1992
Census of Agriculture

AC92-S-4

Volume 2
SUBJECT SERIES

Part 4
History

U.S. Department of Commerce
Economics and Statistics Administration
BUREAU OF THE CENSUS

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Chapter 1.

Introduction

BACKGROUND INFORMATION

Article 1, Section 2, of the United States Constitution requires that a census of population be carried out every 10 years to apportion representation of each State in the House of Representatives. Even as the delegates to the convention that produced the Constitution discussed its various provisions, James Madison, its principal author, urged that the census be used for something more than just counting heads. Nothing came of his recommendations until 1810, after he had become President Madison. In that year, the census tried to collect information on manufacturing establishments as well as population, and included a single item asking whether the person enumerated was engaged in agriculture (approximately 80 percent were). Another 30 years passed before the census program included an enumeration of agricultural activities. The 1840 census attempted to collect more detailed information on manufacturing, mining, and agriculture, with limited success. Despite this, the value of agriculture data (and the other detailed statistics) was so obvious that the census program was permanently expanded to cover economic and agricultural activities.

The agriculture census remained part of the decennial census program from 1850 through 1920, while the other economic areas were covered first as part of the decennial program, and later every 5 years. In 1915, the Congress authorized the collection of agriculture data quinquennially, but it was not added to the mid-decade enumeration covering the economic areas until 1925.

Through 1940 the Census Bureau carried out the agriculture census with the other economic censuses, but changes in their respective schedules, intended to use the agency's resources more efficiently and to distribute the workload over the periods between the decennial censuses, caused the reference years to diverge. By the 1950's, the agriculture census was collecting and publishing information for years ending in ''4'' and ''9'', while the economic censuses had years ending in ''2'' and ''7'' as reference periods. In 1976, Public Law (P.L.) 94-229 shortened the intercensal periods after the 1974 and the following agriculture census to 4 years each, restoring the agriculture census to a concurrent schedule with the 1982 and later economic censuses.

The agriculture census is the only source of statistics on American agriculture showing comparable figures, county by county, and classifying farms by size, tenure, type of organization, principal occupation and age of operator, market value of agricultural products sold, combined government payments and market value of agricultural products sold, and Standard Industrial Classification (SIC) code. The 1992 Census of Agriculture covered all agricultural operations in the 50 States, Puerto Rico, Guam, and the U.S. Virgin Islands.

LEGAL AUTHORITY

The Bureau of the Census, an agency of the U.S. Department of Commerce, carried out the 1992 agriculture census, under authority granted by Title 13, United States Code—Census. Title 13 governs the agency's operations, establishes what censuses shall be taken and the intervals between them, specifies certain administrative procedures, and describes the duties of particular officials. (See appendix A for excerpts of Title 13 applicable to the agriculture census.)

Chapter 1 (Administration) of the title covers collecting and handling census and survey data and the qualifications and duties of census supervisors and other employees. Section 5 of the chapter assigns to the Secretary of Commerce responsibility for preparing census report forms and determining the number and type of inquiries included. Section 9 sets confidentiality requirements for census data and forbids the ''use of information furnished... for any purpose other than the statistical purposes for which it was supplied....'' The section also restricts access to census report forms to sworn Department of Commerce or Census employees and forbids publication of any information from the census or any survey that could be used to identify a specific person or establishment.

Chapter 5 (Censuses), section 142, describes the type, frequency, and geographic scope of the agriculture census, and section 195 authorizes sampling to be used to carry out the provisions of Title 13 (except—applied to the censuses of population—for determining population for apportionment of congressional representation).

Chapter 7 (Offenses and Penalties), section 214, sets out the penalties (a fine of not more than $5,000, imprisonment for not more than 5 years, or both) for any employee or Census Bureau or Department staff member publishing or otherwise communicating to any person other than a sworn Census Bureau or Department of Commerce employee any data covered by the confidentiality provisions of the law. Sections 221 and 224 require response to

the censuses and establish penalties for noncompliance (a fine of $100 for individuals and $500 for organizations).

USES OF AGRICULTURE CENSUS DATA

Agriculture census data are routinely used by the Administration; Congress; Federal, State, and local government organizations; the business community; scientific and educational institutions; and farmer organizations.

- **The private sector**—businesses, farm cooperatives, commodity and trade associations, utility companies—relies on agriculture census data in developing plans for locating new plants, service outlets, and sales and distribution facilities, as well as for allocating research resources, forecasting markets, selecting marketing areas, and for other activities that provide better services to the farm community. A major farm organization uses census data to develop promotional materials on various segments of American agriculture.
- **Farm and agriculture-oriented magazines and news media** use census results as technical background for stories and feature articles to determine their share of the market and to identify the types of farms they reach. A regional television station, for example, used agriculture census data to determine farm operator characteristics and agricultural production levels in each of its 211 television markets, enabling its advertisers to target specific media markets for particular services and products.
- **Administrative and legislative bodies** at all levels of government use the census data in planning farm and rural programs and analyzing the results such programs. The Congressional Budget Office uses agriculture census data to evaluate the farm income-support program; State and county agencies employ census statistics for land planning and zoning, to aid in evaluating environmental policy, profiling the States' labor force, economic planning, and so on.
- **The U.S. Department of Agriculture's National Agricultural Statistics Service (NASS)** employs agriculture census statistics to develop benchmarks and comparisons for many of its current estimates, and in evaluating particular problems or situations. The USDA's Economic Research Service (ERS) uses census of agriculture data in developing the farm accounts, evaluating the current economic situation, and in monitoring and measuring structural changes and adjustments in the farm sector. The Animal and Plant Health Service prepares disease and pest damage assessments, when needed, using census information.
- **Federal Government agencies** use production, sales, and size and type of farm data from the census in calculating such economic measures as the gross domestic product (GDP), farm income estimates, and indexes of productivity and price levels. Census data also are used to calculate Federal disaster compensation and environmental assessments, and for special projects.

FARM DEFINITION

The reporting unit for the agriculture census has always been the individual agricultural operation—the farm (or ranch—for census purposes, ''farm'' and ''ranch'' are interchangeable terms). The word ''farm'' might be applied to any place on which anything called a ''crop'' is grown or any animals are cared for by humans. However, any attempt to collect data on a specified subject, such as agricultural production, requires that both the subject of inquiry and the source of the information desired be defined. Consequently, the Census Bureau has had to develop an official definition of a farm for census purposes.

The ''farm'' first was defined for the 1850 agricultural census as any place with annual sales of agricultural products amounting to $100 or more. The definition has been changed nine times since (see appendix B) with new sales or acreage criteria, but the land involved must be used for or connected with agricultural operations, and must be operated under the day-to-day control of one individual or management (e.g., partnership, corporation). *Agricultural operations* means producing livestock, poultry, or other animal specialties and their products, and/or producing crops, including fruits and greenhouse or nursery products.

The census results are based on data obtained from individual ''farms.'' The land comprising the farm need not be a single contiguous tract; that is, several separate pieces of land may be treated as a single farming operation when all are operated as a single unit. Since the county is the smallest geographic unit for which the agriculture census tabulated complete data, specific rules cover farms with land in more than one county. Where land operated as a single farm is located in two or more counties, the data are tabulated in the county containing the largest value of agricultural products raised or produced.

The 1992 Census of Agriculture used the same farm definition first employed in the 1974 census. A farm was any place that met the above requirements for ''agricultural operations'' and individual control, and that had, or normally would have had, $1,000 or more in total value of sales of agricultural products during the reference year. The farm definition for Puerto Rico and the other outlying areas was different, but also involved minimum levels of sales: For Puerto Rico, a farm was any place that had $500 in annual sales of agricultural products, or a place with at least 10 cuerdas[1] of land and a minimum of $100 in sales. In Guam and the Virgin Islands of the United States, any place with $100 in annual sales of agricultural products qualified as a farm.

[1]A cuerda is approximately .97 acre.

1992 CENSUS OF AGRICULTURE

Scope and Reference Dates

Scope. The 1992 Census of Agriculture program collected and published statistical data for all agricultural operations meeting the farm definition in the 50 States, Puerto Rico, Guam, and the U.S. Virgin Islands. The Bureau requested certain basic data from all farms, while selected information was asked of a sample of about 25 percent of all farms. All farm operators in the 50 States were asked for information on:

- Acreage in the place.
- Crops, including fruits and nuts, vegetables, and nursery and greenhouse products.
- Gross value of sales.
- Land use.
- Irrigation.
- Land in government programs.
- Livestock and poultry.
- Animal specialties
- Amount received from Government Commodity Credit Corporation (CCC) loans.
- Payments received for participation in Federal farm programs.
- Direct sales of commodities to consumers.
- Type of organization, including corporate structure.
- Number of hired workers.
- Injuries and deaths.
- Characteristics and occupation of operator.

The Bureau asked an approximate 25-percent sample of operators (i.e., all those with expected annual sales of agricultural products above a specified value, together with a random sample of all other farms) for additional data. The sample was small enough to limit respondent burden to reasonable levels, while providing reliable county-level estimates for:

- Use of fertilizers and chemicals.
- Total production expenses, including interest expense for secured and unsecured loans.
- Machinery and equipment (inventory and value)
- Market value of land and buildings.
- Income from farm-related sources.

For inquiries in Puerto Rico and the outlying areas see chapters 7 and 8.

Reference periods and dates. The 1992 agriculture census requested inventory data (e.g., number of livestock) as of December 31, 1992, while production, sales, and other statistics (except a few crops, such as citrus, for which data were collected for the production year) were collected for the calendar year 1992. In Puerto Rico, Guam, and the U.S. Virgin Islands, inventories were requested as of the date of the enumeration, while production and sales data were asked for the 12 months preceding that date.

An Overview of the Census Operation

Data collection. The 1992 census, like its predecessors from 1969 onward, was a mailout/mailback enumeration. The Census Bureau assembled an initial mail list of more than 14 million addresses from various sources, including the 1987 census. This preliminary list was reduced by deleting duplicates and nonagricultural operations to a final census mail list of 3.55 million (about 550,000 less than in the 1987 census). In December 1992 the Census Bureau mailed report forms to the names and addresses on the census mail list, with a cover letter asking recipients to complete the report form(s) and mail them back to the Census Bureau. Mail and telephone followup (the latter making extensive use of computer-assisted telephone interviewing (CATI) equipment and techniques) to nonrespondents continued over a period of 6 months after the initial mailing.

The farm and ranch irrigation survey, originally scheduled for 1993, was postponed to 1994 for budgetary reasons. This sample survey covered the major irrigation States (see chapter 9, for details), employing a mail list drawn from the 1992 census respondent list of farms reporting irrigation.

As the Census Bureau ‘‘closed out’’ collection in each State or area (i.e., once an acceptable overall response level had been achieved), it edited, reviewed, and tabulated the data, developed estimates for farms that did not respond, and prepared the data publication for that State or area. The 1992 census enumerated a total of 1,925,300 farms, with an average farm size of 491 acres, and average annual sales of over $84,000. By contrast, the 1987 census showed 2,087,759 farms, with an average of 462 acres and average annual sales of approximately $65,000. Total acreage in farms for 1992 was 945,531,506 compared to 964,470,625 for 1987. Total annual sales of agricultural products for 1992 were approximately $162.6 billion, while the 1987 census showed total sales of $136 billion.

Data processing and publication. The Data Preparation Division (DPD) at Jeffersonville, IN, received mail returns, entered individual report data into the computer file, and resolved edit failures, using interactive minicomputer systems. The Economic Statistical Methods and Programming Division (ESMPD) then tabulated the data on the Census Bureau’s minicomputer system at the Charlotte, NC, facility. (Report forms from Puerto Rico were processed by the DPD, while those from Guam and the U.S. Virgin Islands

were handled by the AGR staff at Census Bureau headquarters.) The Census Bureau employed a new tabulation and disclosure system (TADS) to aid analysts in the review/validation of county and State tabulations before publication. The TADS allowed analysts to review the tables on computer terminal screens, calling up individual farm report files from the computerized data base and resolving any problems that showed up in the tabulations. This eliminated the thousands of pages of computer printouts required in previous censuses for review and correction.

Budgetary constraints required the Bureau to ''stretch out'' the 1992 agriculture census processing, and the first Volume 1, *Geographic Area Series* printed report was issued in January 1994. The agency prepared public-use computer tapes for each State and released them as the printed reports were published. All the agriculture census data also were published on a set of two compact disc-read only memory (CD-ROM) discs, and highlights were available online.[2]

Geographic Area Detail

The 1992 Census of Agriculture provided data for the United States, each of the 50 States, Guam, Puerto Rico, the U.S. Virgin Islands, and for over 3,000 counties or county equivalents. In addition, selected data were tabulated and published at the five-digit ZIP Code level. The United States is the 50 States and the District of Columbia (the 1992 agriculture census did not publish a separate report for the latter), while ''county equivalents'' include the parishes in Louisiana and the''census areas'' in Alaska. State totals are aggregates of the county or county-equivalent totals, while the national ones are aggregates of the State data. The 1992 census data publication program also released selected data items at the five-digit ZIP Code area level on CD-ROM, and a separate CD-ROM containing selected agriculture data for congressional districts from the 103rd Congress and metropolitan areas (MA's).[3]

The 1994 Farm and Ranch Irrigation Survey

This survey was the only follow-on operation provided for in the 1992 agriculture census program. It supplemented the basic irrigation data collected from all farm operators in the 1992 census. The survey used a sample of operations from the 1992 census that reported using irrigation during the reference year to obtain detailed data about irrigation practices without increasing the response burden on all farmers. The survey requested information on:

- Irrigated acreage.
- Crops—acres, yield, and quantity of water applied.
- Methods of on-farm water distribution.
- Source of water.
- Number of wells.
- Energy use.
- Irrigation maintenance costs.
- Irrigation practices.

Data from the survey was published in 1995 for the 48 conterminous States, for the 27 States that account for 98 percent of all irrigation including the 17 Western States, and for the 18 water resources areas (WRA's).

Expenditures

The 1992 Census of Agriculture and its associated activities cost $85.6 million. Census operations invariably overlap one another in periods—one agriculture census program is still being worked on when planning for the next begins. Preliminary work and plans for the 1992 enumeration began almost before the actual data collection for the 1987 census had been completed. Expenditures by major census activities for each fiscal year for the 1992 census are shown in table 1-1.

[2]The agriculture census data were released by State on a flow basis, and the first CD-ROM disc contained the data files for the first 25 States released for publication. When data for all 50 States were released, the Census Bureau published a complete file on two CD-Rom's.

[3]A metropolian area (MA) is an integrated economic and social unit with a recognized large population nucleus. Usually, an MA consists of one or more counties (except in New England, where one or more city or town may be designated an MA) or their equivalents, including a city with a population of at least 50,000, or an ''urbanized area'' with a population of at least 50,000 and a total metropolitan population of at least 100,000 (75,000 in New England). The MA may contain one or more predominantly agricultural counties.

Table 1.1. **Expenditures for Major Census Operations by Fiscal Year**

(In thousands of dollars)

Total	Fiscal year						
	1990	1991	1992	1993	1994	1995	Total
Total	$2,670	$11,238	$13,664	$30,293	$17,271	$10,469	$85,605
Direction	716	2,690	2,231	3,072	3,869	2,811	15,389
Content determination/design	97	2,811	3,493	646	357	376	7,780
Mail list development/mailing	155	1,822	1,889	6,111	834	606	11,417
Data collection/processing	865	3,377	5,348	18,825	8,496	3,392	40,303
Publication/dissemination	837	538	703	1,639	3,715	3,284	10,716

ORGANIZATION OF THE CENSUS BUREAU

During most of the 1992 Census of Agriculture period the Census Bureau was organized under a director, a deputy director, and several associate directors responsible for specific operational or administrative areas—demographic fields, decennial censuses, economic fields, information technology, administrative services, field operations, and statistical design, methodology and standards. Subordinate to the associate directors were three assistant directors with specific responsibilities for economic programs, decennial censuses, and administration. A fourth assistant directorate, for communications, directly subordinate to the director and deputy director, was established in January 1991. The assistant directorate for automated data processing technology (ADP) was abolished in January 1993, and the associate directorate for information technology was created.

In June 1994, the Census Bureau underwent a major reorganization intended to improve control and implementation of Census Bureau policy priorities, establish a planning and organization staff to be responsible for strategic planning, and exercise better controls over the agency's financial operations. The major features of the reorganization were the creation of (1) a Principal Associate Director and Chief Financial Officer, (2) a Principal Associate Director for Programs, (3) a new Associate Director for Planning and Organizational Development, and (4) an Office of the Comptroller at the same organizational level as the associate directors. The associate and assistant directors oversaw the various divisions and offices that make up the Census Bureau. These individual units were grouped by broad functional categories: (1) subject-matter (e.g., Agriculture, Population, Industry, etc.), (2) data collection and processing (Data Preparation, Economic Programming, Systems Support, etc.), (3) statistical research and services (Statistical Research, Center for Survey Methods Research), (4) administration and services (Budget, Technical Services), and (5) communications and public services (Data User Services, Public Information, and the Congressional Affairs Office).

Agriculture census operations remained the responsibility of the Associate Director for Economic Programs, but the operational structure of the economic programs directorate was reorganized as well, consolidating planning staff and resources in a new Economic Planning and Coordination Division. The Agriculture Division's (AGR's) own planning staff was transferred to the new division, while the division itself was reorganized and acquired responsibility and staff for collecting economic financial statistics. Table 1-2 shows the AGR organization before the reorganization, while Table 1-3 displays the new Agriculture and Financial Statistics Division (AGFS) organization. (Since the reorganization and renaming of the division took place only in June 1994, this *History* will use the old title throughout.)

The Agriculture Division (Agriculture and Financial Statistics Division from June 26, 1994) carried out the 1992 Census of Agriculture under the overall supervision of the Associate Director for Economic Programs and the Assistant Director for Economic Programs. Other divisions made major contributions to the enumeration, especially the following:

- The Economic Programming Division prepared many of the computer programs for mail list development and data processing.
- The Data Preparation Division in Jeffersonville, IN, was responsible for handling mailings, part of the telephone followup, and most precomputer processing of the report forms.
- Other divisions handled automated data processing, user services, and publications services.

Table 1-3. **Agriculture Division Organization Prior to June 26, 1994.**

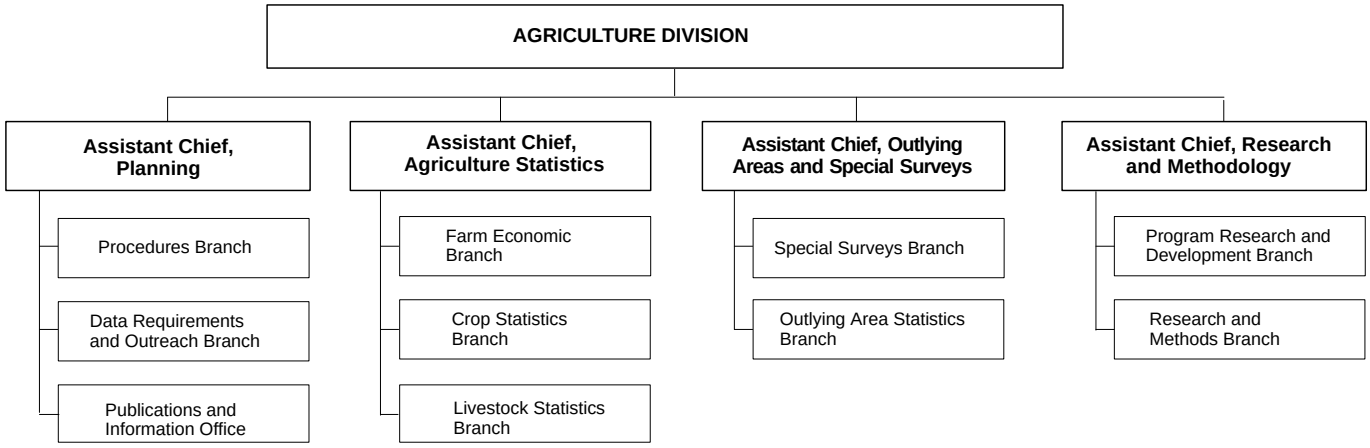
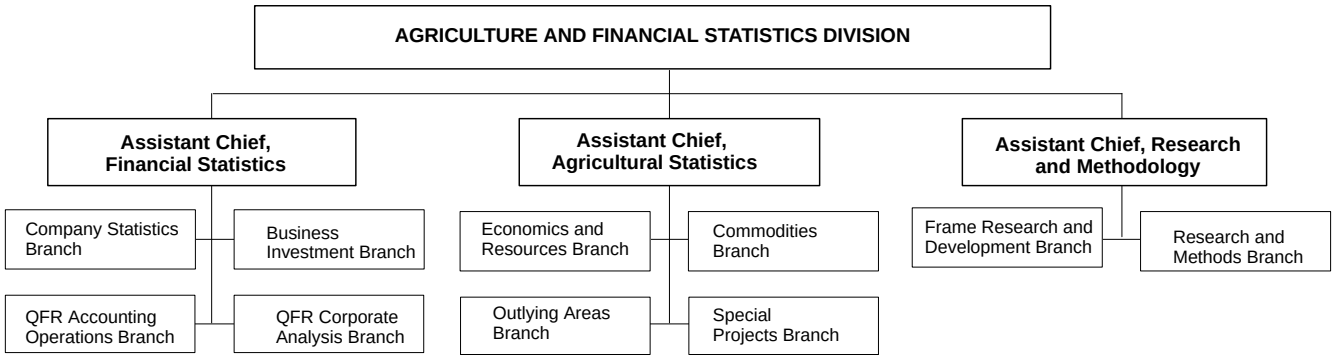


Table 1-3. **Agriculture and Financial Statistics Division Organization From June 26, 1994.**



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Chapter 2.

Planning and Preliminary Operations

PLANNING

Considerations

The periodic agriculture census collects and publishes data on agriculture in the United States. As is the case with the more familiar decennial census of population and housing, planning an enumeration of agriculture is an exercise in balancing conflicting and often contradictory requirements. The core of the agricultural economy in America is farm and ranch commodity production (the terms ''farm'' and ''ranch'' are interchangeable for census purposes; both identify a single agricultural establishment), and most farms and ranches in this country still are controlled by individual owner-operators (although partnerships, and corporate organizations play an increasing role in agricultural production). Farmers, and their counter-parts in agricultural-related industries, are required by law to provide the census information, though most of them would prefer to spend their time doing other things than filling out Government questionnaires. The first and greatest compromise in any agriculture census is made between the wants and needs of data users, and the response burden that can be imposed on data suppliers without provoking outright refusal or other forms of noncooperation.

Cost is a major consideration as well. The Census Bureau developed the mailout/mailback, or self-enumeration procedure for the 1969 census in large part because it would cut costs in half, but even mail enumeration faces continually increasing expenses.[1] Indeed, mailing costs comprise a very large portion of the cost of each census, so there is a permanent interest in saving money by reducing the size of the census mail list. Early response in the data-collection effort also reduces costs by reducing the need to followup to nonrespondent addresses that the Census Bureau, for want of contradictory information, has to assume are farms.

Once respondents have completed and returned their report forms the data must be extracted, processed, and tabulated. The more detailed the tabulations and crosstabulations, the more useful the data are to users, but tabulation and cross-tabulation consume both time and money and increases suppression for disclosure avoidance. The funding available necessarily restricts the volume and detail of the tabulations, as does the requirement that the census be published on a *timely* basis. With unlimited resources of time and money, much more detailed and complex statistics could be published, but timeliness in releasing the data also is critical, so further compromises have to be made to ensure valid data are available to users within a reasonable period following the enumeration.

The balancing act is further complicated by the confidentiality requirements of the law governing the operation of the Census Bureau. The census data-release program may not release information that might be used to identify an individual establishment or operator. This restriction means that all the tabulations and cross-tabulations must be checked to ensure that individually identifiable data items are suppressed (or are not released).

Preliminary Planning

Review of 1987 processing. The Census Bureau made a major effort to streamline data processing for the 1987 agriculture census and to incorporate improvements in succeeding censuses. The most significant of these improvements was the extensive use of interactive systems for many of the most labor-intensive and time consuming tasks, such as keying data and clerical editing. Up to 70 individual work stations at the Data Preparation Division (DPD) office in Jeffersonville, IN, were linked to one of several minicomputers at the Census Bureau's Suitland, MD, headquarters during processing operations. The minicomputers had substantial data storage and processing capacity; they dispensed with many of the paper printouts previously used by displaying data on the Jeffersonville terminals' screens during name and address research, report form check-in, edit and analytical review, disclosure review, and problem resolution and correction operations.

While the changes for 1987 led to significant improvements in overall processing efficiency, data quality, and timeliness of release and publication, the relatively late acquisition of much of the equipment used for the processing meant that the benefits realized in the 1987 census were only the beginnings of the advantages the agency might obtain from this technology. This situation was recognized by the agriculture census planning staff, and the initial planning for the 1992 enumeration included a systematic study of the 1987 processing, tabulation, and

[1]The 1964 agriculture census was the last carried out as a door-to-door canvass, and cost $25.1 million; the 1969 census, using mail enumeration, cost just $26 million, an actual decline in cost when inflation is considered.

disclosure systems. The general processing strategies for the 1992 enumeration were developed at a series of weekly meetings and plans for procuring the required computer hardware drawn up.

Agriculture census steering committee planning activities. In December 1988, the Agriculture Division (AGR) organized an Agriculture Census Steering Committee, whose membership included the Chief and Assistant Chiefs of the AGR, and the Assistant Chief of the Economic Programming Division for Agricultural Programs. This steering committee oversaw the activities of 13 project committees, and several subcommittees, composed of subject-matter specialists from the AGR and other Census Bureau divisions involved in the agriculture census (primarily the Statistical Research Division (SRD) and the Economic Programming Division (EPD)). Each committee and subcommittee was concerned with reviewing and making recommendations on specific census activities, as follows:

- Data content/forms design, mail follow-up/mailing.
- Census test subcommittee
- Mail list development
- Coverage evaluation
- Census processing
  - Imaging subcommittee
- Edit review
- Analytical review
- Disclosure system
- Nonresponse survey
- Statistical weighting (nonresponse and samples)
- Data release program
  - Electronic data release subcommittee
  - Print/tabulations subcommittee
- Follow-on program
- Outlying areas program
- Variance estimation

The individual committees were directed to develop overall time schedules, goals, and objectives for planning for their particular subject areas. The planners worked on the general assumption that the 1992 census processes would be similar to those used for the 1987 census, but that improvements would be made that would significantly change the activities required, their sequence, and timing. While the committees addressed virtually every aspect of the census operation, the most significant changes as a result of their recommendations were:

1. Expanding the use of interactive processing and edit systems in agriculture census operations, including correspondence processing, data entry, and correction edit operations. (See Chapter 6, ''Data Processing,'' for more information on these activities.)
2. The design and implementation (including the acquisition of the required computer hardware) of the Tabulation and Disclosure System (TADS) using interactive table review to eliminate paper-intensive table review activies. (See below, and Chapter 6, ''Data Processing,'' for more information on the TADS).
3. The development of improved disclosure analysis methods to reduce the volume of complimentary suppression required in the census tabulations while maintaining confidentiality.
4. The adoption of the Census Bureau's computer assisted telephone interviewing (CATI) system for the 1992 agriculture census followup operations.

Changes in computer hardware. By November 1990, Census Bureau staff had completed their analysis of the 1987 processing operation, and began implementing many of the recommendations that resulted from that analysis. A major objective that had emerged from the analysis and planning activities was expanded automation of census activities, particularly the processing and tabulation of census data. The AGR staff had begun plans for a new, automated table design system even before the processing analysis had been completed, and had finished plans for a new Tabulation and Disclosure System (TADS) requirement. The TADS requirement called for a standardized method for table development and review that would make maximum use of available technology and reduce both programming resource requirements and tabulation errors. The system would employ a number of computer workstations at Census Bureau headquarters, using advanced software to provide status tracking, interactive table review, and data flow information to the staff at any time during the data processing cycle. Further automation of the processing also would eliminate the huge masses of paper required in previous tabulation review procedures and provide still better online review and research capabilities.

The TADS required the procurement of new computer hardware for the AGR to take maximum advantage of the new system design. The Census Bureau staff decided that any new systems should be compatible with the minicomputer systems employed by the Economic Programming Division (EPD) staff, since EPD would be heavily involved in processing planning and program implementation.[2]

To take best advantage of the TADS, the AGR staff would have the easiest possible access to the system compatible with data file security. To enable the staff to

[2]The equipment and operating systems selected for employment with the TADS were not compatible with the majority of equipment then in use in the AGR, and, consequently, the staff concerned had to be trained in the use of the proposed new systems. This training was conducted shortly after the decision to procure the new equipment was approved, so that once the hardware was in place, work could be started immediately.

make maximum productive use of the system, the final hardware configuration called for 20 new computer terminal stations, all of which could be used for table review and correction. Fourteen of these terminals were ''full capability'' work stations, that is, they had substantial internal memory as well as data and image retrieval capacity, and could transfer corrected tables and other material to the main-frame computer memory. The remaining six work stations acquired as part of the plan were "dumb" terminals—that is, they lacked substantial memory capacity, but could be used for table retrieval and correction, and transfer to the satellite or boot server stations. Two of the ''full capability'' stations were ''boot servers'' that could be used to ''boot up'' the entire system for operations. Twelve ''satellite'' terminals shared the capabilities of the boot servers, except they could not be used for starting up the whole system. Ten work stations were assigned to specific members of the AGR staff. The remaining work stations (satellite and dumb) were available to anyone working on the system.

