2
By type of ED:					
Entirely rural	2,287	66.2	63.0	26.4	10.6
Mostly rural	771	22.3	59.7	25.6	14.7
Urban	395	11.4	51.5	23.2	25.3
Residence of operator:					
On place	3,052	88.4	63.5	24.8	11.7
Not on place	401	11.6	41.3	34.0	24.7
Size of farm (acres):					
Less than 10	235	6.8	46.8	21.1	32.2
10-49	709	20.5	56.0	20.0	24.0
50-69	228	6.6	58.3	25.7	16.1
70-99	346	10.0	62.7	22.2	15.1
100-139	373	10.8	66.4	23.0	10.6
140-179	361	10.4	67.6	25.7	6.7
180-219	214	6.2	69.6	23.8	6.6
220-259	185	5.4	67.3	27.3	5.3
260-499	466	13.5	63.7	31.6	4.7
500-999	200	5.8	63.0	32.9	4.1
1,000 or more	137	4.0	43.6	53.6	2.8
Type of organization:					
Individual	3,203	92.8	62.0	24.6	13.4
Partnership or other	250	7.2	47.0	41.9	11.1
Tenure:					
Full owner	1,921	55.7	68.0	15.7	16.3
Part owner or manager	955	27.6	50.3	43.8	5.9
Tenant	576	16.7	54.9	30.2	15.0
Number of landlords:					
0	1,909	55.3	68.1	15.5	16.4
1	977	28.3	54.2	34.9	10.9
2	320	9.3	51.6	41.5	6.9
3 or more	246	7.1	44.5	49.8	5.7
Number of tenants:					
0	3,021	87.5	62.6	24.2	13.2
1	328	9.5	50.9	37.3	11.8
2 or more	103	3.0	43.2	38.9	17.9
Answer to coverage check question on whether a census questionnarie was obtained:					
Yes	2,809	81.3	68.4	27.1	4.5
Do not know	204	5.9	39.0	25.3	35.8
No	406	11.8	20.5	18.3	61.2
N.A.	34	1.0	58.3	19.5	22.2
Number of tracts:					
1	1,840	53.3	66.4	15.7	17.8
2	817	23.7	58.2	32.7	9.1
3	374	10.8	55.1	36.1	8.8
4	190	5.5	54.8	40.5	4.7
5 or more	231	6.7	41.2	53.5	5.4
Land changes during 1964:					
Started in 1964	138	4.0	53.7	23.7	22.6
No changes	2,789	80.8	64.1	23.0	12.9
One change or more	525	15.2	46.0	41.5	12.5

Note: Numbers and percents may not add to totals due to rounding.

Agriculture, but with a small supplementation (about 500 cases) taken from the 1963 June enumerative survey of the U.S. Department of Agriculture, this being a subsample of those who reported that they had not been farming in 1959. Initially, the sample from the 1959 census files consisted of about 15,000 farms which were selected by multistage sampling with substratification by economic class of farm. At the first stage a sample of 200 PSU's was selected to represent the 50 States of the United States. This sample was the same one which was used for the coverage check. At the second stage a sample of 1959 census EA's was selected within each PSU. These EA's were selected in such a way as to avoid, in large measure, the EA's that had been chosen for the coverage check. At the third stage, farms were selected systematically within EA's, with substratification by 1959 economic class of farm and the use of different sampling rates within the different substrata.