Procurement of the new TADS stations began with two terminals and their associated equipment in January 1991. The entire system was in place, and AGR personnel trained to use the hardware and operate the system by August 1992.

The Structured Program for Economic Editing and Referral (SPEER) system study. In an attempt to save time and resources, AGR and the SRD began a project, early in 1989, to adapt the SPEER system, developed by SRD, for use in processing the agriculture census. The resulting adaptation was designated the ''Ag-SPEER'' prototype, and AGR drew up a list of specific questionnaire sections for a comparative test of the Ag-SPEER and conventional complex edit system (Ag-Complex).

The test prototype covered 107 keycodes (i.e., data cells from the report form) dealing with land and crops, since any edit system would have to be able to work with these sections if it was to be used in the agriculture census. The records passing through both edit systems then were used as a clean data set, and ''perturbations'' were introduced to the data, and the data set then was run through both edit systems once again and the results compared to evaluate the comparative performance of the systems.

The perturbations added to the data destroyed many of the interrelationships among the keycodes, and neither the Ag-SPEER or the Ag-Complex systems were able to restore perturbed values to the originals. SRD staff suggested that subject-matter analysts also examine the results of the edits and produce a more detailed analysis of the results. This involved a followup study involving adding perturbations to one keycode at a time instead of to all the keycodes, while the performance measure was changed to include a mean statistical error (MSE—an average squared ''distance'' of the output value from the clean value for a given datum). Three subject-matter analysts were involved; two identified the AgComplex as the more successful edit system, while one favored the Ag-SPEER.

The AGR staff involved concluded that the Ag-Complex system performed the edit as well as, or better than, the Ag-SPEER system and recommended that the former be used in the 1992 census. In December 1990, time and budget constraints prompted the Census Bureau not to try to develop the Ag-SPEER system for the 1992 census, but the agency continued the research to determine whether the system might be used in 1997.

Creation of Computer Assisted Telephone Interviewing (CATI)

The Census Bureau had made extensive use of computer assisted telephone interviewing (CATI) in its various demographic survey and census operations for some time before deciding to use it in the agriculture census. The Census Bureau first used a CATI system for the agriculture census in 1982, when the procedures and equipment were tested using approximately 10,000 delinquent large farm cases. (The followup for the remaining cases referred for telephone followup used clerks who called respondents and then wrote in the data on conventional report forms, before sending the forms through the regular processing system.)

Planning for the inclusion of CATI operations as part of the 1992 Census of Agriculture actually began relatively late in the census planning operation, when the AGR established a CATI Committee (composed of Census Bureau staff knowledgeable about the CATI systems used in other Census Bureau activities) in August 1991. The Committee consisted of members from the Agriculture, Economic Programming, Field, Demographic Surveys, and Systems Support Divisions. For the first 6 months of the planning phase, this committee met every 2 weeks, thereafter dividing into working groups to develop specific CATI procedures, reconvening once every month to review planning and coordinate activities.

The Census Bureau carried out three small-scale tests (conducted on September 28 and October 28, 1992, and January 14, 1993) of CATI procedures and materials prior to its use for agriculture census followup. Experienced telephone interviewers from the Census Bureau's Hagerstown, MD, CATI facility telephoned AGR personnel for ''enumeration.''[3] The tests examined the wording of the specific questions on the CATI form; routing of interviewing screens that should be used from question to question; output coding for case types; and nonresponse, transfer and installation of files, input file content, and so on. The results of the tests were used to refine CATI enumeration procedures and staff training.

Census Quality Management (CQM) Process Action Team (PAT)

The Total Quality Management (TQM) system was first implemented by Federal Government agencies in the

[3]Assigned ''interviewees'' used scripts designed to produce varied results, i.e., as if the specific respondent was not an agricultural operator, or a refusal, or an in scope case requiring complete enumeration by telephone.

mid-1980's and the Census Bureau moved to adopt a customized version of this system called the Census Quality Management (CQM) in 1991.[4] The Census Bureau established a steering committee of senior officials to supervise the implementation of the program bureau-wide in 1991—as the planning cycle for the 1992 agriculture census was approaching completion and the subject-matter divisions were implementing those plans—and over the following year, all employees of the agency received some degree of training in the CQM program.

The Census Bureau routinely works to improve its quality of service and its products, so the adoption of the CQM program had its greatest impact on how the plans for improvement were made and implemented. During the later planning and the operational stages of the 1992 census the AGR established four process action teams (PAT's) to evaluate and recommend improvements to census data collection and processing; the specific teams were concerned with (1) the citrus caretaker enumeration, (2) census data entry, (3) recording and reporting parameter sources, and (4) computer-assisted telephone interviewing (CATI). Each PAT conducted studies of the specific subject areas assigned and developed general and specific recommendations for improvements to planning teams responsible for specified phases of the census (e.g., the citrus caretakers enumeration team, the edit team). The respective teams evaluated the recommendations for incorporation into the census plan for the 1992 enumeration.

CONSULTATION ON THE CENSUS

General Information

The Census Bureau's function is to collect and publish statistical data for use by public institutions, and private organizations or individuals. It must, therefore, try to determine which specific statistical information are most needed. Since the data compiled in the statistical tabulations must be supplied by individuals and/or organizations outside the agency itself, the Census Bureau must know whether the respondents to its censuses and surveys will be able to supply the information requested.

The Census Bureau maintains regular contact with data users and suppliers, and receives their advice and suggestions on census content. The agency's standing Census Advisory Committee on Agriculture Statistics is the primary source of this advice, but other contacts include direct consultation with the Governors' offices and departments of agriculture of all 50 States, the land-grant universities, a Federal interagency working group (established to advise the Census Bureau on specific Federal agency data needs), and the Census Bureau's own extensive outreach to data users.

The Census Advisory Committee on Agriculture Statistics

Prior to 1940, any advice or recommendations to the Census Bureau about the agriculture census was given by the agency's general statistical advisory committee. For the 1940 census, however, the Census Bureau established an advisory committee specifically concerned with agriculture statistics. From 1940 through 1959 the Census Bureau assembled an agriculture advisory committee as part of the planning program for each census, and disbanded the committee once data collection was completed. In 1962, the agency requested that the Department of Commerce charter a permanent committee on agriculture statistics, and, upon approval of this request, the committee became one of the Census Bureau's ongoing advisory bodies. Farmers' organizations and agriculture-oriented business and professional associations were selected and invited to participate in the census program in an advisory capacity. Each member organization nominated a representative—subject to the approval of the Director of the Bureau of the Census and the Secretary of Commerce—to participate in the Committee's activities.

The member organizations and their representatives for the 1992 census period (October 1, 1990, through September 30, 1995) were:

Organization	Representative
Agricultural Publishers Association	Mr. James D. Rieck
American Agricultural Economics Association	Dr. Jerald J. Fletcher
American Association of Nurserymen (member organization from 1995)	Ms. Ashby P. Ruden
American Crop Protection Association (previously the National Agricultural Chemicals Association)	Mr. Larry L. Harris (from 1991) Ms. Jarrad L. Blank (to 1991)
American Farm Census Bureau Federation	Mr. Mark Jenner (from 1995) Mr. Terry L. Francl (to 1995)
American Feed Industry Association	Mr. David M. Tugend (from 1993) Mr. Norman Coats (to 1993)
American Meat Institute (dropped from committee in 1995)	Mr. Jens Knutson

[4]The essential characteristics of the "new" management plan were improved leadership and organization of the agency involved, improved planning, expanded training for all levels of employees, "implementation for teamwork", and better recognition of contributions to programs by employees. The objectives of the CQM program were to (1) improve the quality of service to the agency's customers, (2) improve product quality, (3) involve data suppliers in Census Bureau discussions and plans to improve their cooperation with the Census Bureau's data-collection efforts, and (4) involve and "empower"" Census Bureau employees.

Organization	Representative
Association of Research Directors, Inc.	Dr. Harold Benson (from 1992) Dr. Sidney Evans (to 1992)
Conference of Consumer Organizations	Dr. William Fasse
Equipment Manufacturers Institute	Mr. Douglas E. Petterson (from 1991) Mr. David W. Maaske (to 1991)
The Irrigation Association	Mr. Robert C. Sears
National Agri-Marketing Association	Mr. Allan J. Hietala
National Association of State Departments of Agriculture	Mr. Arthur R. Brown (from 1995) Mr. Thomas W. Ballow (to 1995)
National Association of State Universities and Land-Grant Colleges	Dr. B. F. Stanton
National Cattlemen's Beef Association	Mr. John Ross
National Council of Farmer Cooperatives	Dr. Joseph D. Coffey
National Farmers Organization	Mr. Calvin Shockman (from 1991) Mr. Willis Rowell (to 1991)
National Farmers Union	Mr. Ivan W. Wyatt
National Food Processors Association (dropped from the Committee in 1995)	Ms. Regina Hildwine
The National Grange	Mr. Leroy Watson
Rural Sociological Society	Dr. Ronald C. Wimberley
National Agricultural Statistics Service, U.S. Department of Agriculture	Mr. Donald M. Bay (from 1993) Mr. Charles E. Caudill (to 1993)

The Committee's meetings were open to the public. Outside agencies—e.g., the Office of Management and Budget (OMB), the U.S. Department of Agriculture (USDA), other Government agencies, Statistics Canada, private organizations, etc.—and the public could send observers and offer comments, questions, and recommendations to the Census Bureau and the Committee during periods of each meeting reserved for public comment. Census Bureau staff prepared and published minutes of each meeting, including any Committee recommendations together with the Census Bureau's responses.

The Committee met six times during the 1992 census period, as follows:

Date	Location
June 6, 1991	Suitland, MD
May 14, 1992	Suitland, MD
May 26, 1993	Louisville, KY
December 7-8, 1993	Suitland, MD
June 7, 1994	Suitland, MD
May 18, 1995	Fresno, CA

The Census Advisory Committee on Agriculture Statistics served as the Census Bureau's principal contact with data users outside the Federal Government. It advised the agency on current and future data needs, the ability (and sometimes, the willingness) of respondents to supply the information wanted, general data collection methods, content and format of agriculture census and survey report forms, and publicity for the census.

Consultation With Governors, State Departments of Agriculture, and Land-Grant Universities

Agriculture is the most important industry in a number of States and is a significant industry in all 50, as well as in Puerto Rico and the outlying areas, and the Census Bureau routinely asks the State governments for assistance in publicizing the census. Every State in the Union has a department of agriculture, and both the Governors, and the State departments of agriculture have a considerable interest in the content of the census questionnaires, as well as in the completeness and accuracy of the enumeration. In February 1989 the Census Bureau mailed letters to the State Governors and departments of agriculture, as well as to their land-grant universities, asking for their requests and recommendations on data content for the 1992 census.

By May 1989, the Census Bureau had received nearly 300 recommendations for changes in the content of the report forms, ranging from requests for additional information on relatively routine subjects, such as asking for individual sales data on rice (in Section 9, Gross Value of Crops Sold), to somewhat more exotic ones, including additional data on llamas and ostriches (in Section 16, Horses, Bees, Fish, Goats, Other Livestock or Animal Specialties), and for retention or deletion of the specific sections (one respondent wanted to retain all of Section 23, Production Expenses, while another suggested it be deleted altogether).

The proposed census report form content, reflecting the Census Bureau's evaluation of the recommendations and

data requests made by the various offices and organizations consulted was finalized in October 1989, and AGR staff and the Forms Design Branch of the Administrative and Publication Services Division (APSD) began working on test designs for a content test planned for late 1989 or early 1990 began.

Federal Agency Working Group

The Federal Government is the principal user of the agriculture census data, and early in 1989 the Census Bureau contacted some 25 Federal offices and agencies that used statistics from the census and asked them to appoint representatives to an interagency working group to discuss data needs and make recommendations on content for the 1992 census. The working group as a whole met twice, on February 23 and on August 16, 1989, to draw up recommendations. The Census Bureau staff also met separately with representatives of individual agencies to discuss detailed questions. The following offices and agencies participated in the working group:

- Department of Agriculture
  - National Agricultural Statistics Service
  - Economic Research Service
- Department of Commerce
  - Bureau of Economic Analysis
  - Economic Development Administration
  - National Oceanic and Atmospheric Administration
- Commodity Futures Trading Commission
- Congressional Budget Office
- Congressional Research Service
- Department of Energy
  - Energy Information Administration
- Environmental Protection Agency
- Federal Reserve System
- Farm Credit Administration
- Department of Health and Human Services
  - National Center for Health Services Research
- Department of the Interior
  - Bureau of Indian Affairs
  - Bureau of Land Management
  - Bureau of Reclamation
  - U.S. Geological Survey
- International Trade Administration
- Department of Labor
  - Bureau of Labor Statistics
  - Occupational Safety and Health Administration
- Library of Congress
- National Science Foundation
- Office of Technological Assessment
- Small Business Administration
- Tennessee Valley Authority

The Census Bureau met with officials from several Department of Agriculture agencies on March 22, 1989, for detailed discussions of census data content, and the Census Bureau's staff also met with individual representatives of these offices to review special problems or discuss particular questions throughout the planning phases.

THE 1990 TEST

General Information

Prior to most censuses, the Census Bureau engages in detailed studies and planning aimed at obtaining the most complete and efficient enumeration. Typically, this planning process will include one or more field tests of materials and/or data-collection methodologies, providing an opportunity to evaluate suggested changes in data content, forms design, changes in instructions to respondents, and other factors that might affect the accuracy and completeness of the enumeration. Preliminary planning for the 1990 Census of Agriculture Test began early in 1989, at which time the Census Bureau contacted data users for requests and recommendations on the data content for the 1992 census. The agency contacted State governors and State departments of agriculture, land-grant universities, national farm organizations, and Federal agencies that made extensive use of agriculture census data for recommendations to improve the agriculture census. The Census Bureau originally planned to finalize the proposed data content for the report forms by the fall of 1989 and to conduct a general test late in the year, followed by a second large-scale test to check enumeration procedures and processing in November 1990. Budget considerations required cutting back on this plan, and in November 1989, all work on the census tests was suspended. For a time, the Census Bureau had no authorization for any test program prior to the 1992 agriculture census, but in April, it received permission to conduct a single test, which was rescheduled for November 1990.

Objectives of Testing

The Census Bureau had four specific objectives in conducting the 1990 Census of Agriculture Test:

1. To test wording and format of new content items to determine whether respondents could understand the questions and supply the information requested.
2. To test varying report form designs (e.g., booklet compared to foldout) to measure differences in response obtained by each.
3. To test various screening questions to try to improve and simplify the identification of nonagricultural operations on the census mail list.
4. To test new instructions to determine whether they help respondents to identify and correctly report for duplicate forms.

Report Forms

The 1990 test involved 17 different report form designs in all. The individual report forms themselves were collected into seven groups by test objectives (see table 2-1).

The form 90-A1 was used for a ''control panel'' in the test. The A1 report form had the same content and design (a 10″ x 14″ foldout with 4 whole and 2 half pages) as the 1987 sample report form. The form 90-A2 was a 12-page, booklet measuring 8″ x 11″, but with identical content to the A1.[5] The remainder of the test forms used the foldout design, and all used black ink on white paper stock, with yellow shading.

The Census Bureau used a separate, short screener form (the form 87-A0400) in the 1987 census in an attempt to identify nonfarm operations as early as possible in the data-collection operation. But the shorter form caused processing, and edit and imputation problems not previously experienced with responses from such (generally) very small agricultural operations using the regular report forms, while not yielding the more detailed information obtained using the latter. (Ultimately, only about a third of the addresses sent these screener forms in the 1987 census mailout were identified as farms under the census definition and were included in the census tabulations.)

The 1990 test included a reexamination of the 1987 screener idea; a control panel received a screener form identical in content to that employed in 1987, while four test panels were sent variations.

1. The control panel received the 90-A17 form, which was identical in content to the 1987 form 87-A0400 screener form, but had a differently worded screener question.
2. The second panel was sent the 90-A18, with the same content as the 90-A17, but no screener question.
3. The third panel was sent the form 90-A3, which was identical in content to the 1987 nonsample report form, with the new screener question.
4. The fourth test panel got the form 90-A4, which was a shortened version of the 90-A3 with a screener question.

Five panels were used for testing various ways to identify duplicate addresses in the mail list. Three of these panels were composed of known pairs of duplicate addresses identified in the 1987 census, while the remaining two were nonduplicate addresses. The duplicate addresses panels received the forms 90-A13, -A14, or -A20. All three forms were identical to the 1987 sample form, but the 90-A13 package included a special insert with instructions for reporting duplication. The 90-A14 used a new ''instructions'' box just below the census logo and address box on the front page of the form for the duplication instructions, while the 90-A20 included only the 1987 instructions, which were part of the overall instruction sheet. The two nonduplicate address panels used forms 90-A15 and -A16, which had the same format, content, and instructions arrangements as the 90-A13 and -A14 respectively. These panels tested the new duplicate instructions' effect on response rates for the general (nonduplicate) universe.

Four panels tested specific data items and data concepts new to the census. All four panels employed form designs generally similar in layout and content to the 1987 sample form, but with specific data item variations. The objective of this specific part of the test was to determine if specific new data items were understood and accurately answered by the respondents, decide which of several variations of an item obtained the best overall response, and determine whether a particular item was reported frequently enough to include it in the census. All four report forms used—the forms 90-A6, -A7, -A21, and -A22—tested layout and wording for the following data sections/items:

- **Section 1—Number of Landlords:** Number of landlords from which the operator rented land.
- **Section 2—Types of Wheat:** Acres of three different kinds of wheat (winter, durum, and spring).
- **Section 20—Farming Practices:** Farming practices that reduced the use of chemicals and manufactured fertilizers, such as low-impact sustainable agriculture (LISA).
- **Section 21—Direct Sales:** Direct sales of agricultural products for human consumption.
- **Section 22—Production Contracts:** Commodities produced under production contracts.
- **Section 26—Injuries and Deaths:** Farm-related injuries or deaths.
- **Section 28—Farm Labor:** Total farm labor, including the operator and unpaid labor.
- **Section 29—Fertilizers and Chemicals:** Use of commercial fertilizers and chemicals.

[5]The main reason for testing a booklet format was the possible use of electronic imaging of the 1992 census report forms in processing the 1992 census. Funding restrictions precluded purchasing the needed hardware for such a system, and the idea was abandoned for the 1992 census.

Table 2-1. **Forms Tested**

Panel number	Form number	Content description	Sample drawn from	Test objective
1 2	90-A1 90-A2	1987 Sample Report Form (Control panel) 1987 Sample Report Form (Booklet)	Mail list (with restrictions)	Foldout vs. booklet response
3 4	90-A3 90-A4	1987 Short Form 1987 Booklet Short Form	Mail list farms with estimated TVP[1] less than $25,000 with restriction	Screener questions and short form vs. Nonsample form
5 6	90-A6 90-A7	1987 Sample Form (Version 1) 1987 Sample Form (Version 2)	Inscope farms only Cluster and noncluster sample	Content
7 8	90-A21 90-A22	1987 Sample Form (Version 3) 1987 Sample Form (Version 4)		
9	90-A8	1987 Short Form (Version 1) and duplication instruction	Mail list farms with estimated TVP less than $25,000 with restrictions	Content and screener question
10	90-A11	1987 Sample Form (Version 2) and duplication instructions	Mail list with restrictions	Content and foldout vs. booklet response
11	90-A13	1987 Sample Form with duplication instruction insert	Out-of-scope check-in with linkages to inscope farm	Duplication instructions
12	90-A14	1987 Sample Form with new duplication Instruction on form		
13	90-A20	1987 Sample Form with no insert or new duplication instructions		
14	90-A15	1987 Sample Form with duplication Instruction insert	Mail list with restrictions	
15	90-A16	1987 Sample Form with new duplication Instructions on form		
16	90-A17	1987 Short Form with new screener question	Mail list farms with estimated TVP of $25,000 with restrictions	Screener questions
17	90-A18	1987 Short Form with no screener question		

[1]Total value of agricultural products sold.

Sample Selection

The 1987 census mail file served as the base file for the test sample selection. The file contained approximately 4.1 million records. Prior to sampling, records for operations that were to be excluded from the test were deleted from the sample file, these were—

- All farms with TVP's of $500,000 or more.
- Multiunits and abnormal farms.[6]
- 1987 census follow-on survey cases.
- 1987 Classification Error Survey and June Agricultural Survey cases.
- Addresses in Alaska and Hawaii.
- Postmaster return cases (i.e., cases undeliverable as addressed), correspondence records, and any other case not classified as in-scope, out-of-scope, or nonrespondent in the 1987 census.
- Selected nonrespondent cases.

The resulting sample file was sorted into an in-scope file, an out-of-scope file, and a nonrespondent file. The in-scope records then were sorted again, by ascending census file number (CFN), and the out-of-scope and nonrespondent records were sorted by ascending State/county codes from the CFN, then by ascending 1987 mail size code.

The test sample was organized into 17 test panels, which could be grouped into four general categories (there was considerable overlap among the panels, as several test panels were used to evaluate various form characteristics or instructions, see table 2-1):

1. **Long form panels:** Selected from the entire eligible mail file and made up of 1987 in scope (70 percent), out-of-scope (20 percent), and nonrespondent (10 percent) cases. The long form panels were numbers 1, 2, 5, 6, 7, 8, 10, 11, 12, 13, 14, and 15 (see table 2-1 for report used for each).
2. **Short form panels:** Selected from 1987 mail list cases with TVPs of less than $25,000 (in-scope, out-of-scope, and nonrespondent proportions were the same as for the long form panels). The four short-form panels were numbers 3, 9, 16, and 17 (see table 2 1 for report forms used for each).

[6]Multiunits were companies or organizations with substantial agricultural operations at more than one location; abnormal farms were farms operated by institutions, such as Indian reservations, State agricultural research stations, prison farms, etc.

3. **Content change panels:** Selected from 1987 in-scope cases only, with part of this sample drawn from targeted counties and States. The content change panels all received variations of the long report forms. The panels were numbers 5, 6, 7, and 8 (see table 2-1 for the report forms used for each).

4. **Duplication panels:** Selected from 1987 cases originally checked in as inscope, but later changed to out of scope because of duplication (linkage) to another inscope record. The duplication panels were numbers 11, 12, 13 (see table 2-1 for report forms used for each).

The AGR staff provided the applicable specifications, and the EPD staff used the Census Bureau's mainframe computers to select the specific mail lists for each sample panel from the mail list file prepared for use for those particular panels. The computer selected cases based on the established criteria at a specified sampling rate from a random start in each file. For example, ''panel X'' required 2,600 cases chosen from a total file of approximately 4 million addresses that met the sampling requirement criteria; the computer's counter was set to start with the 56th census file number (CFN) in the file, and selected every 1,500th CFN thereafter. (The actual selection process was more complicated than this for most of the panels, since the samples were also split into in-scope (70 percent—for a panel of 2,600 cases, 1,820 were to be drawn from the 1987 in-scope list), out-of-scope (20 percent—520 cases), and nonrespondent (10 percent—260 cases) portions, but the general procedure was identical for each individual component of the sample panel.)

The samples for panels 5, 6, 7, and 8 (those receiving report forms 90-A6, -A7, -21 and -A22) included ''cluster'' samples drawn for selected counties, as well as a national sample. The remainder of the samples generally were not designed to meet any rigorous geographic dispersion or farm type requirements, but to provide a general cross-sectional sample of addresses within prescribed parameters from each file.

Mailout and Followup

Mailing packages. The report forms, envelopes, information sheets, and cover letters were printed by private contractors and the materials sent to the Census Bureau's Data Preparation Division's (DPD's) facility in Jeffersonville, IN. DPD staff printed the mailing labels using high-speed printers and the computerized address file prepared by headquarters, then assembled the mailing packages. Each package consisted of a cover letter explaining the test, the appropriate report form for each panel, any instruction sheet required, and a return envelope, all folded and inserted so that the blank address box showed through the cut-out ''window'' of the envelope. The labeling machines applied the adhesive address labels through the window of the outgoing envelope.

Mailout and mail followup. The Jeffersonville office mailed test forms to 44,292 addresses in 17 test panels on November 30—about 1 month earlier than the typical agriculture census mailout—with a response-due date of January 1, 1991. (Panels 1-4, and 9-17 consisted of 2,600 addresses each, while panels 5-8 had 2,623 addresses each.) In mid-December, the Census Bureau sent a reminder/thank you card to all addresses on the sample mailing list. On January 14, 1991, followup packages containing the appropriate test report form, instruction sheet, return envelope, and a cover letter requesting response were mailed from Jeffersonville to 19,275 nonrespondent addresses. By the end of January, overall response had reached 66.4 percent. The mail data-collection phase of the test was closed down on February 8, by which time overall mail response was over 69 percent.

Telephone interviews. The Census Bureau planned to carry out telephone interviews of a one-in-four random sample of each of the four new-content panels (5, 6, 7, and 8) for telephone contact, or 2,364 farm operators in all. The AGR designed and printed test questionnaires, arranged for telephone interviewing, and the staff began calling sample subjects in mid-December. Farm operators were generally cooperative with the telephone interviewers and the operation proceeded well ahead of schedule; the first 800 interviews had been completed by the end of December, and all 2,364 telephone-survey sample addresses from the content panels had been contacted by February 11, 1991—more than 2 weeks ahead of schedule.

The telephone interview program contacted test respondents. During later processing and analysis, the answers given by each respondent on the report form were compared to those provided by the same respondent to the telephone interviewer to identify problem areas on the proposed questionnaires.

Response rates. The test achieved a relatively high response rate, with over 55 percent of all addressees replying by mid-January 1991, i.e., *before* the report form followup mailing was done. Final overall response was just over 69 percent, while responses within individual panels varied from a low of 62 percent to a high of over 75 percent. Nine of the 17 panels had response rates over 70 percent, which is considered excellent for a test.

Processing

The Census Bureau carried out only limited processing of the returned report forms, since no tabulations as such were needed. Report forms received from respondents on selected panels (those designed to test response to specified content items and to form design) were reviewed and keyed to a data file at the Jeffersonville office to enable the Census Bureau to measure the effect of new content and

form design on data item and section responses. Approximately 20,000 report forms were keyed to produce the required analysis and tabulations.

Analysis and Results

The census test included a wide variety of ''new'' content materials. The Agriculture Division staff compiled responses received to all the test report forms and to particular sections and individual items. This information was analyzed to identify any patterns of response and the percentages of ''correct'' and ''incorrect'' responses to particular items or sections. Statistical analyses of the telephone sample cases and of all formatted records for the new-content panels allowed comparisons between these panels for comparable items. Finally, two groups of farmers were assembled and asked their opinions and observations about selected sections of the report forms.

The three principal general areas of interest were (1) possible variations in response for foldout compared to booklet questionnaires, (2) the screener questions, and (3) the effectiveness of the duplication instructions. The staff found there was no significant difference in the response obtained between the foldout and booklet versions of the report forms. Similarly, there seemed to be little or no difference in the effectiveness of the various screener questions tested, although the 1987 version (used on form 90-A17) proved more reliable in identifying nonfarms, while the screener questions on the nonsample forms provided similar results with reduced content. Consequently, the staff suggested the Census Bureau use the 1987 screener wording on the nonsample report forms, eliminating the 1987 short form. With regard to the duplication instructions, the test revealed no improvement in reporting of duplication from using either the duplication insert or the additional new instructions on the form. Telephone interviews of respondents who received the alternate instructions showed that only about one-third actually read them. The staff recommended that the 1987 duplication instructions be used again for the 1992 enumeration, although simplified language be employed if possible.

The test also looked at a number of specific data content items to try to determine the practicality of collecting information on them. The staff submitted the following recommendations on these specific items:

1. **Section 1—Number of Landlords:** Add a question on the number of landlords from which the operator rented land and delete request for the name(s) of landlord and tenants.[7]

2. **Section 2—Types of Wheat:** Include the following types of wheat on regionalized report forms for the following States:

   A. Winter wheat, durum, and other spring wheat: Arizona, California, Michigan, Minnesota, Montana, North Dakota, South Dakota, Wisconsin, and Wyoming.
   B. Winter wheat and spring wheat: Colorado, Idaho, Nevada, New Mexico, Oregon, Utah, and Washington.

3. **Section 20—Farming Practices:** Do not include a Farming Practices section on the 1992 census report forms. (The results of all versions of the test, including major items, showed results to be very unreliable, and data published from the responses to these items would be highly suspect.)

4. **Section 21—Direct Sales:** Include the section on direct sales, using the version used on form 90-A21 (panel 7), adding the phrase ''door to door'' in the item itself, with strengthened purchase and resale instructions on the information sheet.

5. **Section 22—Production Contracts:** Drop any item on production contracts from the 1992 census report forms. The relatively small number of farms operating under production contracts, together with the high levels of uncertainty about what a production contract is, resulted in unacceptably high error levels in the test.

6. **Section 26—Injuries and Deaths:** Include a section on injuries and deaths, using the version tested on form 90-A21 (panel 7).

7. **Section 28—Farm Labor:** Include paid labor with two categories of workers—those working less than 150 days per year, and those working 150 days or more. Do not include items on operator labor or unpaid labor.

8. **Section 29—Fertilizers and Chemicals:** Use the 1987 version of the fertilizer and chemical sections, since lack of any additional information on farming practices would seem to make more detailed data on chemical use necessary.

The specific content recommendations all were incorporated into the final report form designs. The Census Bureau decided to adopt the booklet format for the 1992 questionnaires to facilitate a possible test of electronic imaging equipment and procedures in census processing.

REPORT FORM DESIGN

General Information

The Census Bureau consults a variety of public agencies and private groups to determine the content and overall design of the report forms it uses in its censuses

[7]The landlord item test yielded an extra practical lesson in report form design and its effect on response when the printer accidentally failed to provide an unshaded box over the response line for the ''number of landlords'' item on the panel 7 questionnaires. Less than half the respondents from the panel realized they were supposed to respond to this item, whereas approximately 85 percent of respondents in the other three test panels concerned did so.

and surveys (see above for agencies and associations consulted specifically for the agriculture census). The format and overall design of the report forms are the result of the work of the Census Bureau's Agriculture (AGR) and the Forms Design Branch of the Administrative and Publications Services (APSD) Divisions, and reflect the results of tests, studies carried out between the censuses, technology requirements of processing or other systems, and the experience of the staff. The content of the report forms is more particularly the product of a variety of legislative and administrative mandates, and data needs expressed by public and private users.

In determining the content of the 1992 agriculture census report forms, the Census Bureau considered the justification for items based on the following criteria:

- Specific Congressional mandates, or strong Congressional interest or support.
- Requests from Federal agencies for data to meet legislative requirements to provide information to Congress.
- Evaluation requirements for existing Federal programs.
- Data items, which, if omitted, would result in added respondent burden and costs for a separate survey for other agencies or users.
- Historical farm classification requirements.
- Coverage improvement needs.
- Data required on a current problem of particular interest to the Federal Government or the general public.

The Regionalized Report Forms

Title 13, United States Code—Census, authorizes the Secretary of Commerce to determine the content of all census report forms. The Secretary normally delegates the actual task of designing the questionnaires to the Census Bureau of the Census, and for 1992, this work was carried out by the AGR, assisted by the Forms Design Branch of the APSD.

Design of the 1992 forms began with a review of the recommendations of various data users regarding content, and of the 1987 report forms. The Census Bureau retained the overall report form plan employed in the 1992 enumeration, including using ''regionalized'' report form design. For the 1992 census, the 50 States were organized into 9 multi-State regions, plus separate ''regions'' for Alaska, Florida, Hawaii, and Texas, each with a customized report form. The regionalization of the questionnaires actually involved only limited changes, primarily to the specific types of crops listed in the appropriate sections. All of the report forms had identical formats, consisting of a core of standardized inquiries asked of all agricultural operators (e.g., acreage, total value of sales, operator characteristics), and a set of production, inventory, and sales items (e.g., field crops, fruit trees and nuts) that applied specifically to agricultural operations within each region. Using regionalized report forms enabled the census to collect more specific information on locally important agricultural products, while avoiding the apparent inappropriateness of listing items obviously not applicable to a given area (e.g., listing sugarcane on a report form received by a farm operator in Maine). The ''nonsample'' and ''sample'' report form concept was retained as well, with nonsample forms containing questions asked of all operators, while sample questionnaires were used to collected specified additional information (e.g., production expenses, machinery and equipment, farm related income) from a 25-percent sample of the all farms.

Four report forms were used for each region—two nonsample versions (one with the screener question and one without), and two sample versions (one for ''must'' and one for ''certainty'' cases[8]). The questionnaires were numbered for identification, using the prefix ''92-A'' followed by a numeric designator identifying form type (''01'' for nonsample, ''02'' for sample-nonMust, ''03'' for Must, and ''04'' for nonsample with screener question), and the region number (''01 through ''13'' without screener). For example, a small dairy farmer in Wisconsin might be sent report form number 92-A0103; the nonsample questionnaire for region 3 (Wisconsin and Michigan).

The States composing each ''region'' for report form design purposes were as follows:

Region	States
1.	Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, West Virginia.
2.	Illinois, Indiana, Iowa, Kansas, Nebraska, Ohio.
3.	Michigan, Wisconsin.
4.	Alabama, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, Virginia.
5.	Florida.
6.	Arkansas, Louisiana, Mississippi, Missouri, Oklahoma.
7.	Texas.
8.	Minnesota, Montana, North Dakota, South Dakota.
9.	Colorado, Nevada, New Mexico, Utah, Wyoming.
10.	Idaho, Oregon, Washington.
11.	Arizona, California.
12.	Hawaii.
13.	Alaska.

The Census Bureau added a general purpose report form (92-A0214), with nonregion specific crop, livestock, and animal specialty listings, for use in correspondence and for general information.

[8] ''Must'' cases were agricultural operations so large that failure to include their data in the census tabulations would significantly distort the statistics, or which required special handling (e.g., multiunits, abnormals, and so on). ''Certainty'' cases represented operations that were not large enough to qualify as ''must'' cases, but were considered sufficiently large to justify intensive followup. The precise sales levels and/or acreages required to qualify as ''must'' and ''certainty'' cases varied by State.

[redacted]

In addition to the standard nonsample and sample report forms, the Census Bureau designed an agricultural questionnaire for use with its film optical sensing device for input to computer (FOSDIC) equipment (the form 92-AO202(F)), and tested it in the census mailing itself, with a sample of farms in region 2.[9]

The agency tested a variety of report form formats in a national test involving a mailing of test questionnaires to 44,292 addresses in November 1990 (see above). The Census Bureau used the responses from this test to refine the report form design prior to finalization of the content.

The Screener Section

The Census Bureau has been under continual pressure to restrain or reduce costs, and reduce respondent burden, in all of its operations. The mail operations of the census are a very expensive budget item, and significant savings in overall cost could be attained by reducing the volume of mailing required by the census. There are several ways to make savings in the mail operations; for example, reducing the size of the initial mailout, obtaining earlier and more complete response, and quickly identifying nonfarm operations retained on the mail list to avoid followup costs. All of these methods also reduce overall respondent burden. Prior to the 1987 agriculture census the Office of Management and Budget (OMB) issued a directive to the Census Bureau that it reduce the size of the census mail list to 4.2 million addresses overall, and that no more than 3.2 million regular report forms be sent in the initial mailing, to addresses estimated to be most likely to represent farms. The remaining 1 million addresses were those for which the Census Bureau lacked the information needed to reliably identify them as farms, or nonfarms. Since addresses in this group probably included a large percentage of nonfarms, they were to be sent a short form (form 87-A400) asking for basic data required to determine (1) whether the address met the census farm definition, and (2) if it did, to enable the agency to impute for any information not actually collected.

The Census Bureau made strenuous efforts to further refine its mail list and eliminate nonfarms for the 1992 enumeration. Improved mail-list compilation procedures, particularly with regard to identifying and deleting duplicate addresses and nonfarm agricultural operations, enabled the agency to reduce the size of the initial census mail list to 3.8 million addresses. Budget constraints compelled the Census Bureau to reduce the list to 3.55 million addresses for the census mailout. The short form used in 1987 had proven highly successful in identifying out-of-scope addresses early in the data-collection phase of the census (the 1987 short form was a 2-page questionnaire sent to addresses considered least likely to represent farms). For the 1992 census, the Census Bureau used ''screener'' forms that were virtually identical to the nonsample questionnaires, but with an added ''screener'' question asking whether (1) any crops were grown, or (2) any livestock raised, kept, or sold during 1992. Respondents answering ''yes'' to either or both these inquiries were asked to complete the rest of the form; those who said ''no'' to both, were directed to section 26 (Person Completing This Form), and asked to return the form as quickly as possible.

The Census Bureau tested variations of the screener form and the addition of a screening question to the nonsample census report form in the November 1990 test (see above). The results of the test led to a recommendation from the AGR that a short, two-page form with screener be dropped from the 1992 enumeration, in favor of using a screener question on the regular nonsample report forms. For 1992, the Census Bureau produced and used 11 regionalized versions—forms 92-A0401 through -A0411 (as well as a general-reference screener form, the -A0414) for the 48 conterminous States. The data from the screener forms enabled the Census Bureau to (1) determine whether the address involved represented a farm, and (2) if so, to impute census data not specifically requested on the forms.

Facsimiles of a representative standard report form, the FOSDIC experimental form, and a screener form, are reproduced in appendix F.

[9]The FOSDIC equipment is widely used in processing population census report forms. For use with FOSDIC, population census report forms were designed to have the respondent select one of a number of possible statistical ranges, and fill in a circle specifying that particular response. The forms were microfilmed during processing, and the FOSDIC equipment ''read'' the responses from the microfilm by identifying and automatically tabulating the specified response. The agriculture census report forms were a little different, using fill-in squares for respondents to identify items for which they provided specific responses; the responses themselves still had to be keyed to the data file. The principal advantage to using a FOSDIC form for the agriculture census was that it streamlined processing of the report forms.

Contents

Chapter 3.

Preparatory Operations

GENERAL INFORMATION

By early 1991, the Census Bureau had determined the principal characteristics of the 1992 Census of Agriculture and began final preparations for the data-collection effort itself. These preparatory operations encompassed four major activities—

- Determination of census report form content. (See chapter 2 for details of the final report form design, and appendix H for a facsimile of a representative questionnaire.)
- Compiling the census mail list.
- Promoting the census to encourage cooperation by agricultural operators. (See chapter 4 for information on the promotion campaign.)
- Printing the report forms and other enumeration materials and preparing census mailing packages.

The census mail list is the core of the modern agriculture census; the Census Bureau collects the bulk of all the statistics published from the census through responses to report forms mailed to farmers and ranchers. Compiling the census mail list involved acquiring, compiling, and matching (or ''linking'') records from various source lists of addresses believed to represent agricultural operations. For the 1992 census, the mail list compilation was carried out in two phases—the first completed in the spring of 1992 and a second beginning in the early summer using records that became available later in the year. In both phases, records from a variety of sources were compiled and linked—that is, source and address information analyzed to identify duplicate records. When two or more records appeared to be duplicates, the record, or records, with lower priority (that is, those drawn from sources considered less reliable in providing current and complete mailing addresses) were deleted from the file after transferring the identification data to the higher priority record. During both mail-list compilation phases, the Census Bureau tried to classify by size addresses believed to represent agricultural operations meeting the census farm definition. After the second major linkage operation, the Census Bureau applied a classification model (see pp. 29-30) to the resulting address file, grouping addresses within the file by their likelihood of representing a farm. Addresses believed least likely to be farms were identified and either deleted from the file, or were sent a ''screener'' form in the initial census mailout.

After completing the final mail list, the Census Bureau assigned individual identifying numbers—the census file numbers (CFNs)—to each address in the file, and drew the sample file from the general census mail file (see p. 34 for details of the mail list sampling).

Once the report form content and design were finalized, the Census Bureau contracted with private printers to print the report forms and associated materials (envelopes, instruction sheets, cover letters, and so on), assemble the mailing packages according to specifications supplied by the agency, and deliver the packages to the Data Preparation Division (DPD) in Jeffersonville, IN. The DPD staff printed adhesive address labels, using source files supplied by Census Bureau headquarters, and applied the labels to the individual mailing packages just before mailout.

ADDRESS LIST DEVELOPMENT

Introduction

The Census Bureau first used the mailout/mailback data-collection method in the 1969 Census of Agriculture. This self-enumeration procedure reduced personnel and other costs compared to the personal-interview methodology, but required a complete and accurate address list for agricultural operations that met the census farm definition. Duplicate and nonfarm records on the census mail list not only added to the overall cost of the census, but increased response burden and general respondent irritation—undermining respondent cooperation—with the enumeration, so duplicates and identifiable nonfarms had to be eliminated from the list as well.

All this meant that compiling the census mail list was a critical part of the census operation. Continuing emphasis on reducing overall costs for the census meant the Census Bureau had to take particular care with the 1992 list. Budget constraints on mailing costs compelled the agency to restrict the first census mailing to no more than 3.55 million census packages, of which not more than 3.1 million could be mailed standard report forms. The mail-list compilation operation itself produced a preliminary census mail file of approximately 3.78 million names and addresses. To reach the required figure, the Census Bureau employed statistical modeling techniques (see pp. 31-32) to identify and delete from the file records believed least likely to represent farms. For the 1992 census, the Census Bureau

identified some 411,000 addresses to be sent ''screener'' report forms. The screener form included clear instructions that enabled out-of-scope recipients to return the form without having to fill out all the sections. This identified nonfarms early in the collection cycle, saving followup costs as well as response burden for the individuals involved.

General Procedures

The Census Bureau compiled the 1992 census mail list from the records of the previous census and from current administrative records from a variety of Federal agencies and private associations. Names and addresses frequently appeared on more than one of the source lists used for the compilation, so the various lists had to be matched to one another and duplicate records identified and deleted.

The Census Bureau conducted the 1992 mail list compilation in two phases—the first done over the period July 1991 to April 1992, and the second and final phase from June to November 1992. The agency used essentially identical procedures in both phases of the compilation process, the principal difference being the addition to the list of updated source records. Each list construction phase involved seven major operations:

1. Source list format and standardization.
2. Employer identification number (EIN) and social security number (SSN) record linkage.
3. Geographic coding.
4. Name and address coding and record linkage.
5. Resolution of possible duplicates.
6. Statistical modeling (that is, identifying groups of records by expected (or estimated) proportion of census farms in each).
7. Establishing controls and assigning identification numbers and other processing codes.

Sources

General information. The Census Bureau began developing the 1992 mail list in December 1990, when Agriculture Division staff and representatives of other Census Bureau divisions met in the first of a series of conferences to study the acquisition of records for the list. The Census Bureau made a determined effort to include all important sources of agricultural information in the mail-list compilation, including the Internal Revenue Service (IRS), the U.S. Department of Agriculture's (USDA's) various offices, previous census records, and private records from trade and agricultural associations. The Census Bureau used its main computer facility at Suitland, MD, to compile and process the source-list records in two phases, a preliminary (phase 1) linkage operation completed in the spring of 1992, and a final (phase 2) compilation and linkage operation—including the results of the preliminary linkage *and* records not available earlier in the year—completed in the fall of 1992.

Preliminary list. The Phase 1 (spring 1992) linkage operation involved approximately 9.1 million records drawn from the following sources:

Source	Records
Total	**9,158,514**
National Agricultural Statistics Service (NASS):	
Farms	1,594,125
Nonfarms	631,274
Special list*	69,627
Special list (other)	107,603
1987 Census of Agriculture:	
Inscope	1,826,042
Out of scope	1,534,398
Nonresponse	585,810
1990 Internal Revenue Service (IRS) files:	
1040F (Schedule for Farm Income and Expenses (attached to form 1040 Individual Tax Returns))	2,242,356
1120 (Corporation Income Tax Return (equivalent to standard industrial classification (SIC) codes 01 and 02)	21,152
1065 (Partnership Return of Income (equivalent to SIC codes 01 and 02)	67,710
941/943 (Employers' Quarterly Tax Returns) (941 coded 01 and 02 (Agriculture) for nonagricultural workers, and 943 for agricultural workers)	406,772
Business Master File (BMF—IRS 1120/1065 and 941/943 combinations)	71,645

*The Census Bureau began collecting the ''special lists'' in April 1991. This involved contacting various Federal and State agencies, as well as business associations and corporations to request lists of addresses of individuals and companies conducting agricultural operations.

The first phase of the mail-list compilation and linkage operation (see below for details of the phase 1 and 2 linkage) was completed in April 1992, resulting in a preliminary mail file of 4,704,331 addresses.

Final list. In June 1992, the Census Bureau began the second and final compilation and linkage operation, using the preliminary mail file, and adding new source records from the IRS 1991 tax-year files, supplemental (NASS) National Agricultural Statistics Service files, updated multiunit and abnormal lists from the 1987 agriculture census, the USDA's Agricultural Stabilization and Conservation Service's (ASCS's) Conservation Reserve Program (CRP) files, and the NASS's June Agricultural Survey (used by the Census Bureau in its coverage evaluation program)—a total of approximately 3.28 million additional records. The second compilation phase of the operation involved almost 8 million records, as follows:

Source	Records
Total	**7,990,944**
Preliminary mail file	4,704,331
1987 Census of Agriculture, multiunits and abnormal farms	10,670
NASS farm adds (active)	156,336
NASS nonfarm adds (inactive)	207,561
NASS evaluation file (June Agricultural Survey)	64,136
ASCS Conservation Reserve Program	237,443
1991 Internal Revenue Service (IRS) files:	
1040F (Schedule for Farm Income and Expenses (attached to form 1040 Individual Tax Returns))	2,056,966
1120 (Corporation Income Tax Return (for SIC codes 01 and 02))	17,116
1065 (Partnership Return of Income (for SIC codes 01 and 02))	63,912
941/943 (Employers' Quarterly Tax Returns) (941 coded 01 and 02 (Agriculture) for nonagricultural workers, and 943 for agricultural workers)	404,424
1991 BMF (1120/1065 and 941/943 combinations)	68,049

The second compilation and linkage operation created a mail list containing 3,783,302 names and addresses. The Census Bureau reduced this preliminary mail file to approximately 3.55 million by statistical modeling (see below for details).

Source priority codes. The source priority code identified the specific source from which a name and address record had been drawn, and established its selection priority relative to suspected duplicate records from other sources. That is, when two records had been identified as suspected duplicates, the one with the higher source priority was selected for inclusion in the file, and the record with the lower source priority was deleted. Thus, a record drawn from the IRS 1040F file (priority code ''2'') would be selected in favor of an apparent duplicate record from the NASS (USDA list frame) file (priority code ''7''). The source priority codes used in both phases of the mail list compilation, in priority order, were as follows:

Priority Code	Source
1	1987 Census of Agriculture Multiunits and Abnormal Farms.
2	IRS 1040F (Individual tax return).
3	IRS 941 and 943 (Agriculture employers tax returns).
4	IRS 1065 (Partnership tax returns).
5	IRS 1120 and 1120S (Corporate tax returns).
6	1987 Census of Agriculture Farms.
7	NASS (USDA List Frame).
8	Special lists.
9	1987 Census of Agriculture Nonrespondents.
10	1987 Census of Agriculture Nonfarms.
11	NASS Nonfarms.
12*	NASS Evaluation File (June Agricultural Survey).

*Used in the phase 2 compilation operation only.

Format and Standardization

General information. The Census Bureau's two-phase mail-list compilation effort for the 1992 agriculture census involved over 12.4 million individual address records from a variety of sources. Before these records could be matched and the duplicates removed from the mail file, the agency had to establish a computer-record format compatible with its processing programs, and then apply that standardized format to the variety of computerized records assembled from the source lists. This format standardization placed each source record into a standard format for name and address information and for generating processing code fields. The program functions included:

1. Assignment of unique identification number (source file numbers (SFN's)).
2. Source record edit.
3. Assignment of name control.
4. Assignment of processing codes/flags.
5. Size coding.

Source file numbers (SFN's). The format program assigned a unique identification number—the source file number (SFN)—to each computerized record to enable specific records to be located and identified, together with the source from which it had been drawn. Ranges of eight-digit numbers were reserved for each source (for example, SFN's from 15,000,000 to 19,999,999 were assigned to 1991 IRS 1040F source records; 30,000,000 to 30,999,999 to NASS farm adds, and so on) used for the compilation of the census mailing list. The computer program assigned numbers from the reserved set assigned for each source to the appropriate records during the initial processing run.

Source record edit. The source record edit placed all source records (i.e., names and addresses from the various lists used in compiling the mail list) into a common format for computer processing. The edit established two name fields—a primary field that would always be filled first, and a secondary field used (if needed) for additional names (such as farm names, business names, or additional individual names). The secondary field remained blank in most records. Separate fields also were set up for address, place (city, State, and ZIP Code), and for processing codes.

For source lists that used the ''last-name-first'' format, an edit subroutine switched the order of names. The edit program also deleted commas, periods, selected special symbols from the name and address fields, inserted a space between adjacent alphabetic and numeric characters so that each word could be classified as numeric or nonnumeric, substituted uppercase for lowercase alphabetic characters, and replaced standard two-digit State abbreviations for State names or old-style abbreviations. For example:

Doe, Mr. John J., Jr.		MR JOHN J DOE JR
530 Euclid #48	became	530 EUCLID 48
Chessie, Mary. XXXXX		CHESSIE MD XXXXX

Name control. The ''name control'' for a record was the first four alphabetic characters of either an addressee's surname, or of a corporation's main name, used to determine possible duplicate status when linking records based on EIN's or SSN's.

The formatting program read the name field of each record from right to left until it identified an alphabetic word with three or more characters, then matched that word to a ''skip list'' dictionary containing words or abbreviations (e.g., ''Farm'' or ''Sons'') that might appear in the name field but were unlikely to be a surname. The first alphabetic word with three or more characters—a ''3+'' word—on the record that was not on the skip list was used to establish the name control for that record. The first four (or first three if a three-character word) alphabetic characters—from left to right—were inserted by the program into the name control field.

For example, for a record with a name field reading ''Mr James Smith & Sons Dairy,'' the formatting program would read from right to left, identifying ''Dairy'' and ''Sons'' as words to be skipped. The ''&'' was a single character and also would be skipped. ''Smith,'' however, was a legitimate possible surname, and the program extracted the first four characters from left to right—''Smit''—and placed them in the name control field. If the computer program could not identify any usable word after scanning the entire primary name field the name control field remained blank.

Surname locator. The formatting program inserted an indicator—a surname locator—in each individual record to identify the field position of the first character of the name control. If the name-control field was blank, the record could not be recoded (for details of the name recode, see below) for name and address linkage.

Size coding. Each source record was assigned a measure of estimated size derived from size indicators present in the record. The size code was an estimate of the total value of sales (TVP) of agricultural products by the agricultural operation represented by each record. The computer inserted the size code for each record in a specific data field, depending on the source of the individual record. All the size codes for an individual record were retained during record linkage—that is, as records were linked and duplicates deleted from the file, the size codes from the deleted records were transferred to the appropriate field in the retained record. After all identified duplicates had been deleted, the computer scanned all of the size codes for each remaining record. If multiple codes were present, the specific code retained depended on the priority assigned to the size codes for particular sources (i.e., the Census Bureau's estimate of the reliability of size information from a given source). The sources, and the size code indicators were used as follows:

Source	Size indicator
IRS form 1040F	Gross income
IRS 1065 and 1120	Net receipts
1987 Census of Agriculture farm records	Total value of products sold, from 1987 census records
1987 Census of Agriculture nonfarm records	Designated size code (17)
IRS form 941 and 943	Annual payroll
1987 Census of Agriculture nonrespondents	1987 mail-list size code
Multiunits	Designated size code (15) *
Abnormals	Designated size code (16)*
Special lists	Varied by list (usually based on commodity inventory)
NASS farm list	USDA calculated farm value of sales
NASS nonfarms	Designated size code (17)
Conservation Reserve Program	Total dollars paid*

*Used only in the phase 2 compilation effort.

Possible partnership or corporation (PPC) flags. The format program identified certain cases during the list building and matching processing and ''flagged'' their computerized records as possible partnership or corporation (PPC) cases. This prevented the automated deletion of partnership or corporation records that had been matched to individual records. For example, John Doe might operate an individual farm as a sole proprietor, while also having a partnership operation with Joseph Roe. In this case, the computer would compare the Doe/Roe partnership record to Doe's individual record on the basis of his name and EIN, and delete one or the other as a duplicate. The PPC flag on the Doe/Roe record changed the match status from ''duplicate'' to ''possible duplicate'' and the record was assigned to clerical review to determine the final disposition.

EIN/SSN Record Linkage

General information. EIN's and SSN's provided the easiest methods of linking duplicate records from the various source lists. Ninety percent or more of the records from the different sources used in compiling the mail list included either an EIN or an SSN, or frequently, both. The Census Bureau's computer programs compared the numbers on each record to those on all other records in the files—as well as checked name controls and PPC flags—to identify positive duplicate and possible duplicate records. The computer flagged and displayed possible duplicate records for clerical review. Records identified as positive duplicates—those with matching EIN's or SSN's, and name controls, but without PPC flags—were reviewed by computer for source priority codes; the record with higher numerical priority code was deleted from the file. (Source priority

codes were assigned in reverse numeric order; that is, a record with a priority code of ''3'' had a lower priority than a record with a code of ''1.'')

The linkage operation for the 1992 census was essentially identical to the highly successful procedures used for the 1987 enumeration. The computer programs linked records by matching EIN's to EIN's and SSN's to SSN's. Records with both an EIN and an SSN were linked in two separate cycles. The number of records deleted during each phase of the EIN/SSN linkage operations was as follows:

	Records deleted	Total file after linkage
Phase 1 1992 linkage operation:		
EIN linkage	412,332	8,738,958
SSN linkage	2,438,303	6,300,655
Phase 2 1992 linkage operation:		
EIN linkage	593,850	7,397,094
SSN linkage	2,010,671	5,386,423

EIN linkage. Every record with an EIN was subject to the EIN linkage process. The computer sorted the record files by EIN, then by PPC flag, name control, and address-priority code, and transmitted the sorted files to the matching cycle in code-priority order. (Records entered the cycle in descending priority order, so that records that would be deleted always entered the cycle after the record that served as the ''original'' (called the ''deleting record'').) The matching cycle moved the records from the sorted input file into temporary storage for the linkage operation. The computer ''wrote'' the processed records to one or the other of two output files, one for records with EIN's only (no SSN) and all records for deletion, and a second for records with both EIN's and SSN's. (The latter file would be subject to a second linkage operation using SSN's.)

The computer established two record locations, record 1, containing the first (that is, the record with the highest source-priority codes) of a suspected pair or group of suspected duplicates, while record 2 contained successive suspected matching records.

When EIN's matched, the computer compared name controls and checked for a PPC flag; if the name control matched and there was no PPC flag, the records were identified as a positive match. The sorting done prior to the linkage operation ensured that record 2 had lower priority source-address codes than record 1, so the computer flagged record 2 for deletion and transferred all of record 2's source, size, and geographic codes to record 1, then wrote it into the appropriate output file (EIN's only and records for deletion, or EIN's with SSN's), while a new record moved into the record 2 location. When EIN's matched, but the name controls did not, or when one or both records contained a PPC flag, the records were declared possible duplicates. No codes were transferred, but a ''possible-duplicate pair'' number was inserted in both records, linking them so they could be displayed together for review. If record 1 already had a pair number, the same number was inserted into record 2; record 1 then was written to the appropriate output file and record 2 moved into the record-1 location. This cycle continued until the input file was exhausted, all duplicates had been flagged, and all possible duplicates had been assigned pair numbers.

SSN linkage. After each EIN linkage operation, the Census Bureau merged the ''EIN with SSN'' output file with the ''SSN only'' file to create the input file for the SSN-linkage process. The computer sorted the combined file by SSN, PPC flag, name control, and address priority in the same fashion used for the EIN-linkage input file, and used similar linking procedures, except that ''dummy'' file records were created and different methods were used in assigning pair numbers.

The SSN linkage operation created extra records for input records containing more than one SSN. The creation of these dummy records allowed the original and the dummy to be linked, because IRS 1040F files sometimes contained two SSN's (usually those of spouses) and had to be linked to both SSN's. The computer linked only one data field for each record, hence dummy records were created for 1040F records with two SSN's. After linkage, the computer matched the dummy records to their master records, transferred any codes picked up during processing to the master, and deleted the dummy record.

Geographic Coding

General information. The 1992 census mail-list compilation processing operation included a geographic coding operation designed to ensure that all records entering the record-linkage system contained the appropriate standard geographic codes. The agriculture census did not require the very detailed geographic coding required for the economic censuses, since agriculture census data generally were compiled for only three primary geographic units—States, counties, and five-digit ZIP Code areas (data for other geographic entities, such as census divisions, regions, and the United States, were aggregations of State totals). Nevertheless, accurate geographic coding was vital to both the mail-compilation operation (the name and address linkage operation used ZIP Codes as a blocking parameter) and the census mailout itself.