Use of the January 1964 Questionnaire and Final Subsampling

For the January 1964 inquiry the full combined sample of approximately 15,500 farms was used. The questionnaires (EPA 26) were mailed out just after Christmas, 1963. For those who did not reply promptly in January, a second request was sent by mail, and a little later in the month every third nonresponse case (excluding those in economic classes 7 and 8) was followed up by telephone. It was considered best to accept a modest nonresponse rate for January questionnaires since any who might still be farming could be given an opportunity of being chosen for the panel even though no response had been received from them on the initial round. A high response rate was obtained and, in effect, the entire 15,500 was subsampled, except those who indicated that they had ceased farming prior to January 1, 1964. Information from the January questionnaires (EPA 26's) was used to classify the farms, the previous sample substratification having been based solely on the 1959 economic class. "Measures of importance" were derived which took into account inventory numbers of livestock, quantities of crops produced in 1963, and the magnitudes of expenditures for machine hire and hired labor. All farms having measures of 200 or more were subsampled for the panel at a rate of one-half; those having measures between 100 and 199 were subsampled at a rate of one-third. These two groups excluded those in the telephone followup. Those in the telephone followup were subsampled at a rate of one-sixth, and all the remaining cases thought possibly to still be farming were subsampled at the rate of one-fourth. The total numbers selected were about 3,300 from the 1959 census sample and an additional 165 from the USDA sample.

About 100 of the 3,465 cases were "postmaster returns." These, together with those subsequently found to be no longer farming, were dropped from the panel. Since the original probabilities of selection of all cases were carefully maintained, an estimate can be obtained of the 1964 numbers of farms as reflected by the panel sample.

The Control Sample

In addition to the sample selected for the panel proper, a parallel sample was selected to be used as a control in a study of possible conditioning effects. Theoretically at least, it was possible that the experience of panel members in regularly answering inquiries during 1964 might affect the replies they gave on certain questions on their 1964 census questionnaires. However, persons who had filled only the EPA 26 in January 1964 (which questionnaire related to 1963) could be expected to fill their 1964 census questionnaires without being influenced by the panel surveys. Therefore, it was proper to select a parallel sample from the original 15,000 by excluding any which had been chosen for the panel. For the small USDA sample no attempt was made to select a control sample. For purposes of this analysis, copies of the 1964 census questionnaires were obtained for members of the control sample as well as for members of the panel.

Size of Sample and Scheduling of Panel Reports

To facilitate the operation of the survey, a system of "staggering" the report periods was used. The entire sample was divided into three groups and the periods of reporting were varied for each group as follows: All groups were asked to fill out and return the January 1964 questionnaire (which included 1963 annual data); group I was asked to report on January 1, March 1, July 1, October 1, and again on January 1, 1965; group II on January 1, April 1, August 1, and January 1, 1965; and group III on January 1, May 1, September 1, and January 1, 1965. The total size of sample initially was about 3,465 or an average of 1,555 per group. Exclusion of farms not active in 1964, farms for which panel data were not obtained for the full year, and farms for which there were no matching census questionnaires reduced to approximately 2,600 the total number of cases for which comparisons could be made.

Description of Questionnaires

The basic concept of the study was that of a system of continuing inventory accounting. Therefore, continuity from report to report for the same individual was established by copying certain items of information from each completed questionnaire to the next one prior to mailing. The system of continuing inventory accounting may be illustrated with the case of cattle and calves. Beginning with the latest previously reported inventory number, the respondent was asked to add births and purchases, to obtain a control total, and then to record sales, slaughtering, deaths, and any other removals and to add the current inventory number (the number of cattle and calves now on the place) to arrive at the same figure as the control total. If he failed to reach a "balance" by this method he was asked to try to find and record the explanation for the difference.

Likewise for crops, questions were asked early in the season about quantities of the previous year's crop on hand and then to these were added quantities harvested and quantities purchased; on the credit side quantities used for feed (or seed) and quantities sold were added to the closing inventory to achieve a balance. For expenditure items, the plan was slightly different. Each time an EPA 27 questionnaire was sent out, information on the previous expenditures was copied from the last report. In this way it was hoped that the respondent would avoid including the same expenditure twice, and also that he would remember to include all amounts paid (or costs incurred) since the date of the items reported on the earlier report.

The panel questionnaires after the initial one generally contained the following sections:

Identification
Operation
Cattle and calves
Hogs and pigs
Sheep and lambs
Other livestock
Corn for grain
Oats for grain
Alfalfa for hay
Livestock and grain not on this place
Expenditures

An additional section on contracts was included in the questionnaire for the first reporting period, and sections were omitted when inapplicable, e.g., corn for grain omitted in the first reporting period since corn is not harvested until later in the year. In the section on operation the record of the land in the farm and the tenancy was transferred from one report to the next and was maintained from questionnaire to questionnaire without change throughout the year except when the farmer reported that a change had occurred. Information on livestock and grain not on this place was recorded in order to avoid confusion since the reporting in the regular sections was to include only quantities located on the place.