The agriculture census geographic-coding operation used census State and county codes, alphabetic county abbreviations, and ZIP Codes. The geographic information used was drawn from the master geographic reference file assembled by the Census Bureau's Geography Division.

Geographic reference file. The source for the 1992 agriculture census geographic codes was the 1992 Economic Geographic Reference File (EGRF), compiled by the

Geography Division. The 1992 EGRF was a concise and relatively easily maintained computerized geographic file containing approximately 50,000 place codes covering the 50 States, the District of Columbia, Puerto Rico, Guam, the Virgin Islands of the United States, and the Commonwealth of the Northern Mariana Islands. It contained the geographic code structure—including two-digit State, three-digit county, two-digit congressional district, and five-digit ZIP Codes—required for tabulating economic (and agricultural) data for specified geographic entities, as well as for editing other geographic files, and for producing recode files, geographic stub file, and other geography-related reference materials and products. Geography Division compiled the 1992 EGRF by updating the 1987 economic geographic information reference tape (EGIRT) file, using independent sources of geographic information.[1]

After updating, the Geography Division used the Census Bureau's mainframe computer to edit the EGRF to check for consistency in the file. Thereafter, the EGRF contained the following records used in the agriculture census:

1. One record containing the name and current and historic codes for specified census geographic entities (for agriculture census purposes, these entities were, regions, divisions, States and equivalents, counties and equivalents, congressional districts, and five-digit ZIP Codes with proper and variant spellings of most post office names, as well as the most likely county location for each ZIP Code).

2. One record representing the United States as a whole.

The Geography Division created several products from the EGRF used in the 1992 Census of Agriculture. These included the county/place code change file, used to convert 1987 geographic codes to the 1992 code structure; the county alpha recode file, which converted the FIPS county code into a six-character alphabetic abbreviation of the county name (used to prepare the questionnaire mailing label); the duplicate names file identifying each place or equivalent name that occurred more than once in a given State; and the publication geographic stub file, used to insert geographic entity names in the stubs for publication tables.[2]

[1]The sources used included (1) lists of new boundary changes that affected governmental units through January 1, 1992 (based on the Census Bureau's annual boundary and annexation survey); (2) the Office of Management and Budget's (OMB's) changes to the metropolitan area (MA) list inventory and components; (3) a list of towns in New England, New York, and Wisconsin, and of townships in Michigan, Minnesota, New Jersey, and Pennsylvania that qualified as special economic urban areas (SEUA's); (4) the appropriate Federal Information Processing Standards (FIPS) publications (the FIPS codes were the source of the State and county geographic identification codes used in various agriculture census processing, tabulation, and publication operations); and (5) selected 1990 census population reports.

[2]The 1992 EGRF also was used in publishing the 1992 Economic Census Geographic Reference Manual, a printed report containing the codes assigned to geographic areas for which the Census Bureau tabulated data for the 1992 economic and agriculture censuses.

Mail-file processing. The Census Bureau used the 1992 EGRF to edit the agriculture census mail records in a series of computer operations that (1) checked the validity of the ZIP Code/post office name match on each record; (2) inserted ZIP Codes, post office names, and State and county alpha codes into records lacking those items; (3) standardized spellings of post office names; and (4) assigned (mailed and reported) county and State numeric codes.

Geographic coding was carried out as part of both the phase 1 and 2 mail-list processing operations (following EIN and SSN linkage and the deletion of duplicated records identified during those operations). In phase 1 processing, 6,040,354 records underwent geocoding and 1,366 records were rejected by the coding program.[3] Records geocoded during phase 1 processing (over 4.7 million in all) were not recoded in phase 2. A total of 632,662 records underwent geocoding during the phase 2 operation, and 2,026 were rejected as uncodeable.

After geographic coding, the mail file was ready for name and address linkage.

Name and Address Linkage

General information. After EIN/SSN linkage and deletion of duplicates, and geographic coding, the remaining mail-file records underwent a third linkage operation that matched names and addresses. The name and address linkage process (1) identified name parts and other variables to use for the matching program, (2) recoded the names and addresses to create short records for linking, and (3) matched the names and addresses in the file and deleted duplicate records.

Identification of name parts. The contents of the first and second name fields for each record had to be identified before the names themselves could be passed for linkage. The computer did this by comparing all the words in each name field to the ''skip list''. Words matched to words on the skip list were ignored, and the computer scanned and classified all the remaining characters and/or character strings as a surname, single letter, conjunction (''&,'' ''and,'' and so on), or ''other.'' The surname was identified using the surname locator assigned in the initial format program (see above). The computer identified conjunctions by comparing each word to another dictionary, and classifying the words accordingly. Each word was coded with a numeric designator (for example, surname = ''3,'' conjunction = ''4'').

After classifying each character and character string in each field, the computer retained the assigned codes, in sequence, as the name pattern. This pattern identified each word (character or character string) in the field, and the computer compared the name pattern to a file of acceptable name patterns that identified each word as a first name or initial, middle name or initial, or surname.

[3]The usual reason for rejecting a record was that it was uncodeable; that is, the information in the record was so incomplete, or so obviously wrong, that no reasonable identification of its geographic location (at the required level) could be made.

The computer created dummy records for any record with a multiple name pattern, so that each possible name had an individual record. Each dummy record carried all the identification codes of the original record so that it could be matched back to the original after linkage. Dummy records also were created for spouse names (except those from the IRS 1040F files), names in the second name field, and partnerships.

Record linkage. Prior to 1992, census record linkage was done within each ''block'' of records—a block consisting of all records from a single ZIP Code (or ZIP Code group[4]) that had the same recoded surname. The linkage process used a limited number of variables (surname, first name, middle initial, box/house number, rural route number) as match keys. While generally effective, this match procedure failed to detect a high proportion of duplicate names and addresses, identifying many address as ''possible duplicates,'' which required clerical review.

In an effort to increase the numer of duplicates detected and to reduce the need for costly and time-consuming review, for the 1992 census the Census Bureau used a new name-and-address linkage method based on a statistical model developed by the Census Bureau's Statistical Research Division (SRD). The new procedure used frequency-based probabilities and statistical-match weighting produced by an expectation-maximization (EM) algorithm, along with a match weight adjustment based on expert judgment.[5] More information was extracted from the individual records—including street name, telephone number, and SSN—for comparisons, which significantly improved detection of duplicate records. Blocking for linkage in the new system was based on ZIP Code or ZIP Code group and the first character of the surname, which meant that more comparisons were made within blocks.

The procedure also used ''string comparators'' to compare names, telephone numbers, and identification numbers. The name and address linkage operation in previous censuses classified match keys as agreeing, disagreeing, or missing. The string comparators used for the 1992 census identified degrees of similarity between two strings of letters or numbers. For example, if three of the last four-digits of two telephone numbers checked agreed, the comparison was not given the full disagreement weight, and thus was more likely to be classified as a possible duplicate rather than a nonduplicate record.

The new procedures allowed the Census Bureau to set high and low limits, or cutoffs, for assigned duplication ''weights'' for each group of records processed. Pairs of records having weights above the high cutoff were identified as duplicates, those with weights below the low cutoff were nonduplicates. Pairs with weights falling between the cutoffs were identified as possible duplicates for clerical review.

Statistical Modeling

General information. The various matching operations used to compile the 1992 census mail list produced a ''final'' mail file of approximately 3.78 million records. The Census Census Bureau used statistical modeling to identify those records remaining in the file that were least likely to represent farms for deletion to reduce the file to 3.55 million addresses. The Agriculture Division staff selected a ''classification tree'' methodology as the means to separate mail records into probable-farm, and probable-nonfarm, operations.

The Census Bureau used a classification tree model in the 1987 census as well. This form of statistical modeling used the known characteristics of farms from the previous census to determine which were most useful in predicting farm/nonfarm status. The 1987 census classification model had been developed by the Census Bureau's Agriculture Division and Economic Programming Division. For the 1992 census, the Census Bureau used classification and regression trees (CART) software purchased from a private vendor.

Classification tree methodology. The 1987 census mail-list records served as the source for the classification tree definitions. The CART software partitioned the 1987 mail list into model groups (MG's) defined by the information known prior to the mailout and common to both the 1987 and 1992 mail lists (for example, geography, record source, previous census status, and expected value of sales). The computer calculated the proportion of 1987 farm records in each group, and used that as the expected proportion of farms in the same group for the 1992 mail file. After updating the definitions (for example, using tax records for 1990 and 1991 instead of 1985 and 1986) the staff applied these model groups to the 1992 preliminary mail file.

The CART software defined the model groups for the 1992 census by the values of the classification variables determined most likely to identify farm/nonfarm status for all the records under consideration. Fourteen of the classification variables were defined according to whether a given record had the following characteristics:

1. Was this record a 1987 Census of Agriculture nonrespondent?
2. Was this record a NASS farm?
3. Was this record a NASS nonfarm?
4. Was this record a 1987 Census of Agriculture farm?
5. Was this record a 1987 Census of Agriculture nonfarm?
6. Did this record submit an IRS 941 or IRS 943 form in tax years 1990 or 1991?

[4]A ZIP Code group combined all records for a multi-ZIP Code city into a single block. In the agricultural census, subject addresses in cities were relatively few in number, and typically were horticultural or other specialty operations.

[5]The weighting adjustment was necessary because the EM algorithm lacked acceptable accuracy for finding probabilities associated with rare events, such as agreement on SSN's from two separate records.

7. Did this record submit an IRS 1065 form in tax year 1990 or 1991?
8. Did this record submit an IRS 1120 form in tax year 1990 or 1991?
9. Did this record submit an IRS 1040F form in tax year 1990 or 1991 and was it a NASS farm and/or a census in-scope record in the 1987 Census of Agriculture?
10. Did this record submit an IRS 1040F form in tax year 1990?
11. Did this record submit an IRS 1040F form in tax year 1991?
12. Did this record submit an IRS 1040F form in tax years 1990 or 1991?
13. Did this record submit any IRS forms, except a 1040F of either tax year 1990 or 1991?
14. Was this record on a special list?

The Census Bureau also used expected mail size (that is, expected total annual value of sales of agricultural products) as a classification variable. The expected mail size had values ranging from 1 (estimated annual total value of products sold (TVP) greater than or equal to $1,000,000) to 14 (estimated TVP less than $1,000). The Census Bureau derived this variable from information received from the source lists used to compile the initial mail list. The following categories or records were included in the mail file as certainty records, and therefore excluded from the modeling operation:

- Multiunits and abnormals (see p. 31).
- Most special list records and other source records matched to special list records.
- NASS June Agricultural Survey (JAS) records and other source records matched to JAS records.

Source-list record linkage. The phase 2 linkage operation began in June 1992, matching 4.7 million records in the preliminary list to approximately 3.29 million from new source lists. After linkage, source and size codes required for modeling and sample selection were assigned to the individual records, and a file of 3,783,302 records was created. Applying the statistical model to this preliminary file created 787 MG's. Records in the MG's with the lowest expected proportion of farms were identified as least likely to be farms for the 1992 census, and were flagged for deletion from the 1992 census mail file. Agriculture Division staff reviewed the results of the initial modeling and adjusted the model based on past experience, to shift specified groups of records from the mail list to the delete file, and from the delete file to the mail list. This adjustment added 145,026 cases to the delete file, but shifted 134,445 cases from the delete file to the mail file, so that the total deletions from statistical modeling totaled approximately 229,000, with the final mail file reduced to 3,553,639 records.

Once the final mail file was defined, the Census Bureau also used the statistical model to identify records to receive the census screener report forms. This file was created by selecting records with (1) an estimated TVP of $25,000 or less and (2) the lowest farm probability among records not selected to receive the long (sample) report form. The model identified 411,640 records in the census mail file to receive the screener forms.

Clerical Resolution of Possible Duplicates

After completing each EIN/SSN and name and address linkage operation the computer sorted the possible duplicate cases file by pair number for clerical resolution. In previous censuses, the clerical review operation involved printing thousands of pages of computer printouts and clerical processing of possible duplicate records and data keying to incorporate clerical actions for computer processing. For the 1992 census, the Census Bureau developed an interactive computer system for reviewing and processing possible duplicate records. The new system displayed computerized records of possible duplicate sets on a computer terminal screen for clerical review. Using specific procedures and guidelines, the clerks reviewed the records to determine whether the records in each set were duplicates. Records to be retained were identified by comparing source-priority codes (when duplicate records had identical source priority codes, the clerks retained the one with the most complete addresses). The clerks identified duplicate records electronically for deletion by keying the appropriate action code into the computer. (A small sample of possible duplicate sets were resolved by telephone calls to the respondents involved.)

The interactive system eliminated the need for printing and control of the paper listings previously used, as well as the need for a separate data-entry operation to capture the clerical actions. The 1992 census clerical resolution operation processed 769,267 record sets containing 1,979,936 individual records, compared to 1,100,900 sets and 2,430,019 individual records for the 1987 census, but required a clerical staff of only 24 (compared to 59 employed in the previous census), and cost only about half as much per record processed.

Controls

General information. The Census Bureau creates a set of checks and controls on the mail list compilation operation in each census to enable it to track the actual source record processing and collect materials to test specific phases of the operation. The 1992 census used two major control procedures—a ''trace sample'' of individual source records undergoing compilation and individual process control counts. The agency used the trace sample for quality control review of the overall operation, while the control counts recorded the number of individual records retained or deleted from the file at each processing step.

Trace sample. The trace sample was a file sample of records selected from the various source lists used to

monitor the mail list development processing. The trace-sample records were selected as part of the format and standardization operation for each source list. The computer selected the first record, and every 1,000th record thereafter from each file, setting a ''trace flag'' in each to identify it as a trace sample record. Each trace-sample record was copied to a file for storage and display (when specified) at each stage of processing for review by statistical analysts. This produced a file for each sample record showing it as it entered the compiling operation and the changes made to it at every point during processing. The Census Bureau's staff used the trace sample as a quality control tool, and for research projects concerned with address file processing.

Control counts. The Census Bureau's computer programs generated processing-control counts of input files, deletions (and the point in processing at which records were deleted), and output files at each stage of the mail file processing cycle. These counts served as checkpoints at each phase of the processing. The principal matching operations, and the control counts generated in the phase 1 and 2 mail list compilation were as follows:

Count	Records	
	Phase 1	Phase 2
Total input file	9,151,290	7,990,944
EIN linkage deletes	412,332	593,850
SSN linkage deletes	2,438,303	2,010,671
Exact name matches	260,301	49,430
Name and address linkage deletes	814,691	171,019
Possible duplicate deletes*	457,779	128,629
Geocoding rejects	1,366	2,026
Final processing rejects	62,187	1,106,130
Out-of-scope ''2+'' deletes		140,783
Duplicate 1987 CFNs		5,104
Statistical model drops		231,895
Output file (preliminary (Phase 1) and final (Phase 2) mail files	4,704,331	3,551,407

*Includes deletions resulting from clerical and telephone review.

FINAL MAIL LIST

General Information

The final mail-list preparations involved assigning census file numbers (CFN's) and other processing codes to each record, identifying ''must'' and ''certainty'' cases, selecting records to receive sample report forms, and identifying cases to receive the screener form.

Census File Numbers (CFN's)

Census processing required a unique identification for each data record—the census file number (CFN). The Census Bureau assigned a CFN to each address on the final mail list. Each CFN consisted of 11 digits arranged in three groups. The first five digits were the State and county codes for the expected location of the agricultural operation, the second five a serial number identifying the specific operation within its county, and the last digit was a check digit to provide for a quality control check during processing.

The CFN was printed in both numerics and as a bar code on the address label affixed to each report form mailed.

Must and Certainty Cases

''Must'' cases were agriculture operations that (1) were so large that failure to include their data would significantly distort the census statistics, or (2) required special handling, such as multiunits. ''Certainty'' cases were agricultural operations expected to have large acreages or volumes of sale, but did not qualify as must cases in terms of size or type of farm, but were important enough to justify automatic selection for the long (sample) report form.

Must cases were identified by computer review of the census mail file after record linkage had been completed. The selection program used size codes for individual operations, lists of multiunits from the 1987 census inscope list, and other size indicators from the mail files, to identify records for (1) farms so large that some data had to be collected, rather than imputed, in cases of nonresponse; (2) operations for which some explanation was needed of why they were not engaged in agricultural operations (i.e., an address that had large-scale agricultural activities recorded in the 1987 census); and (3) addresses with indications that census response would require special analyst's review. These general categories included—

- **Multiunits.** Multiunits were companies or organizations with significant agricultural operations at more than one location. Multiunits typically required a separate report form for each agricultural establishment, since each was considered a separate farm for census purposes. Individual files were maintained for each ''master'' (i.e., company or organization) record and each associated farm. Multiunits identified prior to the census mailout were assigned multiunit identification numbers in the alpha/plant field[6] of the address label indicating whether the report form was for the master company or for an associated farm.
- **Abnormal farms.** Abnormal farms were those operated by institutions, such as Federal or State agricultural research facilities, prison farms, Indian reservations, etc.

[6]The alpha/plant field identified the company with a six-digit number in the alpha field of each record. The ''plant'' code was a four-digit establishment identifier. The master record for a multiunit would have the company identifier in the alpha field, and four zeroes in the plant field, while each associated farm had the company identifier in the alpha field, and an individual identification number in the plant field. Each report form for a master company or associated farm had a serial number, the farms receiving numbers in sequence following the master establishment.

- **Other farms.** Other must farms included addresses the Census Bureau believed represented large individual farms. The size criteria (expected total value of products sold (TVP) or total acreage) used to determine must status varied from State to State (e.g., in Texas, a must case had to have an expected TVP of $500,000, or 2,000 acres of land; while in West Virginia, $100,000 in TVP or 1,000 acres qualified).

Other large cases also were selected for telephone followup on the basis of acreage and TVP. The minimum acreage requirement generally was the same as for the must cases—i.e., 1,000 to 10,000 acres, depending on the specific State, while minimum TVP varied from $40,000 to $500,000. Must and telephone followup cases received intensive telephone followup during the census processing. When addresses could not be reached by telephone, or the farm operators refused to respond, secondary sources, such as the USDA's Extension Service (ES) and/or Agricultural Stabilization and Conservation Service (ASCS) offices were asked to provide information on any agricultural operations of nonrespondent addressees. Data from previous censuses, together with information from other sources, were used to impute responses for nonrespondents.

Mail List Sampling

The Bureau of the Census introduced large-scale sampling for agriculture data in the 1945 Census of Agriculture. The Census Bureau used post-census sample surveys to supplement the basic data collected in the 1959 and 1964 agriculture censuses, and employed a 50-percent sample in the 1969 census to collect data for farms with annual sales of less than $2,500. In the 1978 and following censuses, the Census Bureau sampled its census mail list to collect specified additional data from selected agricultural operations. The censuses asked all farms for basic data, while a sample of approximately 25 percent of addresses on the census mail list received a sample report form requesting additional information on such items as value of machinery and equipment, production expenses, and use of fertilizers and insecticides. To further reduce overall response burden in the 1987 census, the Census Bureau introduced a ''short'' form (one sheet, front and back) with abbreviated versions of the standard items. Addresses on the mail list, but believed least likely to meet the census farm definition, received these short forms. For the 1992 census, a screener section was added to the front of the standard nonsample questionnaires to produce the Form 92-A401 to -A411, and -A414, Screener Forms. The screener section enabled recipients who were out of scope to determine that fact, and skip the rest of the reporting sections of the form.

The sampling method used for the 1992 census was essentially the same as that used for the 1982 and 1987 enumerations. The mail-list compilation operation identified addresses as ''certainty'' (including multiunits, abnormal farms, and all farms in counties reporting fewer than 100 farms in the 1987 census) or ''noncertainty'' based on expected value of sales of agricultural products or acreage (the exact requirements for designation as a certainty farm varied by State). After linkage and deletion of duplicate records, and the statistical modeling of the final mail list, the regular census mail file was sorted by CFN for sample selection.

The sample file included all mail-list records in Alaska, Hawaii, and Rhode Island, and a sample of records in all other States. Records selected for the sample included all ''certainty'' records, a systematic sample of 1 in 2 of all noncertainty records in counties reporting 100 to 199 farms in the 1987 census, and a systematic sample of 1 in 6 of all noncertainty records in counties reporting 200 or more farms for 1987. This differential sampling scheme provided reliable data for the sample items at the county level. When a nonsample large farm was identified during processing, the Census Bureau mailed it a supplemental form containing the additional sample data inquiries.

The Census Bureau identified mail-list records to receive the screener form by statistical modeling (for details, see above). All records not designated for the sample were sorted by model-group farm probability as specified by the mail-list group. The records in the groups with the lowest probability of being farms, and with an expected total value of agricultural product sales below $25,000 were added to the screener form file. The remaining mail list records received the nonsample form.

The final mail list file was as follows:

Report form type	Records
Total	3,551,407
Sample/certainty (including must)	1,008,068
Nonsample	2,131,699
Screener	411,640

PRINTING AND ADDRESSING REPORT FORMS

General Information

The Census Bureau contracted with commercial printers to print the report forms, information sheets, mailout and return envelopes, and other enumeration materials.[7] The contractors printed the various forms, and assembled specified numbers of mailout packages for the initial and followup mailings, using written specifications provided by

[7]Other materials included special instruction inserts for multiunits, abnormal farms, cattle feedlots, nursery and greenhouse operations, poultry contractors, bee and honey producers, fish and aquaculture operations, and laboratory animal producers. The number of operations in each of these categories varied widely; there were fewer than 200 laboratory animal producers on the census mail list, while there were nearly 57,000 nurseries and greenhouses.

the agency, and under quality control supervision of Census Bureau personnel.[8] The contractors sent completed packages and other printed materials to the DPD office in Jeffersonville, IN, for final preparation (essentially affixing mailing labels and sealing packages) and mailout.

Address Labels

Printing. The 1992 agriculture census mail list comprised over 3.55 million names and addresses. The Census Bureau created a computerized mailing list at its main computer facility in Suitland, MD, then transmitted the list to the DPD in Jeffersonville, IN, by telephone datalink. The DPD staff in Jeffersonville used the address list files to print the adhesive address labels using six high-speed printers. The check-in operation updated the response list daily, and the Census Bureau created an address file of nonrespondents following each response cutoff date. Computer-generated adhesive address labels (the addresses were from the nonrespondent lists produced by the Census Bureau after each mail response cutoff date) were used for all the mailouts except the first followup, which used the 92-A01(L2) Reminder Card (the equipment printed addresses directly onto the face of the about 1 million cards; the remainder were addressed using the adhesive labels).

Quality control. As the labels were printed (for the initial mailout and after each mail closeout), DPD quality control (QC) clerks monitored the printing to ensure that the labels were in the proper format, legible, aligned so that when cut the address and identification information would be visible, and that the bar codes were readable and in the correct format. The QC clerks checked the entire first file for each farm type from each printer, for each printing. They also spot checked pages of labels at specified intervals in each printing run. QC problems with any file resulted in partial or complete reprinting, as needed.

Printing, Assembling, and Addressing Mailing Packages

Quantities. The quantities of report forms, letters, and envelopes printed for the 1992 agriculture census are summarized in table 3-1 (for more detailed information on printed quantities of materials, see appendix C).

[8]In addition to the complete packages of each form type, a certain number of each type of form was printed and reserved for remailing to ''undeliverable as addressed'' (UAA) cases, for correspondence, or for informational uses. For example, the nonsample printing run included not only the regular mailing packages for regions 01 through 11, but also a total of 81,000 UAA packages for those regions, as well as 22,000 correspondence packages (2,000 per region, the UAA packages prepared for each region varied proportionally to the initial mailout for a particular region), and 90,000 ′information' copies of the report forms (5,000 to 11,000 per region).

Table 3-1. **Quantities of Materials Printed**

Form number	Description	Quantity
Information sheets and form letters:		
92-A01(I) and -A02(I)	Instruction sheets	9,289,000
92-A01(L1) and (L1A)	Transmittal letters (initial mail-out (L1) and UAA's (L1A)	4,563,000
92-A01(L2)	Reminder card	4,200,000
92-A01(L3) through (L6)	Followup letters	4,656,000
Envelopes		
92-A7.1 through -A7.5; -A7B, -A7C, and -A7	Outgoing envelopes	9,862,000
92-A8A(SC), (N), (S), and (M)	Return envelopes (screener (SC), nonsample (N), sample (S), and must (M))	9,800,000
Report Forms		
92-A0401 through -A0411, and -A0414	Screener report forms	1,816,000
2-A0101 through -A0111	Nonsample report forms	5,137,500
92-A0201 through -A0214	Sample report forms	2,667,900
92-A0201(F)	Sample report form (FOSDIC test)	129,000
92-A0301 through -A0311	Must report forms	466,000

Facsimiles of the instructions sheets, reminder card, and principal followup letters are included in appendix G.

The mailing package contents for the initial mailout in December 1992 were as follows:

Type	Report form	Information sheet	Return envelope	Cover letter
Screener . .	92-A0401 through -A0411*	92-A01(I)	92-A8A(SC)	92-A01(L1)
Nonsample .	92-A0101 through -A0111*	92-A01(I)	92-A8A(N)	92-A01(L1)
Sample	92-A0201 through -A0213*	92-A02(I)	92-A8A(S)	92-A01(L1)
Must	92-A0301 through -A0311*	92-A02(I)	92-A8A(M)	92-A01(L1)

*As appropriate, the mail packages include Hawaii (-A0212) and Alaska (- A0213), and special instructional inserts.

Quality control. Private contractors printed and assembled the 1992 agriculture census mailing packages to specifications supplied by the Census Bureau. Teams of two or three DPD quality control (QC) personnel visited each contractor's printing facility when the forms and packages were being printed and assembled to oversee the printing and to inspect the contractor's printed materials and assembled packages. Report forms and envelopes were subject to a visual review to make certain the printing was of acceptable quality, the proper colors and shading were used, and so on. The QC staff also checked a random sample of assembled mailing packages to ensure that they were complete and the materials had been inserted in the proper order.

Each contractor boxed each day's production of assembled packages for QC review, which involved the Census Bureau's QC staff selecting a specified number of boxes (the exact

number depended on the total number of boxes of packages produced by that days' printing run) for the quality check. The QC staff then pulled three packages at random from each box for inspection. When an error was identified, the rest of the packages in the box involved were checked as well. If similar, or other, errors were found, the surrounding packages also were inspected. All detected errors had to be corrected before the packages were shipped to the DPD office at Jeffersonville for labeling and mailing.

Labeling. The adhesive address labels for the initial mailout (and for all but the first (thank you/reminder card) mail followups, were printed by form number in ZIP Code sequence. Labeling machines at the DPD office in Jeffersonville, IN, applied the labels through the open windows of the outgoing envelopes. The machines labeled mailing packages at the rate of up to 10,000 per hour. QC staff inspected the labeling machines prior to each production run and checked at random intervals during each run to ensure that the labels were applied to the correct forms and that torn or mutilated labels were removed and the packages recycled for correction.

The bulk of the labeling was completed by the end of November, and the Census Bureau released the mailing packages for abnormal and multiunit operations to the U.S. Postal Service for mailing on December 8. The remainder of the approximately 3.55 million census mailing packages were mailed during the following week.

Contents

Chapter 4.

Public Awareness Program

INTRODUCTION

General Information

Objectives. The public awareness program for the agriculture census has two major parts, the first addressing data collection and the second involving promoting data dissemination and use. The data-collection outreach phase has as its principal goal to persuade farm and ranch operators to complete and return their census questionnaires. The program's objectives were to—

- Encourage farmers and ranchers to respond to the agriculture census by February 1, 1993.
- Create public awareness of the agriculture census.
- Inform farmers and ranchers of the benefits of the census data to their own operations. .
- Emphasize the confidentiality of the census data.
- Defuse negative attitudes towards the census.

The data-dissemination, or post-census, phase of the awareness program was intended to—

- Increase public awareness of the agriculture census and its data products.
- Increase public access to, and use of, agriculture census data products.

Consultation. The Census Bureau's Agriculture Division[1] (AGR) formed a census awareness program working group in the summer of 1990 to prepare a promotion and marketing campaign. Early in 1991, the agency formed an ad hoc committee with representatives of various agencies from the U.S. Department of Agriculture (USDA) to coordinate cooperation between the Census Bureau and the USDA in promoting the 1992 census.[2] Originally, the Census Bureau considered contracting with a private company to develop and implement television and radio activities for the 1992 census promotional campaign; in December 1992, however, the AGR was directed to use agency resources for its public awareness effort. The division's staff, in cooperation with the agency's Public Information Office (PIO), Data User Services Division (DUSD), and Congressional Affairs Office (CAO), designed a multimedia publicity program for the 1992 census.

Program activities. Publicity and promotional activities involved precensus mailings to inform respondents and data users about the agriculture census, efforts to promote early response to the census, and post-census mailout news releases about the enumeration and the data collected. Census Bureau staff briefed Members of Congress, farm and agribusiness organization representatives, and agriculture-related media editors and broadcasters. The agency distributed information materials—brochures, lesson plans, news releases, special stories, and the like—to schools, businesses, private associations, and individuals throughout the country.