Landlord Crop-Share and Other Special Questionnaires

Since it was well known that many producers of corn and oats rent a portion or all of their land and pay a share of the crop as rent, a separate EPA 29 questionnaire was sent to crop-share landlords whose names had been obtained from the EPA 27's returned during the spring months. Questionnaires relating to oats were mailed out in the summer and those on corn in the late fall, with followup as required. The principal questions on the EPA 29 related to the quantities received by landlords as their share and their disposition of these quantities. This provided evidence on crop sales. The response to these questionnaires was good and the information obtained contributed to an understanding of different levels of reporting by tenants and landlords under various circumstances.

An additional form, EPA 30, Record of Storage Facilities and Quantities Stored, was used on an experimental basis in several locations in the North Central States to help check the accuracy of reported quantities. To fill in these forms, field staff workers went personally to farms in the sample and observed the storage facilities directly, making measurements and attempting to assess objectively the quantities actually in storage. About 60 such visits in all were made to respondents in the panel surveys.

Operation of the Panel

Except for the initial EPA 26 questionnaires, which were sent out from and returned to Jeffersonville, all mailing and return of questionnaires was done from and to Washington. Because of the distances involved, and the possible psychological effect, about 20 percent of the questionnaires were regularly sent by air with return airmail envelopes, and an additional 15 percent or so were sent by regular mail with airmail return envelopes enclosed. Questionnaires were regularly mailed out the 29th of the last month in the reporting period, with second requests sent out by the 9th or 10th of the following month. Throughout the surveys, the return of questionnaires was regularly about 70 percent or a little more. A small portion was regularly obtained by mail after a telephone followup by the field staff.

The field followup was undertaken each time for cases which still had not responded by the 16th or 17th of the month. The following four types of followup were used: (1) A telephone call followed by mail return of the questionnaire, (2) telephone interview, (3) telephone followed by personal visit if necessary, and (4) personal visit for those who had no telephone. During the time of the field followup, completed questionnaires continued to be received by mail, and the field offices were regularly notified of these returns in order that no further work would be done on these cases. In addition to the followup of nonresponse cases there was a limited amount of field followup for failed-edit questionnaires which had been received and which had been found sufficiently deficient to require such followup. For less serious defects, form letters were devised and sent to respondents to seek clarification of discrepancies. During the course of the panel surveys several hundred such letters were sent out, and followup letters were sent as needed, seeking to elicit maximum response.

As indicated previously, the response by mail regularly equaled 70 percent or more. In addition, another 9 or 10 percent was obtained by telephone interview and 10 percent by personal interview. Consequently, the total response rate regularly exceeded 90 percent even though the "base" included some cases found to be no longer farming. For cases for which no response was obtained for one reporting period, the questionnaire for the next reporting period was modified individually to include as the period of reporting the entire time since the receipt of the previous completed questionnaire. This method was used in order to maintain the sample at the maximum percentage of completeness. Refusal cases amounted to about 1 percent at the beginning, and this type of nonresponse increased gradually to about 3 percent.

Final Report and Correspondence Followup

For the final report, January 1965, the mailout and followup were speeded up in order to achieve a

Table 14. DESCRIPTION OF THE PANEL SAMPLE, AND GROSS AND NET

	Item	All farms			
		Total	With acceptable[3] panel reports		With unacceptable panel reports
			With non-zero panel reports	With zero panel reports	
		(1)	(2)	(3)	(4)
	Cattle:				
1	Inventory	2,608	1,836	570	202
2	Number sold	2,608	1,586	758	264
3	Receipts for sales	2,608	1,586	758	264
	Hogs:				
4	Inventory	2,608	893	1,568	147
5	Number sold	2,608	883	1,598	127
6	Receipts for sales	2,608	883	1,598	127
7	Number of farrowings	2,608	541	1,986	81
	Sheep:				
8	Inventory	2,608	236	2,335	37
9	Number sold	2,608	217	2,355	36
10	Receipts for sales	2,608	217	2,355	36
	Corn:				
11	Acres harvested	2,608	1,150	1,247	211
12	Bushels harvested	2,608	1,150	1,247	211
13	Bushels sold	2,608	528	1,917	163
	Oats:				
14	Acres harvested	2,608	766	1,760	82
15	Bushels harvested	2,608	766	1,760	82
16	Bushels sold	2,608	234	2,310	64
	Alfalfa:				
17	Acres harvested	2,608	759	1,586	263
18	Tons harvested	2,608	759	1,586	263
19	Tons sold	2,608	144	2,352	112
	Expenditures:				
20	Livestock purchases	2,608	1,208	1,222	178
21	Machine hire	2,608	1,187	1,053	368
22	Hired labor	2,608	1,180	986	442

[1]A large individual difference is one of 20 percent or more of the panel figure; i.e., for a particular farm and item, $\frac{\text{census-panel}}{\text{panel}} \geq .2$.

DIFFERENCES BETWEEN PANEL AND UNEDITED CENSUS DATA, BY ITEM

Farms with acceptable panel reports and with large individual differences between panel and census data for the item[1]						Gross and net differences[2]			
		With nonzero panel reports							
		Total							
Total	With zero panel reports	Number	Percent of all farms with acceptable nonzero panel reports (7)-(2)x100	With census response	With no census response	Gross difference	Percent of gross difference for which "difference reasons" were determined	Net difference (census minus panel)	
(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	
299	30	269	14.7	264	5	8,156	57.4	-870	1
803	69	734	46.3	716	18	23,747	76.6	+3,715	2
898	69	829	52.3	796	33	$2,992,400	61.7	-$115,502	3
283	40	243	27.2	240	3	10,461	30.2	-241	4
465	14	451	51.1	435	16	25,757	60.5	-7,147	5
489	15	474	53.7	451	23	$817,243	55.4	-$378,785	6
102	19	83	15.3	80	3	838	23.4	+276	7
49	3	46	19.5	46	-	4,465	38.5	-2,513	8
115	13	102	47.0	95	7	8,621	41.5	-6,969	9
124	12	112	51.6	94	18	$164,663	37.8	-$129,991	10
217	55	162	14.1	159	3	3,490	46.3	+188	11
404	51	353	30.7	305	48	638,302	37.9	-191,208	12
323	39	284	53.8	179	105	729,143	36.0	-401,731	13
143	35	108	14.1	108	-	2,039	36.7	+847	14
235	36	199	26.0	182	17	155,773	30.1	+6,867	15
156	25	131	56.0	89	42	110,213	27.6	-41,953	16
301	64	237	31.2	232	5	6,248	28.7	+1,240	17
453	61	392	51.6	374	18	31,638	60.5	+13,632	18
117	21	96	66.7	78	18	5,724	45.3	-1,478	19
878	78	800	66.2	680	120	$2,165,392	30.4	-$916,214	20
937	207	730	61.5	629	101	$387,712	47.0	+$49,024	21
883	161	722	61.2	595	127	$871,717	18.4	-$305,801	22

[2]Gross and net differences are based on all farms with both acceptable panel reports and large individual differences; i.e., the farms shown in column (5). In computation of gross and net differences, the census nonresponses shown in column (10) were treated as zero census reports.

[3]See p. 58 for definition of "acceptable" reports.

maximum response. The first mailing was made December 24, the day before Christmas, 1964, and the second mailing about January 5. It was thus possible to refer the nonresponse cases to the field on January 13 and 14. Nevertheless, the followup of nonresponse and failed-edit cases continued to some degree into February, and a few isolated cases were completed by personal interview at the time of field work on the coverage check in late March.