Before the census mailout in December 1992, promotional activities concentrated on raising general awareness of the census and encouraging early and complete response. After the bulk of the data had been collected, the focus of the program shifted to informing the public, and particularly potential data users, about census product data content, format, media, and availability.

Theme and Logo

The Census Bureau used two logos for the 1992 agriculture census. The first, used in the title boxes of report forms and on the spines of printed publications, duplicated the 1987 logo depicting a farm and silo, with "AG CENSUS USA" below it.

[1]On September 18, 1994, the economic directorate was reorganized and the Agriculture Division was renamed the Agriculture and Financial Statistics Division.

[2]The participating USDA offices were the Radio and Television Division, Office of Public Affairs; Extension Service (ES); Agricultural Stabilization and Conservation Service (ASCS); Soil Conservation Service (SCS); Farmers Home Administration (FmHA); National Agricultural Statistics Service (NASS); and the Animal Plant Health Inspection Service (APHIS).

A second logo appeared on the front covers of printed reports; this was a stylized representation of a barn and silo, and plowed fields, with stylized cows peeking out at the viewer from the lower left side of the circular field. The logo was a circle, with green ink on an white background.

A third frequently employed image was a map of the 50 States with symbols of various agricultural products superimposed over the approximate areas of the country in which they were grown. This image was used on all three posters, information kits, covers, and video tapes, as well as in the ''drop-in'' ads provided to magazines and newspapers (see page 40).

The theme for the 1992 promotional campaign duplicated that used for the 1987 effort—''America Counts on Agriculture,'' and this motto, usually preceded by the admonition ''Make It Known,'' was used on the posters, press releases, and other publicity materials.

CENSUS PUBLICITY CAMPAIGN

Broadcast Materials

The AGR staff drafted initial work proposals for a series of radio and television promotional spots in August 1990, and some preliminary video-taping of promotional materials began in October 1990. However, substantial work on the radio and television components of the public awareness campaign did not begin until early 1992, when the Census Bureau began recording a series of radio and video promotional spots for distribution to Census Regional Offices (RO's), State/Business and Industry data centers (S/BIDC's), and cooperating broadcast outlets. However, the Census Bureau decided to concentrate its broadcast outreach activities in radio, in part because radio broadcasters proved more cooperative about using promotional materials, and because the agency determined that farmers spent more time listening to radio than watching television.

The Census Bureau prepared two series of public service announcements (PSA's) as the primary radio broadcast publicity vehicles for the agriculture census. The first was a set of four PSA's (one 10-second and three 30-second spots) in which members of Congress recorded scripted statements supporting the agriculture census for distribution and broadcast by radio stations in their districts. The second was a series of 11 recorded statements of support for the census from agribusiness leaders, government officials, and representatives of farmer and agricultural organizations, such as the Pennsylvania Farmers' Association and the National Cattlemens' Association. The Census Bureau began distributing copies of the PSA's in November 1992, and continued sending materials out until May 1993, supplying copies to every member of the National Association of Farm Broadcasters (some 280 full-time members in all, each of which could represent a network of 2 to 200 broadcasting outlets).

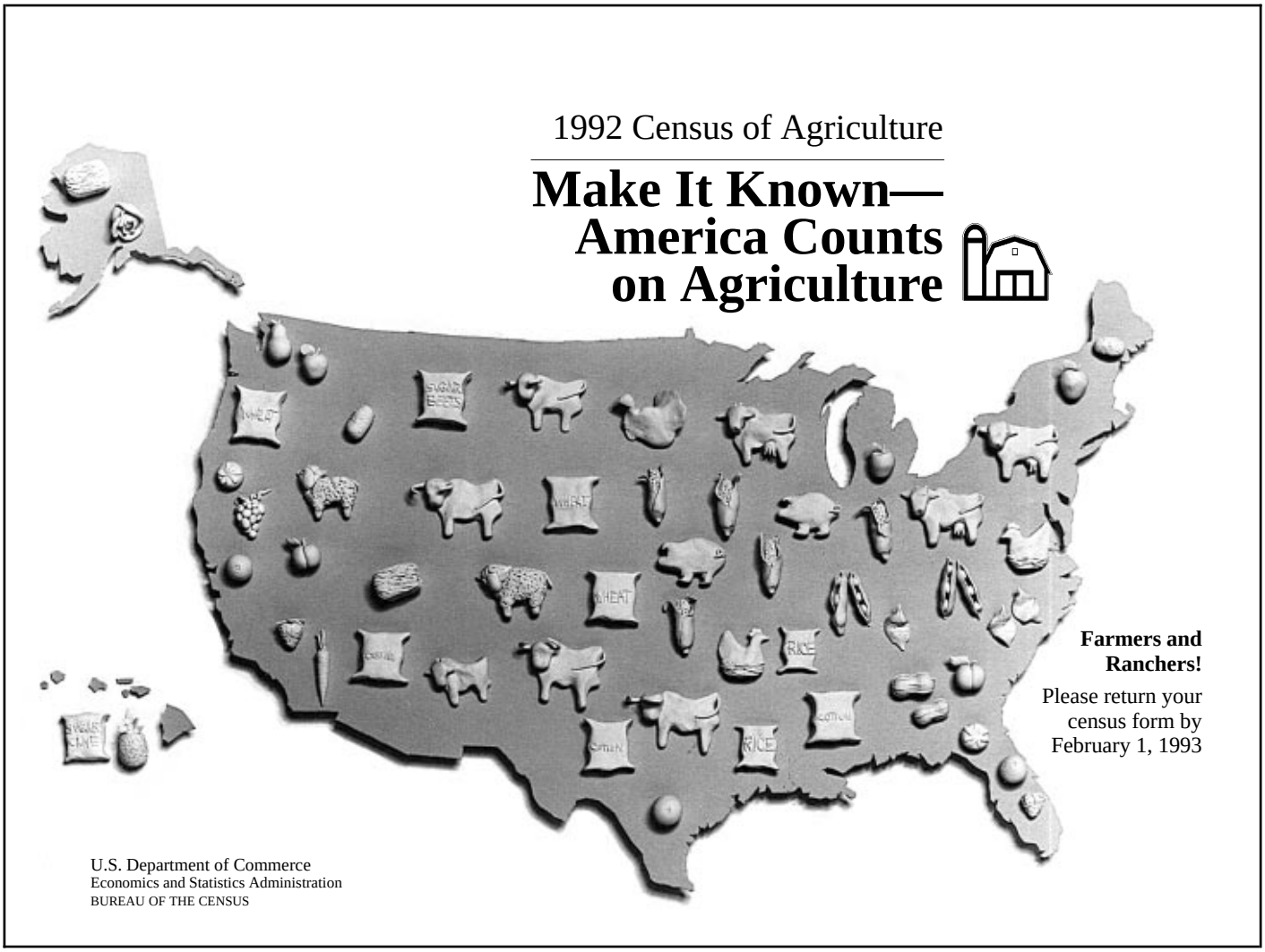
During and immediately following the enumeration, the AGR and the PIO cooperated in preparing agriculture-census related interviews for radio broadcast. Each month, beginning in May 1993, PIO staff conducted a series of four recorded interviews with Agriculture Division staff covering a variety of census-data related subjects—e.g., Federal payments to farmers, catfish farming, young farmers, ranking agriculture States and counties, etc. The interviews, edited to one minute each, then were broadcast as the ''Just a Minute'' segment of the PIO's own ''Windows on America'' radio program, which was distributed to cooperating broadcasters. At its inception, this program was used by only a few radio stations, but within 18 months as many as 200 broadcast outlets were involved.

Printed Materials

General. While broadcast and other electronic media are increasingly influential in reaching the public, printed materials—newspapers, magazines, posters, informational brochures, and the like—remained an important source of information. The 1992 public awareness program continued to make use of these materials, providing posters and brochures to offices and agriculture-related organizations all over the country for display; distributing wallet cards containing basic agriculture information as well as an introduction to the 1992 census at conferences and meetings; providing articles, press releases, and drop-in advertisements to magazines and newspapers; and writing and distributing standardized speeches, agriculture census guides, and lesson plans.

Posters. The Census Bureau printed 64,750 copies each of a 8-1/2″ x 11″ and an 11″ x 14″ 1992 agriculture census poster, using green and black ink, with gray shading, on heavy white glossy stock. The Census Bureau mailed 16,000 of the smaller posters to rural post offices (i.e., those whose areas included rural delivery routes) for display, and distributed a further 42,500 copies of each to vocational agriculture teachers and programs (the teachers also received a cover letter requesting that they ask their students to place the posters in the windows of local businesses). Approximately 10,000 copies of the larger poster were sent to USDA agencies (National Resources Conservation Service (NRCS—3,150 copies), the Extension Service (ES—4,800 copies), and the Farmers Home Administration (FmHA—50 copies)), while the Census Bureau distributed 200 more to Land Grant Colleges.

The Census Bureau also printed 250 copies of an 11″ x 24″ version of the poster for use in displays at meetings and conferences.


1992 Census of Agriculture
Make It Known—
America Counts
on Agriculture
Farmers and
Ranchers!
Please return your
census form by
February 1, 1993
U.S. Department of Commerce
Economics and Statistics Administration
BUREAU OF THE CENSUS

Brochures, standardized speeches and statements, and order forms. The Census Bureau prepared pre- and post-census promotional brochures as part of the awareness campaign. The pre-mailout brochure, Form A92-R1, *The 1992 Census of Agriculture,* was an eight-page brochure, outlining the history, legal authority, and scope of the agriculture census. It briefly described the need for the census and the principal uses of the information collected and published, and alerted operators about when they were likely to receive the census questionnaire.

Agriculture Division and the PIO also wrote a short standardized speech promoting the census for Census Bureau employees and interested outside persons to give at local meetings and presentations. Approximately 10,000 copies were printed and distributed to ES and ASCS county offices, as well as to land-grant colleges and universities, various agricultural, trade and public service (e.g., Junior Chambers of Commerce, FFA, and Rotary) associations, and State departments of agriculture.

The post-mailout items included the 1992 Census of Agriculture Data Products Order Form. This covered much of the same background material given in the *Preview*, but also provided basic descriptions of the data-release program and included ordering and pricing information for both printed reports and electronic media and telephone numbers for accessing online services and for obtaining additional information.

Guide to the 1992 Census of Agriculture and Related Statistics. While most agriculture census data users are primarily interested in the agriculture data themselves, there are a number of other Census Bureau programs that publish statistical information that is useful in any study of American agriculture or the people concerned with agriculture. Moreover, some specialized data users are not familiar with the overall character of the agriculture census statistics program. In order to provide a compact general overview of agriculture-related statistics available from the Census Bureau, the DUSD, in cooperation with the AGR first produced a general guide to the agriculture census and related statistics for the 1982 enumeration, and added this publication to the general program for succeeding censuses. The *Guide to the 1992 Census of Agriculture and Related Statistics* was a 58-page booklet that outlined the background and procedures of the agriculture census, and described the agriculture census data series and media used for each. The publication also reviewed other Census Bureau data sets from census and current data programs that included agriculture-related information or that might be of interest to agriculture census data users. The guide covered publication plans for the 1992 agriculture and economic censuses, and listed reference sources. Appendixes included a list of tables in the Volume 1 data reports, and a facsimile of a representative 1992 agriculture census report form.

The Census Bureau distributed copies of the *Guide* to its regional offices and public advisory committee members, State data centers, clearinghouses for Census data services, and as part of its census curriculum support project. The *Guide* was available on request at Census Bureau exhibit booths or presentations at conferences and conventions around the country and from Agriculture Division and DUSD.

Newspapers and magazines. The Census Bureau began distributing printed promotional materials in November 1992. Special information kits were assembled, each containing some or all of the following—

- A cover letter.
- Agriculture census fact sheet.
- Form 92-A15, ''Questions Frequently Asked About the Census of Agriculture.''
- The appropriate sample report form.
- The *1992 Census of Agriculture Report Form Guide.*
- Telephone contacts for the Agriculture Division.
- Scheduled release dates for 1992 Census of Agriculture publications.
- Data release program.
- An insert suitable for use in Congressional newsletters.
- The script for four radio PSA's.[3]

Two thousand eight hundred similar information kits (without the PSA scripts and with a different cover letter) were distributed to newspaper and magazines news editors, and to some radio news directors as well.

The Census Bureau prepared 11 data-collection series news releases (forms 92-A24(A) through -A24(K)) about the census for release between November 1992 and May 1993. The first three releases announced that the census was about to begin and told why agricultural operators should cooperate. The remaining eight concentrated on reminding farmers to respond, and described the importance of agriculture and its changing characteristics in the United States.

Agriculture report form guide. The AGR prepared form AC92-R-7, *1992 Census of Agriculture Report Form Guide*, as a reference manual for county agents, vocational agriculture teachers, USDA agencies (e.g., the National Agricultural Statistics Service (NASS), Farmers Home Administration (FmHA), ASCS, etc.), and others to use in helping farmers and ranchers, or other respondents, complete their report forms. The *Guide* was 64 pages long, including appendixes and index, and contained explanations and detailed instructions for completing each item on the sample

[3]The PSA scripts were included only in the kits sent to the administrative aides of Members of Congress. The Census Bureau requested that Members of Congress support the census by participating in these radio PSA's by making a generic statement of support. The four PSA's had scheduled release periods; the first was to be used before December 15, 1992, the second between December 15, 1992 and February 1, 1993; the third from February 1 to June 1; and the final one after June 1, 1993.

and nonsample questionnaires. Moreover, each item instruction included what should *not* be included in their response. For example, the instructions for section 2, ''Cropland Harvested,'' item C, ''Cropland used for cover crops,'' asked for land used in 1992 only to grow cover crops for controlling erosion or to be plowed under for improving the soil. Respondents were specifically instructed not to include acreage from which crops were harvested or land used for pasture or grazing.

The Census Bureau printed 75,000 copies of the *1992 Census of Agriculture Report Form Guide*, together with cover letters and/or additional materials (such as the precensus lesson plan), were distributed as follows:

Organization or agency	Copies
National Resource Conservation Service (NRCS)	3,150
Farmers Home Administration (FmHA)	50
Extension Service (ES)	4,800
National Agricultural Statistics Service (NASS) State office (5 each)	250
High school vocational agriculture teachers	8,500
Land grant colleges and university agriculture departments (2 each)	74
State data centers (SDC's), and lead agencies (2 each)	100
Census Bureau regional offices (10 each)	120

Precensus lesson plans. The AGR staff developed the precensus agriculture census lesson plan for use by vocational agriculture classes; ''agriculture in the classroom'' teachers; student teachers at land-grant universities; mathematics and geography teachers; and elementary, middle, and high school teachers. The plan—form AC92-R-3(A) *Census of Agriculture Lesson Plans*—provided background information on the census and six lesson plans:

- Plan 1. Kindergarten through grade 2.
- Plan 2. Grades 3 through 6.
- Plan 3. Grades 7 through 8.
- Plan 4. Grades 9 through 12.
- Plans 5 and 6. Grades 7 through 12.

Lesson plans 1 through 4 were designed to introduce students to the agriculture census; each was geared to a specific age group. Lesson plan 5 was designed to be used with each schools' language arts program, while lesson plan 6 was intended to be employed with the schools' mathematics program.

The Census Bureau distributed the precensus lesson plan to some 8,000 vocational agriculture instructors and to over 3,000 USDA ''Agriculture in the Classroom'' instructors. Several thousand copies also were distributed to land-grant universities, teacher education programs, community colleges that had agriculture programs, and to farm and trade organizations.

Special materials. In addition to the usual press releases, advertisements, public service announcements, and other conventional publicity materials, the Census Bureau used several special promotional items to try to increase public awareness about the agriculture enumeration. During the 1982 agriculture census, the Census Bureau had purchased a supply of baseball-style hats, bearing the census logo, for distribution by NAFB members. The hats proved so popular that the Census Bureau used them again in the 1987 census, and by 1992 they had become almost a standard part of the promotional program. For the 1992 census, the Census Bureau ordered 4,000 hats with the census logo; 20 of the hats were supplied to cooperating NAFB member stations, while the rest were given away at conferences and meetings, or on request.

The Census Bureau also ordered 20,000 corn starch book bags, imprinted with the product map design and theme used on the census posters, for distribution at meetings and conferences as well, together with 10,000 rolodex cards showing the agriculture census logo and telephone information contact numbers at the Census Bureau, and 30,000 pencils stamped with slogan ''America Counts on Agriculture.''

Agribusiness and Agricultural Organizations

The largest single user of agriculture census data, after the Federal Government, is the agribusiness sector of the economy. About 16 percent of the Nation's gross domestic product (GDP) is involved with agriculture, which means that a very large number of business enterprises are necessarily very interested in what happens down on the farm. Consequently, the Census Bureau and the agribusiness community have a mutual interest in achieving the most complete and accurate census possible and the Census Bureau has always enlisted the help of concerned businesses in publicizing the census and encouraging cooperation. To help in this effort, the Census Bureau made all of its publicity materials (posters, brochures, census guides, drop-in advertisements, and so on) available to interested agribusiness companies and associations.

In May 1991, the Census Bureau sent a letter to major agricultural organizations in each State, informing them that Census Bureau personnel were available to make presentations on the agriculture census, or staff booths or displays at business conferences, meetings, and conventions. The agency also provided copies of news releases, information kits, and feature articles to farm organizations' publications, and made staff and materials available for information booths at conventions and conferences held by various agriculture-oriented organizations. AGR staff regularly attended the annual conferences of several major

agribusiness and agriculture organizations, including the National Association of Farm Broadcasters, Future Farmers of America, American Farm Bureau Federation, National Cattlemen's Association, National Agri-Marketing Association, Rural Sociological Society, National Farmers Union, and so on. During 1991-92, the staff also participated in approximately 20 State meetings, concentrating on those States (primarily in the southeast) that had the lowest response rates to the 1987 census.

The member organizations of the Census Advisory Committee on Agriculture Statistics (see chapter 2 for member organizations and their representatives) cooperated in the publicity campaign as well. The organizations' representatives on the Committee recorded and/or filmed interviews and supporting statements, and the groups themselves publicized the census in their own advertising and promotional materials.

POSTCENSUS PUBLICITY AND ASSISTANCE TO DATA USERS

News Releases

Following the completion of data collection for the census, the Census Bureau conducted a publicity campaign designed to inform potential users, and the public at large, about the kinds and availability of the data to be published. The AGR prepared a series of 50 news stories—one for each State—using the 1992 census data, and released the specific story for each State just prior to the publication of the printed Volume 1 report for that State. Copies of the stories were mailed to the national wire services, national and local newspapers (with copies sent to all the major news outlets in the State for which the census data were about to be published), and agriculture-oriented magazines. Each article contained summary State-level data from the 1992 census and comparative 1987 statistics on total number of farms, land in farms, total value of sales, and so on, and graphs of selected items. Copies of the stories also were released on the Census Bureau's online information service—CENDATA™—and on the AgriData Network's online system as well.

A summary story, using the same format as the State stories but displaying data for the United States, was prepared and released when the volume 1, *United States Summary*, was published in October 1994.

Professional Meetings

The Census Bureau sent representatives to a variety of trade shows, professional conferences, agricultural news media conferences, and commodity producers association meetings to help publicize the census. Agriculture Division and other Census Bureau staff made special efforts to attend meetings of such organizations as the American Agricultural Editor's Association and the National Association of Farm Broadcasters to request their help, and the help of their associations' members, in promoting cooperation with the census. These meetings enabled Census Bureau officials to hear suggestions for improving the census and their own particular efforts and supplemented the advice and assistance provided through the Census Advisory Committee on Agriculture Statistics (see chapter 2). AGR personnel staffed information booths, made presentations and speeches, or participated in discussions and workshops at an average of four or five meetings every month for most of the census period. Division representatives also regularly participated in meetings of prominent organizations, such as the National Agri-Marketing Association and National Association of State Departments of Agriculture, and attempted to reach more specialized audiences by participating in the 1993 Industry Trade Fair in Puerto Rico and the 1993 annual conference of the American Society of Agricultural Engineers.

State Farmer Meetings

Census Bureau staff routinely attend the annual meetings of a number of State- and national-level farm organizations—the American Farm Bureau Federation, Future-Farmers of America, National Farmers Union, National Cattlemen's Association, and others—making presentations, staffing information booths and exhibits, and so on, to promote the census to the leaders and members of the various organizations. The Census Bureau also tried to target specific organizations and meetings in agriculturally important States (e.g., the California Farm Equipment Expo). In an average year *between* the agricultural censuses, the Census Bureau participated in 20 to 25 national conferences and meetings. During the run up to the 1992 census, staff also took part in about 20 meetings of State-level organizations, concentrating in States (particularly in the South) with low response rates to the 1987 census.

Contents

Chapter 5.

Data Collection

GENERAL INFORMATION

The Census Bureau employed mail self-enumeration as the principal data-collection methodology for the 1992 agriculture census in the 50 States (Puerto Rico, Guam, and the Virgin Islands of the United States were enumerated in separate operations, see chapters 7 and 8 for details). The Data Preparation Division (DPD) at the Census Bureau's Jeffersonville, IN, facility carried out the bulk of the mail operations involved in the enumeration, with the close supervision and assistance of the Agriculture Division (AGR). The DPD mailed some 3.55 million agriculture census report forms in December 1992, and carried out up to five followup mailings to nonrespondents—the first a reminder card requesting early response, mailed in the first week of January to *all* addresses on the census list—between the beginning of January and the end of June 1993.

The vast majority of agricultural operations were enumerated by mail, but the Census Bureau supplemented the mail enumeration with a telephone followup program in which telephone interviewers tried to contact selected nonrespondent cases with large estimated annual total value of sales (TVP) of agricultural products and, in counties with unacceptably low overall levels of response (i.e., less than 75 percent). For the 1992 census, the agency introduced computer-assisted telephone interviewing (CATI) as the principal technique employed in the telephone followup operations for the agriculture census. The telephone followup to large nonrespondent cases began in March 1993, while the low-response county telephone operation began in May.

The AGR conducted a separate enumeration of citrus caretaker operations[1] in the summer and early fall of 1992, in order to obtain data on citrus production in Florida, Texas, and Arizona at the close of the growing season in those States.

In addition, the data-collection operations for the 1992 census included mailouts to addresses for the 1992 Nonresponse Survey from April through July 1993 (while mail followup to the census was still underway), and the 1993 Model Drop Survey (used to evaluate the effectiveness of the Census Bureau's classification tree methodology in accurately classifying addresses on the mail list).

[1]Citrus producers, whose groves were covered in the caretaker enumeration, also received census report forms by mail in the December mailout so they could report any other agricultural activities.

CENSUS MAIL OPERATIONS

General Information

The DPD office in Jeffersonville, IN, had the primary responsibility for handling the agriculture census mailings (as it did for the bulk of all the Census Bureau's mail data-collection operations). The DPD office received assembled mail packages from the private contractors, prepared adhesive address labels using computerized files provided by the Census Bureau's headquarters computer facility, applied the labels (or, in the case of the reminder cards, printed the addresses directly onto the cards using DPD equipment) to the packages, and conducted the mailings for the census mailout and the followup mailings. The data-collection mailing for the 1992 Census of Agriculture involved over 8 million separate cards or packages in the initial and five followup mailings.

The 1992 agriculture census report-form packages included a cover letter asking addressees to respond by February 1, 1993. The first followup mailing, carried out in the first week of January 1993, consisted of a reminder/thank you card that was sent to all addresses on the initial census list. The four regular followup mailings that followed were conducted at 4 to 5 week intervals, beginning in the second week of February, and continuing into the first week of June 1993. The second, third, and fifth followup mailings all involved complete report form packages, each including the report form, instruction sheet, cover letter, and return envelope. The fourth followup consisted of only a letter (form 92-A01(L5)) asking for a response.

The Census Bureau organized the census mail list by type of case (i.e., ''must'' or ''nonmust''), and by State, in nine geographic segments, to distribute the processing workload. Segment 1 comprised all ''must'' cases for all States. The remaining eight segments each contained ''nonmust'' cases for specified States, as follows:

Segment	States
1	Must cases for all States.
2	Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming.
3	Texas, Michigan, Minnesota, Montana, North Dakota, South Dakota, Wisconsin.

Segment	States
5	Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia.
6	Alabama, Georgia, Kentucky, South Carolina, Tennessee.
7	Arkansas, Louisiana, Mississippi, Missouri, Oklahoma.
8*	Florida, Kansas, Indiana, Iowa.
9	Alaska, Hawaii, Illinois, Nebraska, Ohio.

*FOSDIC test cases for Iowa were mailed as part of the segment 9 mailout.

These segments did not correspond to the agriculture regions established for the design of the census report forms, or to the official census geographic regions or divisions used for tabulating data. Rather, they were a processing and administrative convenience, with staggered response closeout and mailing dates.

Initial Mailout

General information. The 1992 Census of Agriculture data-collection effort began on December 8, 1992, when the Census Bureau began mailing questionnaires to addresses on the mail list. Between December 8 and 18, questionnaires and associated materials were mailed to 3,551,407 addresses throughout the 50 States. The DPD office in Jeffersonville, IN, conducted the mailing operations for this, and the followup mailouts. The census employed third-class bulk rate postage for most of the mailing packages, using first-class postage only for multiunits, abnormals, ''births'' (i.e., newly identified agricultural operations), Alaska and Hawaii addresses and, in followup operations, for undeliverable as addressed (UAA) cases and the reminder/thank you card sent in January mailing. First class postage also was used on the return envelope included in each report form package.

The census mailout. The initial mailing packages each contained the form 92-A01(L1) cover letter requesting response, the appropriate report form, the form 92-A01(I) information sheet with instructions for completing the report form (the form 92-A02(I) was used for addresses in Hawaii), any special instruction sheet (required for known feedlots, nurseries, certain animal specialties, and so on), and a return envelope.

The quantities of each general type of form sent in the initial mailing were as follows:

Table 5.1. **1992 Census of Agriculture Mailout: December 8-18, 1992**

Form type	Quantity
Total	3,551,407
Nonsample (forms 92-A0101 to -A0111)	2,131,699
Sample (total (excluding multiunits and abnormals))	1,000,442
General sample (forms 92-A0201 to -A0213)	865,226
Must cases (forms 92-A0301 to -A0311)	135,216
Multiunit (form 92-A0301 to -A0311, form 92-A0201 and -A0212)	5,727
Abnormal (forms 92-A0301 to -A0311, 92-A0201, and 92-A0213)	1,899
Screener (forms 92-A0401 to -A0411)	411,640

Followup Mailings

General information. Private contractors printed the report forms and other census mailout materials, assembled the mailing packages for the initial and followup mailings subject to quality control inspection by Census Bureau personnel on the premises, and delivered them to the DPD facility at Jeffersonville, IN, where the individual packages were labeled and mailed on a flow basis. (See chapter 3 for the details of the label printing and assembly operations.) The DPD staff used similar procedures for each mailout. Table 5.2 summarizes followup mailings for the 1992 census:

First followup—reminder/thank you cards. The DPD mailed form 92-A01(L2) reminder/thank you cards to all addresses (except abnormals) on the census mailing list. Originally, all the address labels for the reminder/thank you cards were to be printed using the new inkjet printer at Jeffersonville, but only 1 million labels could be prepared on this equipment before the scheduled mailing date. Accordingly, the DPD staff brought the older Printronix printers online to complete the label printing before the deadline. Address labels were applied to over 3.5 million

Table 5.2. **Summary of 1992 Census of Agriculture Mail Followup**

Followup	Form content	Dates of mailing	Total	Nonsample	General sample	Must	Screener
First	Reminder/thank you card	Jan.6-8, 1993	3,543,781				
Second	Report form	Feb. 11-24, 1993	1,521,702	858,117	398,505	66,957	198,123
Third	Report form	Mar. 18-29, 1993	1,102,924	610,123	295,772	48,782	148,247
Fourth	Letter	Apr. 23-May 7, 1993	856,191				
Fifth	Report form	May 27-June 3,1993	722,874	401,852	191,766	25,841	103,415

cards using the mechanical labeling equipment used for labeling the census mailing packages. The requested response date for the census was February 1; the cards were mailed on a flow basis as they were labeled, from January 6 through January 8, 1993.

Second followup. By early February 1993, response to the census was over 50 percent, and the Census Bureau was preparing for the first followup to nonrespondent addresses. Cut-off dates for response for each geographic segment were established, ranging from February 8 to the 21st. As each date was reached, updated address lists consisting of all addresses within a particular segment for which no response had been checked in at Jeffersonville, were generated and address labels printed. Mail followup packages for each segment had been prepared in advance by the printing contractors, each consisting of the appropriate report form (i.e., nonsample, certainty, and must, by segment), the cover letter form 92A01(L3), requesting prompt response, any special instruction sheets, and a return envelope. The address labels were mechanically applied through the open ''windows'' of the outgoing envelopes and the 1,521,702 packages were mailed on a flow basis, by geographic segment, between February 11 and the 24th. (See appendix D for details of the followup mailings.)

Third followup. The Census Bureau's study of previous mail-enumeration operations, particularly response to followup mailings, revealed that report form mail-followup achieved better and earlier response than letters, so the 1992 mail-followup operation emphasized mailing complete enumeration packages to nonrespondent operations. The third mail followup used a complete census report-form package, with the original cover letter replaced by the form letter 92-A01(L4) requesting prompt response, reminding the addressee that response was required by law, that information provided would be kept confidential, and giving the toll-free telephone assistance number. Closeout dates for response varied by segment from March 15 through March 24. By the third week of March, overall response had reached 68 percent (approximately 2 percent *below* the 1987 rate at the same date). The address labels were printed and the preassembled report-form packages mailed on a flow basis from March 18 through March 29. The third followup mailings totaled 1,102,924 packages.

Fourth followup. Closeout dates for the fourth followup ranged from April 21 through May 4, with mailout on a flow basis from April 23 through May 7. The fourth mail-followup was the only ''letter'' followup, and used the form 92-A01(L5) letter to ask addressees to respond to the census. The L5 letter repeated the information given in the L4 used in the third followup, with the applicable sections of Title 13, U. S. Code printed on the reverse side of the letter. A total of 856,191 letters were mailed to nonrespondent addresses. The final closeout dates for response to the fourth followup ranged from May 24 to May 28, with two segments closing out each day. By May 29, the response rate to the 1992 census had reached 78.1 percent. This was about 2 percent lower than at the comparable point in the 1987 census.

Fifth followup. The fifth mail-followup was a report form mail operation, with each mailing package consisting of the appropriate report form and information sheet, a cover letter, form 92-A01(L6), requesting response to the census and noted that this was a final notice. This letter assured confidentiality of the information supplied and included (on the back of the letter) excerpts from Title 13, U.S. Code, relating to the authority for collecting the data, the mandatory response provisions of the law, and the guarantee of confidentiality.

The DPD staff in Jeffersonville prepared adhesive address labels for the report form packages using the census check-in file for the segments as each was closed out. The labels were applied by machine to the mailing packages, and mailout, by segment, began on May 27 and finished on June 3. A total of 722,874 census packages were mailed to addresses still on the nonrespondent list.

Undeliverable As Addressed (UAA)

Census packages for which no physical place matching the address could be found were returned by the Postal Service as UAA. The DPD staff at Jeffersonville identified UAA cases during the receipt and check-in phase of the processing (see chapter 6 for details) and prepared special packages for remailing. These packages contained the appropriate report form, instruction sheet and return envelope, together with a form letter specifically written for UAA cases. The DPD remailed—

- First-time UAA's believed to represent larger agricultural operations.
- UAA cases with address changes.
- ''Deceased'' UAA's (the report forms were mailed to the ''Estate of ...'').

The UAA mail followup used only two closeout dates, February 4 and March 1, 1993. The Jeffersonville office received 278,424 UAA cases from the Postal Service, of which 33,393 were remailed (UAA cases were remailed first class).

TELEPHONE OPERATIONS

General Information

Telephone operations for the 1992 Census of Agriculture encompassed an ''incoming call'' activity to assist respondents and answer general inquiries about the census, and a data-collection and followup operation. The DPD office telephone operations staff in Jeffersonville, IN, handled incoming calls, as well as calls to secondary sources for

selected nonrespondent cases. The data-collection and followup operation introduced computer-assisted telephone interviewing (CATI) as the principal telephone followup activity to the agriculture census.

Computer Assisted Telephone Interviewing (CATI)

Introduction. CATI collected data through respondent telephone interviews, and the interviewers keyed the data supplied directly to the data file. The data then were processed electronically, eliminating paper report and processing forms. Prior to the 1992 agriculture census, The Census Bureau had used CATI extensively in its demographic surveys program, particularly the Current Population Survey (CPS). For the 1992 Census of Agriculture, delinquent large farms once again were referred for telephone-followup, but this time CATI was used for *all* the referrals, as well as for followup for low response counties (i.e., those with response rates below 75 percent at specified dates), and for the 1992 Nonresponse Survey, and for cases related to the June Agricultural Survey (JAS).

CATI staff training. Field Division personnel trained CATI enumeration staff for the agriculture census CATI followup in January and February 1993. The training included an introduction to the agriculture census, using agriculture census reference materials, farm operations, concepts and procedures, ''walk-through'' training interviews, and a final review. Each operator was given a binder containing relevant reference materials (e.g., a glossary of agriculture census terms, the 1992 report form guide, a table of units of measures with a conversion chart, crop yield and price guidelines, and so on), together with written procedures to consult once operations began. The CATI staff began interviewing large-farm delinquent cases on February 22, 1993, with referrals for the nonresponse survey added to the workload beginning in April, and those for low-response counties in May.

Field organization and assignments. The CATI operation used two dedicated offices, one in Hagerstown, MD, and the second in Tucson, AZ. Cases selected for telephone followup to the nonrespondent survey, and the low-response county followup were assigned to the CATI offices on a flow basis, with Hagerstown handling cases from States in the eastern and central time zones, while the Tucson office was responsible for those in mountain and pacific time zones. Each office operated three shifts—morning, afternoon, and evening—each approximately 5 hours long. Each CATI interviewer used a work station consisting of a monitor and a keyboard, both networked to the individual office's computer with the active CATI files, and telephone systems with headphones. When operators began work on individual records, the CATI program displayed file information and the interview questions on the monitor, and the interviewer keyed responses directly to the respondent's record in the CATI file.

The Hagerstown facility employed 45 operators and workstations on the first shift, 50 on the second, and 20 on the third shift for agriculture-followup operations during the first 5 days of each month, reducing this to 30 operators for the first and second shifts, and eliminating the third shift during Current Population Survey (CPS) operations (the first four full work days of the week of the 19th of each calendar month), then using 55 operators and stations for each shift during the remainder of each month. The Tucson office used 85 operators and stations for each shift except during CPS week, when the first and second shifts were reduced to 20 operators each, and the third shift to 10.

The cases referred to the CATI followup operation included—

- Large nonrespondent farms (i.e., farms with an estimated annual value of sales of agricultural products of $100,000 or more or with 1,000 acres or more (depending of the specific State)).
- Nonrespondent cases that matched to the JAS farm list.
- A sample of the general nonrespondent list (used for the 1992 Nonrespondent Survey).
- After May 1993, a sample of nonrespondent addresses in those counties with response rates below 75 percent.

Initial planning for the telephone-followup projected a total workload of up to about 167,000 delinquent large-farm cases. The actual number of these cases submitted to the CATI-followup operation between February and September 1993 was approximately 152,000. This total included—

- Low-response county referrals. Approximately 9,700 cases, in 179 low-response counties scattered across 31 States were referred for CATI followup in eight ''waves,'' beginning in May and ending in August 1993.
- Any nonrespondent case with expected sales of $250,000 or more, or with expected size of 3,000 acres or more.
- 1992 Nonrespondent Survey. A total of 14,271 cases were referred for CATI enumeration.
- Any case with an address that matched to or originated in the JAS farm list (important for estimating farms not on the mail list for the coverage evaluation).

Telephone Followup Operations

Telephone numbers search. The Census Bureau's Economic Programming Division (EPD—now the Economic Statistical Methods and Programming Division (ESMPD)) prepared 49 computerized State files of delinquent large-farm cases selected for telephone followup for installation on the systems serving the Hagerstown and Tucson facilities (the DPD staff in Jeffersonville handled cases in Hawaii because of the unique nature of much of agricultural production there). The Census Bureau's records originally created for many of these large operations included telephone numbers whenever possible (i.e., whenever the

administrative records used to compile the lists included a telephone number for an address), but many did not, so Field Division staff conducted a computerized review of each State file to identify specific records that did not have a usable telephone number. This process created separate State files of ''bad'' telephone number cases, which were installed on the computer system at the responsible CATI facility to enable the Directory Assistance subunit (DA subunit—a number of CATI operators on each shift were assigned to this subunit) to call directory assistance for telephone numbers. As numbers were identified, the information was added to the State files and subsequently submitted for CATI enumeration.[2]

The EPD assembled each State file on a Thursday, and DA subunit searches began on the following Monday, lasting for approximately one work week. Telephone numbers research for the 1992 Nonresponse Survey and low-response county referrals (beginning in April and May respectively) was handled in the same way, although cases for several States were organized into a composite, rather than an individual file, for installation on the CATI system.

Telephone interviewing procedures. When each shift began work at the CATI facilities, interviewers ''logged on'' the CATI system—that is, turned on their individual work stations and keyed ''P'' (for ''proceed), which allowed access to the CATI file. The CATI system automatically assigned records for followup to available stations that were not already actively working on a file.

The same basic procedures were followed for all cases referred for CATI-telephone followup. When a case was assigned to an interviewer, the work-station monitor displayed identification information for the specific case, including a ''label line'' that might include the name and address of the operator, the name of the operation, and/or the census farm number (CFN) for the operation. The page also showed available background information, including a specified contact person when available, any previous contacts made with the particular operation, and information on the operation from previous censuses. After reviewing the historical and background information, the interviewer entered the identification information and name of the contact person from the label line, and the telephone number, then attempted to call the number.

Once the interviewer contacted an operation; he or she could interview any knowledgeable family member who was at least 14 years old, an employee of the farm operator, or an accountant if the operator permitted. Ideally, the interviewer spoke directly to the operator. The interviewer asked the person if he or she was willing to respond to the census by telephone. If the answer was yes, the interviewer confirmed the identity of the respondent and the agricultural operation involved and checked whether the respondent had received any census report forms under a different name or CFN. (If the respondent had received forms under another name or CFN, the interviewer entered these into the record at this time for matching to the nonrespondent file.) The interviewer entered the respondent's name and began the interview proper. The CATI system displayed each question and the interviewer entered the appropriate codes or responses (e.g., crops and livestock/animal specialties were assigned numeric codes (1 = field corn for grain, 13 = soybeans, and so on; quantities reported, such as ''770 acres'' were entered as numerics in response to specified questions, i.e., ''770'')).

After completing the interview, the interviewer keyed ''P'' once again, displaying a section in the record (the ''i-notes'') for any comments or notes about anything that might be considered atypical for a farm operation. For example, for a small operation that grows only roses, the interviewer might add a note—''grows roses only.'' The interviewer then entered the work ''COMPLETE'', his or her own interviewer identification code, and the date of the interview.

Output files. The results of the CATI operations at the Hagerstown and Tucson facilities were transmitted to the EPD at the Suitland, MD, headquarters by telephone datalink, in the form of four output files for each State:

1. **Answer file:** Interviewer coding including respondents' data and interviewer remarks for resolved cases.
2. **F7 file:** Interviewer remarks made during the interviewing process for resolved cases.
3. **History of access file:** ''Snapshot'' of installed cases showing each time accessed.
4. **Case master file:** System management information for each installed case.

The ''Answer'' and ''F7'' files for each State were transmitted nightly after the last shift for each facility closed down telephone operations. At the closeout for each State (i.e., when all telephone referral cases for a specific State had been resolved) a cumulative version of all four files was sent to the EPD. The EPD assured the receipt of these files and subsequent processing for merging them into the 1992 Census of Agriculture data file.

Results. Altogether, some 175,900 cases were referred to the CATI units for telephone followup, the bulk of which (over 152,000) represented delinquent large farms. (An additional 7,897 cases composing the 1993 Model Drop Survey also were referred to the CATI staff for telephone interviewing in September 1993.) The CATI units contacted and enumerated 57,708 large farm cases by telephone. (Approximately 29,300 cases originally referred for telephone followup responded by mail during the followup

[2]During the early stages of the CATI large-farm followup operation, evencases that lacked usuable telephone numbers after DA subunit search were merged with the general State file so that they would be identified in the output files. The Census Bureau changed this procedure following the first''wave'' of large-farm referrals by assigning appropriate coding identifying them as lacking telephone numbers; this dropped the cases from the ''calling queue'' while still identifying them in the output files.

operation.) Some 15,000 large-farm cases referred to the CATI operation were found to be out of scope while about 5,000 were duplicates and were dropped from the file.

The low-response county operation ultimately involved a total of over 9,700 individual cases, but the objective of CATI enumeration in this operation was limited to raising overall county response to 75 percent; when this was achieved, further telephone-followup activities ended. Final results for the low-response county file showed 4,358 cases resolved, either by enumeration or identification as out of scope (excluding mail returns received while the CATI operation was underway).

The 1992 Nonresponse Survey CATI followup achieved a 94.5 percent response rate (13,486 cases in all).

Jeffersonville Telephone Operations

General information. The Data Preparation Division (DPD) office at Jeffersonville, IN, included a telephone interviewing staff and facilities that had handled most of the Census Bureau's telephone enumeration and survey activities prior to the adoption of the CATI systems and the establishment of the dedicated CATI offices in Hagerstown, MD, and Tucson, AZ. With the advent of the CATI offices, the bulk of these telephone canvassing and survey operations were transferred to those offices, and the Jeffersonville staff was assigned to handle calls for assistance (see chapter 6 for details), consult secondary sources for problem cases and refusals, and followup correspondence and other special cases that required access to the census data file and processing operation.

Secondary source operations. The purpose of the secondary-source operation was to obtain information to determine the farm status of all cases that could not be completed by respondent contact, including refusals and ''no telephone number listed'' nonrespondents, as well as other noncontact cases. All followup cases the CATI telephone units could not complete as either inscope or out of scope were transferred to the EPD for assignment of secondary-source flags based on the presence in the individual records of various types of administrative data. For unsatisfied CATI records having associated NASS data, and with an indicator that the NASS data had been updated in 1992, the in-scope census record was generated by computer without any telephone contact with a secondary source. Telephone calls to secondary sources were made for all other unsatisfied CATI records to verify that they were agricultural operations as of December 31, 1992. After confirming farming operations for these cases the Census Bureau created an in-scope report from available administrative data. The administrative records used included NASS records that lacked a 1992 update indicator, and records without NASS data but with an historic record (e.g., 1987 census) that had not been created from a 1982 census record.

The telephone control unit sorted the incoming files by State and county groups, using the individual records' CFN's and assigned records by county groups to telephone operators, who contacted the appropriate U.S. Department of Agriculture (USDA) Agricultural Stabilization and Conservation Service (ASCS) county office to try to obtain the necessary information.[3]

Six telephone clerks worked each shift, calling ASCS offices in this operation. When the ASCS offices were able to provide information, cases were classified as inscope or out of scope. The latter were deleted from the file. For in-scope cases with NASS data with no 1992 update data and nonreplicated historic data cases, the clerks entered the appropriate flag code in the ''Census Use Only'' box on the front of a labeled blank form 92-A0214 (general) questionnaire, and routed the case to the data keying unit. For cases with no replicated historical data the clerks tried to obtain additional data from the ASCS office contacted, summarizing the data on Form 92-A417, General Source Worksheets, then transcribing the totals to a form 92-A0214 report form.

A total of 25,966 cases were processed by the Jeffersonville telephone staff for secondary source contact; 13,083 of these cases proved to be inscope, and the imputed data were incorporated into the census data file. The remaining 12,883 cases were dropped from the file as out of scope.

MODEL DROP SURVEY

In September and October 1993, the Census Bureau carried out a Model Drop Evaluation Survey to evaluate the efficiency of the agency's Classification and Regression Tree (CART) methodology used to identify and delete addresses least likely to represent farms from the 1992 agriculture census mail list. (See chapter 10 for more information on the actual evaluation.) The national sample frame for the Model Drop Survey comprised the 229,180 addresses deleted from the census mail list by the CART procedures and by analysts' adjustments, organized in five strata (1 through 5) based on calculated probability of meeting the farm definition. (See chapter 3 for more information on the statistical modeling used in preparing the census mail list.)

[3]The Census Bureau and the ASCS tested a different method of collecting secondary-source data—mailing lists of names to ASCS offices. This was tried for secondary-source cases in Oregon, but proved unsuccessful for a variety of reasons, including slow delivery and nondelivery of the mailed lists, and slow response by some offices. In general, the agency found that telephoning the individual offices should be the first approach, with facsimile transmission or mailing of lists resorted to only if the ASCS office(s) could not or did not respond to telephone inquiries.

The Suitland headquarters staff drew systematic samples from each of the defined strata, as follows:

Stratum	Total addresses	Sample selected
Total	**229,180**	**7,897**
1	48,082	1,657
2	60,261	2,077
3	57,668	1,987
4	33,558	1,156
5	29,611	1,020

The EPD prepared a computerized file of the total stratified sample of 7,897 records for referral to the CATI facilities for telephone numbers research and interviewing. Some 5,421 sample cases were contacted and resolved by CATI interview during September 1993; 2,476 cases for which telephone numbers could not be found or that the CATI staff could not contact, were mailed survey packages containing a 92-A414, Screener Form, a cover letter explaining the survey and asking for prompt response, and a return envelope, and were processed in DPD's coverage evaluation unit. Mail data collection continued to the end of the 1993.

A total of 5,892 responses (82.2 percent (excluding UAA cases)) were obtained by the survey, of which 5,526 were classified as farm or nonfarm addresses. An additional 729 (mailed) cases were UAA, and 1,276 addresses were nonrespondent. Overall, the Model Drop Survey achieved a 33.1 percent mail response rate; the CATI followup attained 96.8 percent response from cases submitted for telephone followup.

NONRESPONSE SURVEY

General Information

The Census Bureau surveyed a sample of agriculture census nonrespondents to estimate the proportion of nonrespondents to the census in each State that met the census farm definition. These estimates, and the final number of nonrespondents for each State, were used to estimate the number of census nonrespondents that actually were farm operations in each county. The Census Bureau used a whole-farm imputation procedure to ''inflate'' the data from respondent farms to represent ''all farms,'' including nonrespondents, in the statistical publications. (See volume 1, *Geographic Areas Series*, appendix C, for details of the statistical estimation methodology and the reliability and coverage estimates for each State.) The survey sample excluded all must, abnormal, and Alaska addresses. The specific maximum sales and acreage limits varied from State to State—the total value of agricultural products sold (TVP) from $100,000 to $200,000, and the acreage from 1,000 to 3,000 acres.

The Census Bureau selected the 1992 Nonresponse Survey from the agriculture census check-in file. The agency stratified the eligible address file based on expected value of sales, information from previous censuses, and report form type. The strata codes assigned are shown below.

Stratum	Description
0	All cases ineligible for nonresponse weighting and all 100-percent followup records for each State.
1	All eligible screener cases for each State.
2	All eligible nonscreener cases with an estimated 1992 TVP of less than $2,500.
3	All eligible nonscreener cases with an estimated 1992 TVP between $2,500 and $9,999.*
4	All eligible nonscreener cases with a 1987 census in-scope source combination code and an estimated 1992 TVP of $10,000 or more.*
5	All eligible nonscreener cases with no 1987 inscope source combination code, but with an estimated 1992 TVP of $10,000 or more.

*Since the telephone cutoff levels varied by State, the mail-size codes for cases included in strata 4 and 5 also varied by State.

The Census Bureau staff used a single-stage, systematic sample of eligible records for each State to select a total of 18,569 addresses for the survey. Individual State's nonrespondent lists were used as the sample frame, with selection intervals calculated to produce samples large enough to produce reliable estimates for each State. Samples were selected at five points during processing, depending on the census data-collection closeout dates for the States involved. The selection dates by States were as follows:

Group*	Selection Date	States
01	Apr. 12, 1993	Delaware, Indiana
12	Apr. 26, 1993	Iowa, Missouri, Oregon, Washington, Wisconsin
03	May 10, 1993	Connecticut, Maine, Maryland, Massachusetts, Michigan, New Hampshire, Ohio, Rhode Island, Vermont, Virginia, West Virginia
13	May 10, 1993	Illinois, Kansas, Wyoming
04	June 28, 1993	Kentucky, New Jersey, New York, Pennsylvania, Tennessee
14	June 28, 1993	California, Colorado, Idaho, Minnesota, Montana, Nebraska, Nevada, Utah
05	July 12, 1993	Florida, Georgia, Mississippi, North Carolina, South Carolina, Texas
15	July 12, 1993	Alabama, Arkansas, Arizona, Louisiana, New Mexico, North Dakota, Oklahoma, South Dakota
26	July 12, 1993	Hawaii

*The first digit of the group number identified the survey center for those States, and the second digit the selection ''wave''. The survey centers were: ''0'' - Hagerstown, MD; ''1'' Tucson, AZ; and ''2'' - Jeffersonville, IN.

Data Collection

The 1992 Nonresponse Survey was conducted using the CATI system. As each wave of sample selection was

completed, the sample names and addresses were referred to the telephone offices in Hagerstown, MD, and Tucson, AZ, for identification of telephone numbers. The telephone search staffs found current telephone numbers for 14,271 cases in the sample, and these were referred for CATI enumeration. As the telephone numbers research proceeded, the staffs inserted computer flags for cases for which no telephone numbers could be located, and twice generated output files (one during telephone operations (containing 4,563 records) and a second (with 1,015 records) after calling was completed) of names and mailing addresses for which directory assistance could find no telephone numbers or the Census Bureau was otherwise unable to contact. These files were sent to the EPD at headquarters, which used it to generate mailing address labels. The Census Bureau used certified mail to send the 92-A0414 report forms (a nonregion-specific sample form used for both the Nonresponse Survey and for mailing to certain correspondence cases) to addresses for which no telephone numbers could be found.

Telephone operations (see above) began in April and continued through August 1993. The telephone followup achieved a 95.6 percent response rate for cases with valid telephone numbers, contacting 11,032 survey sample cases. Mail followup was considerably less successful, with a final response rate achieved of just 47.1 percent.

CITRUS CARETAKERS

Background Information

A citrus caretaker is an organization or individual caring for, supervising, or managing citrus groves for the grove owners. Individual caretakers' activities varied considerably in scope, from doing only selected grove work to handling the entire care and management of the groves (although many did not do harvesting). The Census Bureau introduced mail enumeration in the 50 States in the 1969 agriculture census, but continued using field enumeration for citrus caretakers in several States—initially Florida, but later including Texas and Arizona. The field interview procedure eliminated the difficulty of identifying and enumerating absentee owners who, in any event, frequently employed caretakers to manage their groves and did not have the information needed to complete the report form.

The first separate field operation to collect data from citrus caretakers was undertaken in the 1964 agriculture census in Florida, where caretakers received special attention in an effort to improve coverage of the citrus industry. The field interview staff visited caretakers and completed a report form for each that listed the names, addresses, and acres owned by each grove owner employing the caretaker. The Census Bureau staff then matched the owners' names and addresses to the census respondent file to eliminate duplicate reports. Direct canvassing of caretakers continued in the censuses that follows, and expanded to cover caretakers in Texas in the 1974 and later enumerations, and in Arizona from 1978.

The 1992 citrus caretakers' enumeration covered all three States included in previous censuses—Florida and Texas by field interview and telephone interview in Arizona—where their employment by grove owners continued to be widespread, and they remained the most reliable source of information.

The 1992 Enumeration. The Census Bureau designed and printed a special questionnaire (i.e., form 92-A0215) for enumerating the caretaker operations. The A0215 was an 8-1/2″ x 13″ 8-page booklet, printed in black ink on white stock, with salmon shading. Content was considerably abbreviated (compared to the regular report forms) and contained only those items applicable to citrus caretaker operations. There was one section each on citrus production and nursery and greenhouse crops, and a single section on ''other crops, livestock, or poultry,'' while the remainder of the form incorporated most of the noncrop inquiries from the sample report form (i.e., sections on irrigation, farm labor, production expenses, use of chemicals and fertilizers, machinery and equipment, current value of land and buildings, income from farm-related sources, products sold directly for human consumption, injuries or deaths, organization, corporate structure, and characteristics of the operator (of the caretaker operation)).

The AGR compiled a list of citrus caretakers from various administrative records and mailed the census report forms, together with a cover letter, and an instruction sheet, to identified citrus caretaker operations in Texas in May 1992, in Florida in early September 1992, and in Arizona in October. The caretakers were asked to look over the report form and complete it if possible, and then to hold it until an enumerator visited or telephoned. Caretakers in Texas and Florida were visited by Census Bureau interviewers, while those in Arizona were telephoned and the data transcribed to a report form(s) by the telephone interviewer. The staggered schedule of mailings and enumerations were intended to contact the caretakers when their workloads were lightest and information from the 1991-92 harvest season would be available.

A 92-A0215 report form was completed for every caretaker that had any citrus operations in 1991-92, and each caretaker enumerated was assigned a unique ''caretaker number.'' In cases where a caretaker was responsible for citrus operations in more than one county, the county containing the most citrus acreage was designated the ''principal'' county of operations. When caretakers had significant citrus operations in more than one county, the Census Bureau asked that a report form be completed for each county with 500 acres or more of citrus.

The interviewers not only obtained at least one completed report form for each caretaker, but also obtained lists of the names and addresses of grove owners, acres in grove and county, and grove location, so that the Census Bureau could ensure that duplicate reports from the grove owners were not incorporated into the census data file. The caretakers were asked to inform their grove owners that they had provided citrus production data to the Census

Bureau, and supplied the owners with their caretaker's numbers. (The Census Bureau matched the names and addresses of grove owners listed in the caretaker enumeration against the census mail lists during data processing.) Caretakers also could request the Census Bureau to mail them the special instruction sheet Form 92-A31(L), for use by grove owners who also received a 1992 agriculture census report form. The A31(L) instructed owners to write in their caretaker's ''caretaker number'' on the report form, and to supply any additional information requested on noncitrus operations.

The number of citrus caretakers enumerated, number of grove owners they served, and the approximate acreage of citrus production in their operations, by State for 1992 and 1987, were as follows:

State	Caretakers		Grove owners		Citrus acreage	
	1992	1987	1992	1987	1992	1987
Total . .	**61**	**92**	**2,465**	**3,975**	**171,300**	**196,500**
Arizona .	5	7	65	175	7,300	12,000
Florida . .	44	65	2,300	3,000	150,00 0	170,000
Texas . . .	12	20	100	800	14,000	14,500

Citrus operations *not* associated with caretakers, both in the States specifically covered by the caretaker enumeration, and in other States (e.g., California, Hawaii) were enumerated in the regular census data-collection effort that began in December 1992.

RESULTS

The 1992 Census of Agriculture achieved an overall response rate of 84.5 percent—about 1.3 percent below the final response rate for the 1987 census—obtaining responses from approximately 3,000,940 addresses, from a total census mail file of 3,551,407. The UAA cases accounted for another 33,983 cases. The CATI and secondary source telephone data-collection operations collected data for 76,079 additional farms.

The Census Bureau published statistics for 1,925,300 agricultural operations that met the census definition of a farm. Major summary results of the census data-collection operation, with comparisons to selected previous censuses, are given in table 5.3.

Table 5.3. **Summary Census Counts**

	1992	1982	1974
Total number of farms. . . .	1,925,300	2,240,976	2,314,013
Land in farms (acres) . . .	945,531,506	986,796,579	1,017,030,357
Estimated value of land and buildings per farm .	$357,056	$345,869	$147,838
Total value of sales of agricultural products . . .	$162,608,334	$131,900,223	$81,526,126

Contents

Chapter 6.

Data Processing

INTRODUCTION

The data processing operations for the 1992 Census of Agriculture can be very approximately divided into a preparatory phase and computer processing. The former actually made extensive use of automated equipment and computers, but was primarily concerned with the receipt, sorting, and handling of census report forms, and the entry of the data from those forms into the census data file. The computer processing consisted of editing the data file, imputation of data for nonresponse, and tabulation.

The bulk of the preparation processing was done at the Census Bureau's Data Preparation Division (DPD) office in Jeffersonville, IN, while the computer processing of the data was done interactively, using minicomputers at Suitland and the Census Bureau's Charlotte, NC, facility.[1] The various activities at Jeffersonville made extensive use of interactive systems linked electronically to the Charlotte office. The minicomputers had substantial data storage and processing capacity, and their use enabled the DPD staff to dispense with paper printouts, using data displayed directly on the individual work stations' monitor screens for review and edit purposes.

The Census Bureau's computer facility at Charlotte, NC, used minicomputer systems to format, edit, and tabulate the data received from Jeffersonville. Individual census records that failed the computer edit were electronically referred to the Jeffersonville unit and displayed on terminal screens there for review and correction. The DPD staff could enter any corrections required directly to the file using the interactive systems.

The Census Bureau conducted 1992 economic and agricultural censuses concurrently and integrated many of the processing activities for the censuses (e.g., check-in, correspondence), but the data from the economic and agriculture census report forms were keyed separately and each of the census operations employed specialized computerized edit and tabulation programs.