However, the gathering of information from panel members was continued by means of correspondence to a considerable degree during the greater part of 1965. Numerous instances were found in which respondents had not entered amounts received for livestock sales, which information would be prepared later for filing tax returns early in 1965. Letters were also sent to those who had indicated the possibility of selling 1964 production of corn or oats during 1965, asking them if sales had occurred.

Processing of Data

Processing the data began with the assembly of the following materials for each panel member: Panel questionnaires for January 1964 and all subsequent reporting periods, all correspondence and reports of followups, any special panel questionnaires related to the case, and the matching census questionnaires. For each member of the control sample, a copy of the matching census questionnaire was added to the January 1964 panel questionnaire.

Data for the specific items to be investigated were then transcribed from both the panel and census questionnaires. In the case of the panel data this involved the examination of all forms to determine yearly totals for livestock, crops, and expenditures. The transcribers were instructed to use all sources of information to determine the correct panel figure for each item, based on census definitions and terms of reference. Panel livestock inventory as of January 1, 1965, was adjusted to bring it in line with the census enumeration date, and other calculations were done as required. The data on the census questionnaire were transcribed exactly as entered, before the census manual and computer edits. The transcription of data for each case was done independently by two transcribers; then the worksheets were compared and any differences reconciled. In a later operation, edited data for the same census questionnaires were added to the worksheets.

The panel data were then subjected to an intensive technical review. During this operation all the assembled data and the transcription worksheets for each case were carefully examined to discover and correct any erroneous entries. Also, for each item investigated, judgment was made as to whether the panel data were "acceptable" for use as a standard against which to evaluate the census response. These judgments were based primarily on the internal consistency and completeness of the panel data; only in rare instances was the decision influenced by comparison with the census questionnaire.

One class of item for which missing panel data were always imputed was value of sales or purchases of livestock if the number of animals was reported but the value was not. This imputation was made by calculating an average unit price from the value given in the matching census questionnaire and from any values shown in other panel questionnaires for the same case. No attempt was made to estimate any other missing information.

The technical-review phase also included the filling in of "case-study" records for each acceptable panel figure that differed from the corresponding census figure by more than 20 percent of the panel figure. In these records the technical reviewer recorded both the panel and census figures and, whenever possible, described what he believed to be the reason for each difference. Analysis of these case study reports was carried out independently of the main tabulations.

Results

At the date of writing (July 1968), the main results of the Evaluation Panel Survey are not yet available. However, most analyses of the case-study records described in the preceding section have been completed. Table 14 summarizes some of the results. Following are some highlights of the case-study results:

1. A substantial proportion of all farms reporting each item showed differences of 20 percent or more between panel data and unedited census data. This proportion was greater than one-half for each of the six money items covered by the study and was close to or greater than one-half for each item concerned with numbers of livestock sold or quantities of crops sold.
2. Many of the differences observed in this study would not have occurred, or would have had had a smaller probability of occurring, if the changes in content and collection procedures planned for the 1969 Census of Agriculture had been in effect. Among such differences are those in items not planned to be included in 1969 census content, those arising from the need to report before the end of the reference year, and those resulting from the collection of data from respondents other than the operators. The new procedures also may substantially reduce differences due to recall errors since respondents will be under less pressure to supply answers on the spot and will have more opportunity to use their records.
3. Many of the differences were eliminated or substantially reduced by the computer edit. These include differences resulting from extra or dropped digits and from use of wrong units of quantity, as well as differences resulting from nonresponse to certain items in the census.
4. Differences that would be expected to persist in the 1969 census include those resulting from confusion over the definition of the "place" to which the census report refers, from misunderstanding of the content of specific items, and from careless errors.

Appendix. 1964 Census of Agriculture Publications

FINAL REPORTS

Vol. I State and County Statistics

Issued in 53 paperbound parts, one for each State and for outlying areas of Guam, Puerto Rico, and the Virgin Islands. Price for complete set (53 reports), $126.35.