PREPARATORY PROCESSING

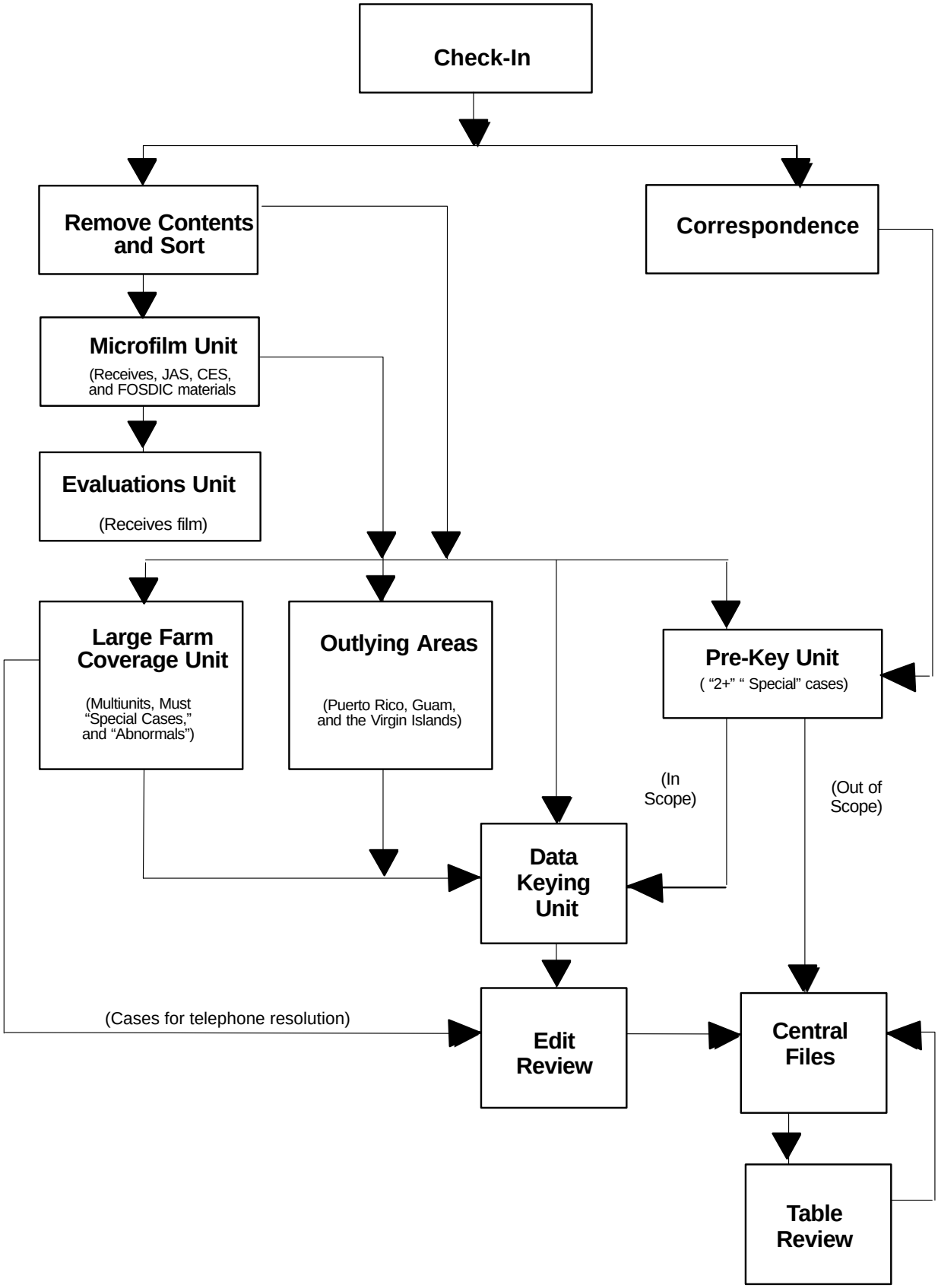
General Information

The DPD mailed approximately 3.55 million agriculture census report forms in December 1992 and conducted an extensive mail and telephone followup over the succeeding 7 months. Responses to the census began arriving at the Jeffersonville facility almost immediately after the mailout. By the end of January 1993, response had reached over 34.3 percent (about 1.2 million responses). As the report forms arrived at the Jeffersonville office, they were processed to update the census respondent lists and to prepare for data tabulation. This involved—

- Receiving and checking in the report forms.
- Sorting the report forms and removing the contents from the envelopes.
- Evaluating and responding to census-related correspondence.
- Reviewing nonagricultural, ''2+,'' multiunit, and ''Special'' cases.
- Microfilming evaluation forms and film optical sensing device for input to computer (FOSDIC) test report forms.
- Keying the data from the report forms to the data file.
- Edit review of keyed work units containing at least one report form requiring correction.
- Maintaining central files containing all the report forms received by DPD during the data-collection operation. Out-of-scope forms were referred to the central files immediately upon being identified; in-scope report forms generally arrived at central files after edit review.
- The DPD staff carried out several other functions, including evaluation studies of census data (e.g., comparing census data to that obtained from the National Agricultural Statistics Service's (NASS's) June Agricultural Survey (JAS)). The ''flow'' of each kind of report form through the DPD processing operation is illustrated in figure 6-1.

[1]The Census Bureau introduced interactive computer systems to the agriculture census processing in the 1987 enumeration.

Figure 6.1. **1992 Census of Agriculture Report Form Flow**



Receipt and Check-In

Receipt and mechanical sort. The U.S. Postal Service presorted incoming agriculture census mail packages by using different mail box numbers for must, sample, nonsample, screener, multiunit/abnormals, and Alaska/Hawaii receipts.[2] The packages were placed in trays by type of receipt and then sent to check-in clerks, who fanned through the receipts in each tray, checked to make certain that each tray contained one type of receipt, and then further sorted to identify agriculture receipts as follows:

- Materials addressed to a specific analyst.
- Agriculture nonresponse survey receipts (form 92-A46).
- Classification error survey receipts (form 92-A90).
- Undeliverable as addressed (UAA).
- Single-unit agriculture receipts (except Alaska and Hawaii).
- Single-unit agriculture receipts for Alaska and Hawaii.
- Multiunits and abnormals.
- No barcode visible.
- PS form 3811 (certified mailout return receipts from the U.S. Postal Service; these were referred directly to the coverage evaluation unit).
- Other receipts.

The unit also received materials that were not checked in because the packages included correspondence. The clerks scanned the correspondence to determine whether it was a ''congressional''—i.e., the return envelope or the letterhead was from a Senator or Member of the House of Representatives, or any representative of the legislative or executive branch of the Federal Government, or if the letter was from a respondent and indicated that a copy had been sent to a Senator or Member of the House of Representatives (the threat to write to any of these was not considered a congressional). Congressional cases were referred to the unit supervisor, while for all other cases the clerks transcribed the census file number (CFN) of the case on the upper right hand corner of the letter, stapled the correspondence to the back of the report form, and placed it in a mail tray to batch for check-in.

Correspondence was grouped into batches of approximately 100 cases at least once each day for referral to the correspondence unit. Single-unit agriculture census receipts (in envelope) and UAA batch sizes were based on the capacity of the rolling bins used to transport materials—a batch consisted of a full bin, or 10,000 documents, whichever was less (smaller batches could be used to clear the unit). The unit control clerk used the unit's interactive work station to enter the information needed to register each batch on the Data Entry Control System, keying the necessary code, user name, and password, then indicating the specific operation involved (in this case, check-in batch registration), survey code (agriculture (except Puerto Rico)), and the correct document type (selecting from report forms, 2+ report forms, UAA, or respondent originated correspondence (ROC)). The computer generated a Check-in Batch Cover Sheet with a sort number, batch number and check-in action code for each batch of work requiring laser/wand/keyboard check-in. The clerk placed the cover sheet on top of the appropriate batch and sent the materials for check-in by laser sorter or wand/keyboard check-in.

The rolling bins of single-unit receipts were sent to the check-in/laser sorter unit, where the 56-pocket laser reader/sorter was used to sort the packages. The sorter operator created a header record for each batch, keying the sort number, batch number, and batch special code from the Batch Cover Sheet. The operator jogged the receipts (to make certain they did not stick together and that the address barcode was visible through the envelope window) and placed them upside down facing the laser, and then started the sort. The laser ''read'' the barcodes showing through the address windows on the return envelopes, and sorted the packages as follows:

- By State (except Alaska and Hawaii).
- Multiunits and abnormals.
- Other returns.
- Classification error survey receipts.
- June agriculture survey receipts.
- Undeliverable as addressed (UAA).
- Machine failures (machine failures were not resubmitted for each batch, but were held and rebatched as ''machine failures'' and resubmitted later).
- Machine rejects (rejects were resubmitted three times; if still unreadable they were returned to the opening staff for opening).

Materials for multiunits, abnormals, and Alaska and Hawaii were sorted separately. After a batch had been sorted, the operator keyed the relevant identification data to the tracking system and transmitted the check-in information to the mail-update file.

Materials requiring laser wand/key check-in included report forms and UAA's with unreadable barcodes, 2+ cases, multiunit report forms and UAA's, respondent originated correspondence, agriculture census out-of-scope cases, and secondary source referrals from the telephone unit. Wand/key operators also used the interactive systems to keep track of their work, keying batch numbers and other identification information as work batches arrived for check-in. The operators used a hand-held laser wand to check in

[2]Must (P.O. box 5105), sample (nonmust: 5115), nonsample (5125), agriculture screener (5135), multiunit/abnormals (5145), and Alaska and Hawaii (5165).

those materials with a visible barcode. If the barcode could not be read by the wand, or no label was present, the operator used a keyboard station to key the CFN directly to the file.

After completing check-in, the materials were sent on to the remove contents and sort unit.

Remove contents and sort. The remove contents and sort unit received envelopes from the initial sort grouped by type of report form (nonsample; must; sample; screener (A400); and multiunit/abnormal, Alaska/Hawaii, and Puerto Rico). Clerks examined the contents of each envelope and sorted the contents into specific groups for further processing, placing the report forms in trays on rolling bins used to transport the report forms between units. The clerks sorted all the report forms first by State, then by type of form—updating the check-in records of report forms identified as ''2+'' cases, and 0/7 screeners to show that status—as follows:

Destination trays (by State and form type)	Forms
Must special cases	Must special cases
Multiunits/abnormals	Agriculture multiunit ''2+ Cases,'' Agriculture multiunit ''2+'' abnormals
''2+'' processing	Agriculture single-unit ''2+'' cases, Agriculture single unit ''2+'' coverage cases
Microfilming	Special cases—June Agriculture Survey (JAS), JAS—other, Special cases—Classification Error Survey (CES), CES—other
Special cases	Special cases (all other)
0/7 Screeners	Screeners 5-7
Good receipts data entry)	FOSDIC cases, Alaska and Hawaii cases, all other cases

Quality control. The lead clerk for the unit conducted quality control checks on the staff's work each day and reported the results to the unit supervisor. The checks were made by the lead clerk selecting one case from each destination tray twice each day (morning and afternoon), and reviewing the selected cases to determine if they had been sorted correctly. If an error was identified, the clerk then verified the four preceding and four succeeding cases in that tray. If there were no additional errors, the clerk returned the cases to the tray. If additional errors were identified, then the cases in that tray were subjected to 100-percent verification and correction. After verification was completed for a particular tray, that tray was released for further processing. The clerk entered the number of forms verified for each group, the number of forms in error, and descriptions of the errors for each group on the Daily Verification Record, and sent it to the unit supervisor.

Tracking System

About 3.5 million report forms were processed by the DPD during processing operations for the 1992 agriculture census. Each of these documents represented a response (or nonresponse) record, and the DPD had to maintain control of how these millions of documents and records were handled during the processing operation. The system developed to do this employed elements of the Census Automated Tracking System (CATS) originally used for the 1990 Census of Population and Housing, and adapted for the agriculture census.

The agriculture census CATS contained a file of all the census file numbers (CFN's) mailed out in the census. As report forms arrived at the Jeffersonville office, the CATS tracked the CFN's by integrating available information from the various automated data-capture systems used in the census processing—(1) the laser sorter, (2) wand/key check-in, (3) batching for data entry, (4) computer-assisted telephone interviewing (CATI) check-in, (5)data transmissions, and (6) computer editing. At each of these stages in processing, the individual report form/record CFN was entered into the tracking system, together with the process point identification.

The system produced five basic data capture resolutions:

1. **Undeliverable as addressed (UAA):** The census form was returned by the U.S. Postal Service as undeliverable.
2. **Out of scope (O/S):** The case has been identified at some point in processing not to represent an operation meeting the census farm definition.
3. **Keyed and transmitted:** Data have been keyed from the report form and transmitted to Charlotte and edited by the Economic Programming Division (EPD), and the case has not been identified as O/S.
4. **CATI resolution:** The data for the case have been captured by computer assisted telephone interviewing (CATI) and has not been identified as O/S.
5. **Not satisfied:** The case does not fit any of the four categories above, no data have been captured or scope determination made, and it is not UAA.

At the time of the mailout, every CFN was ''Not satisfied.'' As report forms were returned to Jeffersonville, they were checked in by laser sorter (including UAA's) and proceeded through the processing system, with additional check in and out of specific units as they were processed. The CATS generated daily reports showing the cumulative receipts, backlog of forms to be processed, cumulative processed, and number of forms processed each day for

seven categories or processing units: (1) not satisfied, (2) open and sort unit, (3) microfilm processing, (4) batch for data entry, (5) data entry, (6) correspondence unit, and (7) CATI followup. These daily reports were available for the United States and for individual States. Each CFN in the mail file had a CATS record that showed the current location of the CFN, its destination and the location from which it was being sent, and the previous location, as well as the form type (must, sample, nonsample, screener). When a Volume 1 (i.e., for a State, area, or the U.S. summary) report was produced, the CATS generated a report for that State or area with the tallies of CFN's—

- Transmitted for tabulation.
- Resolved by CATI.
- O/S.
- UAA.
- Not satisfied.

Correspondence

General information. The correspondence unit of the processing staff was responsible for reading and processing incoming correspondence (respondent-originated correspondences (ROC)—letters or notes), as well as for cases referred by other units of the processing staff. The unit handled correspondence cases for both the economic and agriculture censuses, and for the 1992 agriculture census, the unit also printed labels for remails to respondents who telephoned the Census Bureau and for UAA name and address change cases. The following information covers agriculture census correspondence operations only.

Interactive processing subunit (readers/keyers). The interactive processing subunit read correspondence referred to it from the check-in operation and the telephone assistance unit, and used interactive processing system to update the computerized census mail list. Telephone assistance cases arrived at the correspondence unit with form BC-435, Record of Telephone Call, documents attached. (Incoming correspondence was read on a first in/first out basis, giving priority to BC-435 materials.) Keyers checked incoming correspondence to determine whether it was agriculture or economic census related, or referred to another Census Bureau operation (such as the Current Industrial Reports survey). Agriculture and economic census correspondence was retained for processing, while cases involving other surveys were referred to the unit supervisor for disposition. Keyers identified agriculture-related correspondence by the 11-digit CFN; an ''A'' preceded the first digit of an agriculture CFN. When a case lacked a CFN, the keyer determined the status of the correspondence by checking for a business letterhead, or for any mention of nonagricultural economic activity in the letter itself. (If a keyer had any doubt about the status of a case, the case was referred to a supervisor.) Agriculture census correspondence without CFN's were referred for CFN search.

Keyers read the correspondence and used problem description tables to select a description that most closely matched the subject of the correspondence, and took whatever action was indicated by the table. For example, in the case of a respondent that did not receive a report form, but wanted to report agricultural operations, the keyer annotated the letter in the top right corner of the first page of the correspondence with the appropriate two-digit unit number (in this case ''12'') and three-digit correspondence category (CORCAT) number (''708''—identifying this case as a ''Name (address add)'' to the census file). For cases requesting time extensions, the unit and CORCAT numbers were followed by a six-digit time extension date. After all correspondence in a batch had been processed by a reader, the reader separated the completed batch into 10 categories:

1. Name/address (corrections).
2. Name (address adds).
3. Name/address search.
4. CFN research.
5. Check-in updates.
6. CORCAT keying.
7. Mailout.
8. Other.
9. Referrals (separated by type (i.e., large farm coverage, supervisor, correspondence analyst).
10. N/A changes HOLD.

Materials in categories 7-10 were referred to the appropriate units. Keyers processed materials in categories 1-6 using interactive programs to update the census mail file. The programs and the general actions were as follows:

Program	Action
Name and address updates	Select menu option ''name/address updates'' and enter necessary changes. If another CORCAT code has been entered on the correspondence, hold the case and source materials for up to 5 days. If corrections had not been made, the keyer referred the case to the unit supervisor; if corrections had been made, the case was held for 3 days and rechecked for additional CORCAT codes and recycled if necessary. After completing, the case was referred to central files.
Name and address adds	The keyers used the ''name and address adds'' routine to add new cases to the database and held them for 3 days to check against CFN data display (recycling if necessary).
Name and address research	The keyers performed name searches of the database as needed (e.g., additional names in correspondence, no CFN present).
CFN	If more than one CFN is given in the correspondence, the keyers checked the status code of the additional CFN(s), and wrote it after the CFN; then referred the case to an analyst.
Check-in updates	When a missing CFN was found during name research, the keyer selected the ''check-in update'' routine and entered the missing CFN(s) with ''3-0'' status and continued processing using the action tables for correspondence with a CFN.
CORCAT keying	Follow CORCAT keying instructions.

As many as 30 CFN's and their associated codes could be keyed at a time.

After completing all interactive keying or updates for a batch, the keyer sent the materials to the unit control clerks for disposition (except for name and address update cases being held for verification and CORCAT keying being held for label generation). The control clerks sorted the completed work each day for referral to the appropriate units—

- Referrals from correspondence readers were directed to the—
  - Large farm coverage unit.
  - An analyst.
  - The unit supervisor.
  - Central files.
  - To the special case unit.
- Verified completed work went—
  - For mailout.
  - To central files.
  - To batch and control for data entry.
  - To the special case unit.

The control clerks prepared a control sheet for each batch of completed work indicating the referring unit (''From 09 Reading''), the receiving unit, and the count sent. The batches were held until CORCAT labels had been printed for them (each morning the unit supervisor checked the printer for labels run up for the previous day's work). The clerks reviewed the labels and referred the completed work batches and labels to the appropriate processing unit.

Quality control. Correspondence mailout materials were subject to quality control procedures requiring 100-percent verification of each batch. Correspondence mailout packages were batched into work units containing one day's work of a particular type (e.g., complete remail, special request, Census Bureau-originated correspondence, etc.), and referred to quality control review with a correspondence inspection record with identification information, and spaces to record the number of packages in the batch, number of errors detected, number of packages found to be defective, and the date. Verification clerks checked each mailout package in each batch for mailout to ensure that (1) the address label was correct, (2) each required item was included in the package, (3) and that all required copies had been made and reports or copies stamped and items circled as needed. Any errors were recorded on the correspondence mailout inspection record; an error rate of 3 percent or more (i.e., 3 percent of the packages inspected were defective) resulted in a rejection of the batch involved. The clerks corrected any errors, added any materials omitted, and released the batch for further processing.

Suspense file. The suspense file held all respondent-originated correspondence (ROC) cases that required a reply by the agency, regardless of the unit of origin, as well as all Census Bureau-originated correspondence (BOC) cases. Cases remained in the suspense file for a maximum of 35 days. If no additional response had been received at the end of that period, the cases involved were referred directly to an analyst who determined what further action, if any, should be undertaken.

Telephone Assistance Unit

Telephone operations. The DPD office at Jeffersonville, IN, included a staff and facilities for conducting telephone enumerations and surveys. Prior to the introduction of the CATI system and the establishment of the dedicated CATI offices at Hagerstown, MD, and Tucson, AZ, this staff had been the principal telephone data-collection operation within the Census Bureau. However, the adoption of the CATI system resulted in the transfer of this function largely to the

two CATI offices, while the Jeffersonville telephone staff was given the task of providing assistance to census and survey respondents who called with questions or problems about the censuses or surveys to which they were being asked to respond, and also handled secondary source inquiries as part of the data-collection operation (see Chapter 5, Data Collection for details).

The Jeffersonville telephone unit was organized to handle incoming calls from agricultural census respondents (the staff also handled incoming calls from economic census respondents, for details see the *History of the 1992 Economic Census)*. Each census mail package included a toll-free telephone number at the DPD office in Jeffersonville, IN, for respondents to use if they needed assistance completing their report forms, or if they had any other questions. The telephone staff handled 74,862 telephone inquiries (many involving multiple contacts with a given respondent (approximately 114,000 individual telephone contacts were made)), the bulk of which were from respondents claiming they had already filed a completed report form, or who believed they were out of scope of the agriculture census.

The DPD staff had 30 individual work stations, each equipped with a telephone and headset, and an interactive computer station. In December 1992, the Census Bureau trained telephone clerks in telephone techniques, subject matter, basic telephone procedures, and using the interactive computer system. (New staff assigned later were trained as they joined the telephone operation.) The staff actually assigned to the operation varied from a maximum of 44 clerks in May, to only a single clerk by December 1993.

Quality control. The quality control regime for the telephone unit involved verification monitoring by the unit's lead clerks or supervisors of incoming and outgoing calls. The verifiers used interactive computer stations and telephone instruments similar to those employed by the telephone interviewers, together with a monitoring package that enabled the verifiers to listen to individual telephone calls and monitor the keystrokes of the telephone clerk handling the monitored call. To begin monitoring, the verifier logged onto computer, entered his or her own surname and a password that activated the Interactive Telephone Calls (ITC) Monitoring Menu. Selecting the appropriate commands, the verifier identified the specific telephone instrument to be monitored. The verifier's screen remained blank until the interviewer made contact during a call, and thereafter displayed each of the interviewer's keystrokes as they were made.

During the first week that an interviewer began handling calls, the lead clerk monitored one call per day per interviewer. If performance was satisfactory, individual interviewers then were monitored at the rate of three calls per week per interviewer. The lead clerk checked five interviewer actions—

1. **Question asking.** The interviewer's performance in asking questions correctly.
2. **Probing.** Whether the interviewer attempted to obtain more data or a clearer answer when necessary.
3. **Responsiveness.** Whether the interviewer answered respondents' questions and requests for any kind of information.
4. **Accuracy.** Whether the interviewer provided correct responses and information to respondents.
5. **Correct entries.** Monitored data entry by interviewers and other keystroke actions.

The lead clerk maintained a record of errors assigned to individual interviewers and reported these to the unit supervisor. The unit supervisor was responsible for making certain that interviewers were aware of any errors made and how to correct mistakes.

Special Case and "2+" Case Processing

Special cases. Special cases were nonmust report forms received from the open and remove contents operation, with attached correspondence, remarks entered on the front or back page, a blank front page with no positive data, or with acres reported in section 1, but with no crops or livestock shown on the form. The special cases staff reviewed the report forms and attached materials using three condition/action tables to determine what action, if any, should be taken with each case. The three tables addressed particular kinds of cases: Table I covered correspondence and remarks, a congressional test (i.e., was the case a congressional case), blank forms, and reports with land, but no crops or livestock; Table II addressed correspondence, remarks, and reported data indicating a change in status; and Table III indicated actions for correspondence requiring reply. Reviewers began work on each case with Table I and continued through Tables II and III until the case met a condition in a table that resulted in the assignment of an out-of-scope (O/S) or referral code.

If the case met none of the conditions in the tables, it was considered inscope, and was sent to the data keying unit. The reviewing clerks entered O/S codes (O/2 for deceased addressee, and O/7 for all other O/S cases) in the upper right hand corner of the front of the report form. Selected referral codes (S for successor, P for partnership, and CF for claims filed) were entered in the middle of the top margin of the report form, while all other codes were written to the right of the label area near the right margin. After reviewing each case, the clerk initialed the report form in the lower right corner of the front page of the report form, and after completing an entire work unit (up to 100 cases), the clerk wrote the data on a yellow post-it note and applied it to the top report of the work unit.

The control clerks for the special cases unit separated completed work units into groups by priority and disposition, and routed them to the appropriate units for further processing. The groups and disposition were as follows:

Groups by priority	Disposition
2+ cases	2+ processing unit
REM, R-AG, or R-LL*	Large farm coverage unit
Form letter assigned	Correspondence reading
Correspondence analyst	Correspondence agriculture analyst
Successor, partnership, or claims filed	Research clerk, special case unit
Out of scope	O/S wanding within unit/forward checked forms to central files
Conservation reserve program (CRP)	Batch and hold in unit
Inscope	Batch for data keying

*A case was coded ''REM'' when attached correspondence conflicted with data reported on the form; code R-AG indicated doubt about farm status, or that the place was a partnership, but the name of the senior partner was not provided; code R-LL indicated that some land was rented out, but that crops were reported.

"2+" cases. ''2+'' cases resulted when; (1) two or more report forms were mailed to the same individual (who might, or might not, operate more than one farm or ranch), (2) two or more report forms were mailed to different individuals involved in the same operation (e.g., a husband and wife, or two partners), or (3) two or more unrelated report forms were mailed to an accountant or a bank trust manager who returned multiple report forms together in a single envelope. All 2+ cases had to be reviewed to determine whether they involved a single or multiple farms, and to ensure that all related report forms were checked in and the records and farms were properly linked within the census data file.

Materials arrived at the 2+ unit on a flow basis, routed from the remove contents and sort unit after check-in, and from the special cases unit. The control clerks at the originating units placed the report forms involved, and any related correspondence, in folders marked ''AG SU 2+'' or ''AG SU 2+ COVERAGE'' and batched them into work units of approximately 100 each for referral to the 2+ unit. Clerks in the 2+ unit reviewed the report forms and all separate pieces of correspondence in each folder to determine whether congressional remarks were present, or if the respondent indicated correspondence with other Federal offices, or if there was any mention of the Freedom of Information Act, and referred any cases with any such material present to the unit supervisor for disposition. All other cases were reviewed to determine if the report forms represented a single farm, or multiple farms, and, if possible, the scope of each report form.

The clerks also had to determine whether all the CFN's present for a specific case had to be linked to prevent duplication of data. The CFN's had to be linked if—

- The materials in a folder included several CFN's, all of which related to a single farm.
- A single report form was returned with multiple CFN's reported on the front page or in attached correspondence.
- When the owner or operator respondent was involved in multiple farm operations.

The CFN's were not linked if—

- The 2+ identification was in error.
- Unrelated report forms had been returned in a single envelope.
- Multiple report forms had been returned with the same CFN attached or written in.
- The case included one or more preidentified abnormal or multiunit farm, or Alaska or Hawaii report forms (all the materials for these cases were kept in their folders, and the individual folders annotated ''2+ Abnormal,'' ''2+ Multi,'' ''2+ Alaska,'' or ''2+ Hawaii'' as appropriate).

The clerks assigned linkage codes to each CFN in each case determined to require linkage. A primary-linkage code was assigned in each case; for cases involving a single-report form with multiple CFN's, the clerk wrote the primary code ''1'' in the upper right-hand corner of the report form address label and circled it, then wrote a secondary code ''5'' to the right of any additional CFN's that had been added in the write-in space. When multiple (but duplicate) forms were in a folder, with only one in-scope CFN, the clerk assigned the primary code to the in-scope CFN, and the secondary code to the out-of-scope CFN(s), circling both primary and secondary linkage codes.

If more than one in-scope report was involved in a case, the clerk checked each report to determine whether they were duplicates. If two or more of the report forms involved were duplicates, the clerk checked which contained the most information, and assigned the primary code ''1'' to the CFN for that report and the secondary code to the others. If there were no duplicate reports, but there was a common ownership relation, the clerk assigned a primary code ''1'' to one of the reports, and a secondary code of ''9'' to the others. The clerks assigned out-of-scope reports secondary linkage codes of ''5.'' When all the CFN's for a case were out of scope, the reviewing clerk assigned a primary code of ''2'' to one of them and a secondary code of ''6'' to the remaining report(s), writing the codes in the upper right corner of the address label and circling them. When a primary or unlinked report was determined to be out of scope, the reviewing clerk annotated report ''O/2'' (in cases involving a deceased owner or operator) or ''O/7'' (all other out-of-scope cases).

After coding, 2+ case CFN's were linked using the interactive system. The clerks entered the primary CFN for each folder and the linkage code assigned to it, then the secondary CFN(s) and linkage code(s). After all the CFN's and linkage codes for a folder had been keyed, the keyer pressed the DO key and the system carried out the linkage and cleared the screen.