Area	Part no.	Pages	Price
STATES			
Alabama	32	403	$2.75
Alaska	49	140	1.25
Arizona	43	221	2.00
Arkansas	34	402	2.75
California	48	545	3.50
Colorado	41	401	2.75
Connecticut	6	227	1.50
Delaware	22	227	1.75
Florida	29	483	3.00
Georgia	28	619	4.00
Hawaii	50	234	1.75
Idaho	39	368	2.25
Illinois	12	439	3.00
Indiana	11	448	3.00
Iowa	16	429	3.00
Kansas	21	422	3.00
Kentucky	30	483	3.00
Louisiana	35	457	2.75
Maine	1	232	1.75
Maryland	23	313	2.00
Massachusetts	4	259	1.75
Michigan	13	447	3.00
Minnesota	15	415	2.75
Mississippi	33	429	2.50
Missouri	17	471	3.25
Montana	38	361	2.25
Nebraska	20	420	2.50
Nevada	45	215	1.50
New Hampshire	2	205	1.50
New Jersey	8	284	1.75
New Mexico	42	331	2.00
New York	7	413	2.50
North Carolina	26	511	3.25
North Dakota	18	350	2.00
Ohio	10	462	3.00
Oklahoma	36	465	3.00
Oregon	47	394	2.25
Pennsylvania	9	417	2.50
Rhode Island	5	207	1.50
South Carolina	27	392	2.25
South Dakota	19	355	2.25
Tennessee	31	471	3.00
Texas	37	881	5.00
Utah	44	302	2.00
Vermont	3	222	1.75
Virginia	24	491	3.25
Washington	46	416	2.50
West Virginia	25	279	2.00
Wisconsin	14	395	2.25
Wyoming	40	249	1.75
OUTLYING AREAS			
Guam	51	32	.40
Puerto Rico	52	349	2.00
Virgin Islands	53	49	.45

Vol. II General Report--Statistics by Subjects

To be issued in 11 paperbound chapters (Introduction and 10 separate subject-matter chapters).

Introduction. 64 pp., 45¢.

Chapter 1 Farms and Land in Farms. 37 pp., 30¢.

Chapter 2 Livestock, Poultry, and Livestock and Poultry Products. 196 pp., $1.

Chapter 3 Size of Farm. 45 pp., 30¢.

Chapter 4 Crops, Horticultural Products, and Forest Products. 208 pp., $1.

Chapter 5 Characteristics of Farm Operators and Persons Living on Farms. 98 pp., 50¢.

Chapter 6 Value of Farm Products Sold and Economic Class of Farm. 81 pp., 45¢.

Chapter 7 Farm Facilities, Farm Equipment, Farm Expenditures, Farm Labor, and Cash Rent. 68 pp., 40¢.

Chapter 8 Color, Race, and Tenure of Farm Operator. 267 pp., $1.

Chapter 9 Irrigation, Land Improvement Practices, and Use of Agricultural Chemicals. 46 pp., 35¢.

Chapter 10 Type of Farm. 260 pp., $1.25.

Vol. III Special Reports

Issued in paperbound parts.

Part 1 Data-Collection Forms and Procedures for Census and Related Surveys. 67 pp., 45¢.

Part 2 Farm Labor. 188 pp., $1.25.

Part 3 Sample Survey of Agriculture. 60 pp., 45¢.

Part 4 Farm Debt. 482 pp., $3.25.

Part 5 Maps. (Scheduled for future publication.)

Part 6 Procedural History. 60 pp.

PRELIMINARY REPORTS

(COPIES NO LONGER AVAILABLE)

Series AC64-P1 Farms, Farm Characteristics, and Farm Products.

This series consisted of approximately 3,150 reports, one for each county, State, three regions (North, South, and West), and a U.S. summary. These reports were incorporated in the various parts of Vol. I, State and County Statistics, 1964 Census of Agriculture.

Series AC64-P2 Farms, Farm Characteristics, Farm Products.

This series consisted of 196 reports, one for each congressional district made up of whole counties in each State as delineated for the 90th Congress. The data in these reports covered the same subjects as those in series AC64-P1 above. These reports showing data by congressional districts were not incorporated in the volumes.