After linkage, the folders and the materials contained in them were disposed as follows:

Groups	Disposition
Abnormals, multiunits, Alaska, and Hawaii	Large farm coverage unit
AG 2+ SU COVERAGE folders	Microfilm unit
Referrals	2+ Agricultural Analyst in unit
Form letter assigned	Correspondence unit
Successor, partnership, or claims filed	Research clerk in unit
O/2 and O/7 coded reports	Out-of-scope interactive check-in unit/boxed for burning
Out-of-scope linked secondary	Boxed for burning
Void duplicates	Boxed for burning
Inscope reports	Batch for data entry

Quality control. The work of both the special case and 2+ case processing units was subject to quality-control procedures before being released from the units. For the special case clerks, the first 100 cases processed were verified 100 percent, while for the 2+ unit, 100-percent verification continued until 25 consecutive error-free cases had been verified. The special case clerks qualified for sample verification if they had achieved an error rate of 5.0 percent or less. When qualifed for sample verification, the work of special cases processing clerks was checked at a 1-in-10 rate, while 2+ case processing clerks' cases were reviewed at a 1-in-8 rate. To remain qualified for sample verification, special cases clerks had to have at least 7 ''accept'' decisions in each sequence of 10 decisions made; receiving a fourth reject decision meant the clerk was returned to 100-percent verification until qualifying for sample verification again. For 2+ case clerks, any error identified during sample verification meant returning to 100-percent verification status until requalifying.

In their quality-control verification of special and 2+ cases, the verification clerks checked for specified errors and coded the records with identified problems. Cases could be rejected for any of the following errors:

Code **Description**

Special Cases

1. Error in scope classification of report forms.
2. Error in coding report for research (code CF (claims filed), S (succesor), or P (partnership)).
3. Referral error.
4. Error in transfer of data from remarks to report form.
5. Error in form letter designation.

2+ Cases

1. Failure to refer Congressional case to supervisor.
2. No linkage made as required (failure to assign linkage codes or enter related CFN's).
3. Linkage made when not required.
4. Incorrect linkage codes assigned.
5. Other error in coding/annotation of report form.
6. Error in performing interactive linkage.

Verifiers corrected all errors identified before referring the individual cases reviewed for further processing. The quality control staff maintained individual weekly verification records for each processing clerk and submitted a weekly summary verification report to the AGR staff at Suitland.

Large Farms Coverage Unit

General information. The large farms coverage unit (LFCU) reviewed multiunit (MU) and abnormal cases, resolved any problems and made any corrections necessary, and conducted any mail or telephone followup required to complete the enumeration of delinquent cases.

Multiunits. The Agriculture Division established company folders for multiunit (MU) farms identified prior to the 1992 census mailout, and report forms were sent to all of the addresses on file for MU operations as part of the census mailing. Agriculture Division analysts accumulated the responses from MU operations in the company folders until all the addresses listed for a MU had responded or been otherwise accounted for, then reviewed all the materials before they were referred for data entry. The review ensured all the agricultural operations of the MU company had been enumerated, satisfied, and corrected, and that each in-scope report was ready for keying to the data file.

Analysts reviewed all the report forms for a single company together, checking for duplication between individual establishments in a MU, correcting name and address errors, telephoning nonrespondents when necessary to obtain data, and, when a report form was missing, or an alpha-plant number or employer-identification (EI) number needed to be corrected, used the interactive name and address update routine to make any changes required. The analysts conducted a section by section review of each report form in each folder, decided what action should be taken to make any corrections needed (e.g., allocated bracketed entries to the appropriate cell, calculated correct units for individual crops and regions, converted fractions to tenths, and so on), and compared data between sections to ensure consistency (e.g., the land in farms reported in section 1 should be the same as that reported in section

10). The analysts also made historical comparisons, matching selected 1992 responses to 1987 data and verifying any changes that exceeded specified limits.[3]

The staff made telephone calls or prepared explanatory letters and mailed report form packages to respondents who had returned incomplete report forms or to resolve specific problems, and held the company folders out of the processing cycle until followup was completed. ''New'' farms could be added to a MU if (1) a farm was part of the operation, but did not duplicate the plant listed in inventory for that MU, (2) data from a report had to be split between across county lines, or (3) telephone or correspondence followup determined that the farm in question had not been covered in the report form mailout.

After completing the review of all the cases in each folder, resolving any problems or referring special problems to the appropriate analyst, the staff updated the census mail file using the interactive systems to identify out-of-scope cases in the file. The report forms and other materials for out-of-scope cases were retained in the company 1992 folders (including the MU inventory sheets and any additional notes or attached materials), which then were filed by alphabetic name. The staff removed in-scope reports from the company folders and batched them into work units for referral to the Data Services Branch for data entry.

Abnormals. Analysts in the LFCU reviewed report forms and attached materials for all abnormal farms—farms operated by grazing associations, Indian reservations, government agencies (including Federal agencies, such as research stations), church held farms, and selected privately held operations) responding to the census before the report forms were sent for data keying. The review was similar to that done for multiunits; the analysts checked—

- Name and address corrections and, if necessary, updated the mail file interactively, then carried out a section by section review of the report form, using a set of printed guidelines to resolve identified problems, and reading any attached correspondence or other materials.
- Carried out historical comparisons, using the same general guidelines used for MU's (e.g., reviewing forms reporting changes of 1,000 acres or more in land for 1992 compared to 1987, and so on).
- For abnormal cases involving two or more farms (i.e., it was part of a 2+ case) the mailed abnormal report forms were used as the primary case and its CFN as the primary numeric identifier.
- Conducted any telephone or mail followup required to complete report forms.

After completing the review of each case, making any corrections required, and obtaining any missing data, the analysts determined whether the individual case was inscope or out of scope. Out-of-scope cases were checked out of the mail file interactively, and the report forms and attached materials were retained in the LFCU file. For in-scope cases, the analysts checked in the CFN using a laser wand and the interactive systems, batched the report forms, and sent them for data keying.

Data Entry

General information. The DPD's Data Services Branch (DSB) received data keying work units (DKWU's) of report forms batched by State and type (must, nonmust, nonsample, and screener (with and without geographic code changes) and FOSDIC[4]). The DKWU's arrived in plastic envelopes with a Data Entry Batch Cover Sheet attached. The cover sheet included the DKWU number assigned by the CATS, the number of documents (report forms, linkage documents, and mail file update materials) in the unit, the State code, the date the DKWU was prepared, and the originating unit.

Data entry (or keying) involved transcribing data from the census report forms to a machine-readable data file for edit and tabulation. The DPD staff used a key-to-disk interactive system that combined the clerical review of the individual census questionnaires with the data entry operation. Each key station had a keyboard and monitor that allowed the keyer to display and edit keyed data, as well as receive messages or questions from the input program. Quality control procedures included reviewing samples of each keyer's work and, when necessary, correcting keyer errors and retraining keyers.

As data were keyed and verified, DSB lead operators transferred the data electronically to the Charlotte, NC, facility for further processing.

Batch for data keying. After check-in and/or other prekeying processing, in-scope agriculture census report forms were referred to the batching control unit where the control clerks batched them into data keying work units (DKWU's) by form type and State, using the CATS system. The CATS system was menu-driven, and the clerk(s) successively selected appropriate items from census and State menus to begin batching. After selecting ''Agriculture'' from the Ag/Econ data entry batching menu, the agriculture submenu was displayed and the clerk chose the correct form type (i.e., must, sample, nonsample, or screener) and the appropriate State. With form type and State identified, the clerk used a laser-wand to read the barcoded labels on the forms to be batched. The computer rejected barcodes with inappropriate State codes in the CFN, or with wrong check

[3]The processing staff carried out historical comparisons for selected farms for land in farms, total value of agricultural products sold, and specified commodities. For example, if either 1992 or 1987 acres reported exceeded 1,000, the 1992 acres should be within 500 acres (or 150 percent) of the 1987 acreage. Changes of 1,000 acres or more in eastern States, or 5,000 acres in other States, also required review and resolution (checking changes in acreage or land rented in or out, omission of leased land, grazing permits, and so on). Similarly, the staff compared 1987 data to the 1992 report for any farm reporting $500,000 or more sales of agricultural products in the 1992 census.

[4]Film optical sensing device for input to computer.

digit, alerting the clerk with an audible ''beep'' and displaying an error message on the station's screen. Report forms whose barcodes were rejected by the CATS were pulled from batching and referred to analysts for problem review and resolution. The clerk continued to wand barcoded labels until 95 report forms had been accepted, then pressed a function key to indicate that the batch was complete. The CATS system emitted a tone, and then printed a Data Entry Batch Cover Sheet for that batch. At the same time the system accepted the batch, it automatically updated the CFN tracking record to show that the report forms in the batch were now going to ''data entry.'' The clerk placed the batch, with the cover sheet on top, in plastic envelopes and placed the envelopes in a rolling bin for transfer to the data keying unit.

Data keying operations. The data entry operation for the 1992 census represented a refinement of the procedures used for the 1987 enumeration. As in the previous census, data entry combined clerical screening and data entry in a single operation. Keyers identified problems on the report forms and used guidance and instructions imbedded in the keying programs to decide whether a given problem should be keyed, flagged, ignored, or handled in some other manner.

As DKWU's were distributed to keyers by the unit supervisors, each keyer opened the plastic envelopes containing the report forms and other documents, wrote a keyer/verifier identification number on the cover sheet, and reviewed each report form for problems as data were entered. Keyers rejected report forms for data entry and assigned ''reject reason codes'' for any of the following reasons:

Code	Reject reason
01	**Geographic Area Code (GAC) check digit failure.** The check digit failed (i.e., the check digit entered was not within acceptable ranges) on the GAC change located in the Census Use Only (CUO) Box 036 on the front page of the report form.
02	**Report form was not keyable.** The majority of data values and/or their location on the report form was illegible.
03	**Blank report form.** Sections 1-26 of the nonsample/screener forms, or Sections 1-32 of the must/sample forms, were blank.
04	**Maximum value failure.** A data field entry exceeds the maximum value.
05	**Remark(s) requiring a reply.** The respondent has entered a remark or remarks on the report form that required a response by the Census Bureau.
06	**Report form nonmatch.** The State code (the first two digits in the CFN) in the CFN is not a valid one for the geographic region (the last two digits of the report form number); and/or more than one type of report form is included in the WU.
07	**GAC validation State change.** The State reported for the principal county (containing agriculture operations) does not match the ''alpha'' State entered on the Data Entry Batch Entry Sheet.
08	**Batch size exceeds established limit.** The batch contains more than 99 report forms with valid data (excluding any rejected report forms). After 99 ''good'' report forms were keyed, all others in the batch were rejected.
09	**Duplicate CFN.** The CFN for a report form had already been keyed, transmitted, and formatted, by the computer; and ''1'' is not entered in cell K039.
10	**State nonmatch.** The State code (the third and fourth digits in the WU batch number) does not match the first two digits of the CUO Box 036 data field.
11	**Secondary source.** The first two digits of the batch number are ''58'' and CUO Box 037 is equal to: • ''1, 3, 7, or 8'' with no data reported on the form. • ''5 or 6'' with data reported on the form. • ''2, 4, 0, or 9.''
12	**Invalid GAC State code.** The first two digits of the GAC in CUO Box 036 are not a valid numeric State code.

The keyers rejected, but did not key a reject reason code for, report forms with invalid CFN check digits and/or invalid CFN State codes.

Four types of report forms could be accepted for keying—must, sample, nonsample, and screener forms. The interactive data entry system program assigned ''screens'' to specific sections of each type of report form for keyers to use in entering the data from the individual forms. For must and sample forms, screens 1-35 were ''keyed,'' while for nonsample and screener forms, screens 1-23 and 30-35 were used. Keyers used screen 1 to key the CFN, and extra CFN's and linkage codes, and data reported in the CUO boxes below the label area, and screen 2 for entering name and address corrections and GAC information. Screens 3-35 were used for entering data from the various sections of the report forms.

After entering the identification and address data from the address label area and section 1 of each report form, keyers began keying the data sections. The keyer entered the two-digit section identifier for each section, then the three-digit keycodes for items within each section containing data, using a nine-digit data field for the information in each item. For example, for section 2 (''Were any of the following CROPS harvested on 'THIS PLACE' in 1992''), the respondent might report that 5,000 bushels of field corn (for seed) was produced on 50 acres. The keyer would enter the section identifier (''S2'') followed by the keycodes

for any specified crops for which the respondent reported crops harvested (e.g., ''067'' for acres and ''068'' for quantity (in bushels) of field corn harvested for grain or seed), and used a nine-digit data field to enter the acres (50) and quantity in bushels (5,000) harvested following each keycode. After keying each data field, the keyer used the field release code, or pressed the ''F6'' function key to move on to the next code of data field.

For sections requesting write-in responses e.g. section 8 (''Were there a combined total of 20 or more FRUIT TREES, including GRAPEVINES, CITRUS, and NUT trees, ''THIS PLACE'' in 1992?'') the keyers did not key the preprinted keycodes unless data were reported in the cells. Instead, the keyers entered the section identifier (''S8'') the ''main'' keycode located under the heading ''code'' only, followed by each keycode (with reported data) in the order in which they appeared in the section. (Sections requesting write-in responses for fruits, crops, or other products not specifically listed in the response boxes included listings of probable crops/products and their respective codes in the section below the response boxes. Respondents wrote in the name and keycode for each crop/product not prelisted, together with the production and inventory data requested on the appropriate line.)

The keyer continued on through each report form, entering the various codes as needed. They were expected to key, reject, or flag any problem item, using detailed instructions as shown in table 6-1.

Quality control. The Census Bureau used formal quality control (QC) procedures for the data keying operation to ensure that the information on the report forms was accurately recorded in the data file for editing and tabulation. Verifiers independently keyed data for report forms for selected records and matched the original keyer's data set with the verifier's set. Any differences were displayed for evaluation and assignment of error. All mistakes identified during this review were corrected and reverified before the data were released for computer processing. The quality control procedures defined errors as either keyer or non-keyer errors. Keyer errors were generally miskeying that caused errors in data fields, field or document omission or duplication, unnecessarily keyed fields, etc. Nonkeyer errors were those involving mechanical problems, or supervisor or verifier errors.

Data keyers progressed through a two-stage verification regime after training, which included instruction on the specific agriculture data entry procedures (the ''T'' stage; during training, all keyers' work was verified 100 percent) a prequalification (''P'') stage, and a qualified (''Q'') stage. After completing training, all keyers were rated in the P stage, and work units keyed by them were verified at the 100 percent rate (i.e., all report forms keyed were checked for chargeable (keyer) errors). During the P stage, all the data keying work units (DKWU's) completed by a keyer with a batch error rate higher than 2.0 percent had to be repaired by the original keyer and resubmitted for verification. To move on to the Q stage, a keyer had to key one DKWU with a keyer error rate of 1.5 percent or less.

Table 6-1. **Keyer Problem Instructions**

Problem	Description	Keyer action
Alpha entries	Respondent used an alphabetic equivalent for a numeric value (i.e., ''ten'' acres instead of ''10'' acres)	Keyer interpreted the value and keyed it in numeric
Dollars/cents	Respondent reported dollars and cents instead of dollar value only	Keyer entered only dollar value
Altered stub	A change or addition to the preprinted items by the respondent	Keyer flagged the problem by entering ''-'' for the data cell(s) involved.
Bracketed entries	A single entry reported for multiple data cells.	Keyer keyed the data in the cell in which it appears, or, if the data is outside any single cell, key the data in the first of the bracketed data cells, and flag the entry by keying ''&''
Data reported outside of a data cell	Data reported written outside corresponding data cell	Keyer keyed data outside a data cell
Double entries	More than one entry (not totaled) reported in a single data cell	Keyer entered the last entry and flagged it by entering ''(''
Fractions and decimals	Fractions and/or decimals reported when not requested, or when ''tenths'' requested	Keyer decided how to key based on rules provided in keyer instructions
Illegible entries	-	Referred to supervisor for resolution; if unable to resolve immediately, keyer keyed a remark flag
Negative entries	Negative values reported for acres or dollars	Keyer keyed a ''+'' flag for the section
Range entries	Data reported with an upper and lower limit instead of a specific number	Keyer keyed upper limit only
Reference to other data	Symbols such a arrows, ditto marks (''), or remarks (''all'') used to indicate ''the same as'' referring to other data	Keyer decided to key data or flag (''+'') based on instructions and examples in keying instructions
Wrong units	Units reported are inconsistent with those listed in the data cell or preprinted to the right of crop names below the write-in section	Keyer compared the reported units to the preprinted units and keyed the data if the units were the same, or flagged the data by keying the reported unit (the first unit if several were used) followed by a ''+''
Remarks	Comments or reporting errors that (1) required a change to the reported data, (2) contained data, (3) related to the manner in which data were reported, or (4) required a reply	Keyer rejected form with remarks requiring a reply. For others, decided to key data and/or flag (''+'') based on instructions and examples in keying instructions

The work for Q stage keyers was verified on a sample basis, with the number of report forms checked based on the size of the DKWU being verified, as follows:

Work unit size	Verification rate (percentage)	Sampling interval
Less than 24	100	All
24-44	12.5	8
45-74	6.67	15
74-99	4.0	25

Keyers at the Q stage had to pass two quality standards on a weekly basis; if a Q keyer had three or more DKWU's rejected during the week, or if a keyer has one or two DKWU's rejected and the overall error rate exceeds 2.0 percent for the week, the keyer was reclassified to the P stage, and continued on 100-percent verification until requalified.

The interactive systems used for keying designated a systematic random sample of report forms from each DKWU for verification based on the sample rates programmed. The first report selected was one whose sequence within the DKWU corresponded to a random integer between the first report in the DKWU and the sampling interval (e.g., for DKWU's with 75-99 report forms, the selection would begin with by randomly selecting one of the first through the twenty-fifth reports in the unit). Keyed DKWU's were accepted if the number of fields with keying errors did not exceed a specified number based on the total number of fields sampled. For example, for relatively small DKWU, with 139-199 fields verified, 4 errors or less would be acceptable, while more than 4 fields in error led to rejecting the DKWU and its resubmission for keying and verification. For a comparatively large DKWU, with 1,588 to 1,668 fields verified, 23 or fewer fields with errors was acceptable, while more than 23 errors meant rejection and rekeying.

After data keying and verification, the accepted DKWU's were moved to a holding area and held until disposition listings were generated showing which records had failed and which had passed the computer edit. The processing staff pulled the keyed DKWU's for the interactive edit review and correction process. Thereafter, the report forms were routed to central files for sorting, boxing, and storage.

FOSDIC data keying unit. The 1992 agriculture census included testing a report form designed for use with the Census Bureau's film optical sensing device for input to computers (FOSDIC) equipment.[5] The test employed census sample (nonmust) questionnaires from selected States in questionnaire region 2 (i.e., Illinois, Indiana, Iowa, Kansas, Nebraska, and Ohio); respondents in Indiana and Kansas, and half the respondents in Iowa received the standard form 92-A0202 questionnaire, while the other half of the respondents in Iowa, as well as those in Ohio, Illinois, and Nebraska were sent the form 92-AO202(F) (FOSDIC) test report form. (The Census Bureau used the report forms for Indiana and Kansas to monitor response rates for FOSDIC, compared to nonFOSDIC, questionnaires.)

The DPD established a special keying unit to handle data entry for the FOSDIC test cases, organized into two subunits, one to key data from the paper questionnaire (the FOSDIC/PAPER subunit), and the second to key data using the FOSDIC/microfilm access device (MAD, hence the FOSDIC/MAD subunit)). The FOSDIC/PAPER keyers entered data directly from the paper report forms, while the FOSDIC/MAD keyers used the MAD and its associated software to key data to the file from microfilm of the report forms. Using the MAD equipment increased the information available to the keyer before the keying operation, identifying all keycodes that the FOSDIC reader equipment had identified and setting the necessary flags for yes/no/blank response or check marks. Furthermore, the reader information was used to run the microfilm readers, which were programmed to skip pages with no markings, to go directly to specified batch numbers for work, and even to skip entire questionnaires.

Each keying subunit consisted of 5-7 keyers with the requisite work stations. The FOSDIC/PAPER keyers received work units of approximately 100 report forms for keying, while the FOSDIC/MAD subunit used microfilm reels containing the images of report forms. Originally, the Census Bureau planned to begin keying using the paper forms in February 1993, and start work from microfilm in May. However, delays in selecting and training the staffs (DPD deliberately chose keyers from the economic area with no experience in the agriculture census operation for the FOSDIC keying unit) led to the paper keying operation beginning in March, and the microfilm keyers starting work in August. All FOSDIC unit keying was completed by early October 1993. Total workload for the combined unit was approximately 72,000 cases.

COMPUTER PROCESSING

General Information

After being keyed to a computer file, the data from each report form were formatted, edited, and tabulated using minicomputer systems at the Census Bureau's Charlotte, NC, facility. The data from each report form were edited, item-by-item, in a comprehensive check for consistency and reasonableness. During the edit, the computer corrected erroneous or inconsistent items, supplied missing data based on similar farms in the same county, and assigned any classification codes required. (Agriculture subject-matter specialists reviewed major changes to the file by the computer edit to ensure no computer-generated

[5]The report forms used circles or boxes filled in by respondents for reporting selected data, which could then be read directly to the data file by the FOSDIC equipment. Report forms using this design technique had been previously used to collect selected information in the population and housing censuses. The agriculture census report form used the fill-in boxes to indicate that data were reported in a specific cell, that is, as an enhancement to data keying rather than for reporting information directly.

errors were retained in the census data file.) The statistical estimation and imputation for nonresponse also were done by computer following the data file edit. The Census Bureau carried out an interactive pre-analytic review of the individual data records, matching all the records in the final file to identify any duplicate responses. This final matching effort found 7,500 duplicate records and deleted them from the final files before tabulation.

The computer work cycle began almost as soon as the first report forms were received and the data keyed and transmitted to the Charlotte, NC, facility in January 1993 and continued until the tabulation and disclosure review was completed in August 1994. The principle components of the computer processing cycle were—

- Format.
- Computer edit and edit correction.
- Statistical estimation.
- Data tabulation and disclosure review.

Format

The data entry operation created an individual record for each agriculture questionnaire containing a series of ''fixed'' record layouts that, for computerized editing and tabulation, had to be converted to ''variable'' output records with binary codes for numeric values. The data files then underwent a computerized format and simple edit process.

The formatting program converted the data records into a series of fixed and variable portions. The fixed portions contained standardized identification information—State and county codes, CFN, standard industrial classification (SIC) code, and so on—and the variable portions held fields for each data item reported, imputed, or changed. The computer recognized the individual data items from the keycodes at the beginning of each data segment and ignored blank segments. Historical data for individual items were added at this time and were compared to the reported data for completeness and reasonableness. The program also carried the flags set during data entry to the formatted records and set new flags for any problems identified during the formatting cycle, as follows:

- Illegal geographic or report-form codes.
- Cases with no reported sales or livestock inventory.
- Cases with individual items flagged (i.e., illegal keycodes, invalid crop codes, etc.).
- Cells or records that, compared to historical data for that item(s), exceeding established limits, or as incomplete.

Flagged cases were displayed for analyst's review and resolution before being submitted to full computer edit.

Computer Edit

General information. Computer editing is the mechanical process of checking and reviewing reported data and comparing it to established parameters. For the 1992 agriculture census, all reported data were keyed and then edited by computer. The format and simple edit procedure converted the raw data records produced by the data-keying operation into binary codes and flagged selected problem cases.

Computer edit and imputation. The complex edit and imputation programs were designed to carry out several hundred individual editing operations in all (850 keycodes could be reviewed for each nonsample form and 900 for each sample form) although generally only a part of the possible total was required for any individual record. Agriculture subject-matter specialists wrote and transmitted the computer edit specifications to the computer programmers in the EPD using decision logic tables (DLT's). Each DLT was a tabular display of the elements comprising a specific edit operation from inception to resolution.

Prior to submission for the complex edit, the formatted data files were sorted by State and by county and CFN within each State. The data from each farm record were subjected to a detailed, item-by-item, computer edit. This complex edit—

- Determined whether each record represented an agricultural operation meeting the census farm definition and deleted out-of-scope operations from the file.
- Assigned farm classification codes needed for tabulating the data, including acreage, tenure, product sales, organization, and SIC code.
- Identified nonsample farms representing farms that met the ''certainty'' criteria for each State, and converted those records to sample records.
- Checked consistency between and within sections of each record.
- Checked for reasonable relationships between and among data items, values for various sizes of farms, and combinations of commodities.
- Checked that geographic, legal, and physical constraints were met.

The complex edit operation also imputed missing data for farms in the census files. Whenever possible, edit imputations, deletions, and changes were based on other data in the same record, or for some items (such as operator characteristics), on historical information from the previous census. Other missing items were calculated based on reported quantities and average commodity prices in the same State. When these methods could not be employed, the imputation program used information reported by other, similar farm operations in nearby geographic areas (e.g., the same county). For example, a

record that contained acres of corn harvested, but not quantity, would be assigned the bushels of corn per acre harvested reported for a nearby farm with otherwise similar characteristics.

Data records that failed to meet the census farm definition, or that had undergone substantial computer-generated changes to the data (see below), were reviewed to ensure that the data had been keyed correctly and/or that the changes were justified. Edit referral cases (i.e., cases that failed edit and were flagged for review by the computer) were reviewed for keying accuracy to ensure that the edit results were correct. Any cases for which the computer edit results were found to be unacceptable were corrected as required and reedited.

Failed Edit Review

General information. Data records rejected by the edit programs—i.e., ''failed edit review'' cases—were referred to the DPD staff at Jeffersonville, which carried out the failed edit review. This procedure determined, (1) whether the information was keyed from the report forms to the data file and, (2) that any changes made to the individual records in the computer edits were correct and acceptable. The staff also reviewed cases identified as format rejects, or determined to be out of scope by the computer (COS's). For general failed edit cases, flags set by the computer identified specific problems, and/or data items that had been changed by the computer edit programs. The failed edit review operation began in the second week of March and continued through December 1993. At peak levels in June and July, the edit review staff processed as many as 8,000 records per week.

Interactive edit. Failed edit cases were referred to the edit unit in their original data keying work units (DKWU), so that the edit clerks worked through batches of reports organized by State and form type (must, sample, nonsample, and screener). The edit clerks used interactive minicomputer systems to review and correct the data records flagged during data keying or computer edit. The ''fail edit screen'' (FES) was the principal tool used for the edit review. When in use, the FES was divided into four areas; the first, at the top of the screen, contained identification information for the individual record being reviewed (e.g., CFN, sequence number, DKWU number, etc.); a second area (taking up the bulk of the screen) contained keycodes and their current data; the third area (on the right side of the screen) contained the keycodes and values entered as corrections to the record; and the last area consisted of reference screens that could be accessed from the FES (e.g., displays of original keyed data, historical data, NASS data, etc.).

To begin edit review, each clerk ''signed on'' the system, called up the production screen, and entered the seven-digit DKWU number of the first work unit to be edited. The system then displayed a CFN menu showing the CFN's, sequence numbers, disposition codes, and referral disposition (RD) codes for each record in the work unit. The listings for reports that had passed the initial edit were displayed in reverse video (i.e., with the background color changed from the standard used on the screen). Cases flagged by the computer as out of scope (''computer out-of-scope'' records) were processed separately (see below) and records that were rejected because of formatting problems were referred to the large farm coverage unit (LFCU) for processing.

The clerks called up the first accessible record in sequence that had failed the initial edit to begin their review. There were four types of failures addressed by the edit review:

1. **Simple edit failure.** Bracketed entries, double entries, other crops or livestock reported, altered stub, wrong units, remarks that required resolution, and geographic change not valid in section 1.
2. **Historical failures.** Large farm records with substantial differences between 1992 and 1987 reported data.
3. **Inconsistency failures.** Entries for keycodes are not consistent with item to be reported or measures used.
4. **Complex edit failures.** The complex computer edit changes in the reported data was inconsistent between or within sections, or reported data exceeded established limits.

The edit clerks used detailed instructions describing the specific edit failures and corrective actions to be taken to review each flagged keycode. After entering corrections for all the flagged keycodes, the clerks pressed the key and entered one of the following RD codes as appropriate:

RD code	Action
1	Re-edit record.
2	Re-edit record—by-pass specified sections based on edit skip code.
4	No changes made—accept as is.
5	Delete from file (out of scope).
7	Million dollar + and/or 30,000+ acres—refer to the LFCU.
9	All other referrals.

If a record referred for re-edit failed a second time, it was immediately redisplayed with the new flagged keycodes, and the clerk reworked the case and resubmitted it for editing. Only when a record had passed the edit did the interactive system display the next available CFN for review. Edit review processing for a DKWU was completed when every accessible CFN in the work unit had an RD code applied.

Computer out-of-scope processing. The computerized complex edit of the 1992 agriculture census data files identified certain records as out of scope, either due to data

keying errors (a respondent entry was missed, or miskeyed), or remarks on the form contained data or clarified a situation on the form the computer did not recognize. The computer out-of-scope review determined whether these records actually were out of scope by an interactive clerical review of each record, using a ''point'' system for agricultural operations reported by computer out-of-scope cases. The edit unit conducted this review; the interactive systems displayed individual records, identifying out-of-scope cases with a ''reverse video'' (i.e., the background color of the monitor screen is different than for in-scope cases) for detailed review. The clerks deleted cases confirmed as out of scope from the data file, and pulled the report forms from the batches involved for referral and storage with other out-of-scope cases.

For cases that appeared to be inscope, the clerks reviewed reported crops or other production, and used a table of point awards for acreage and production of specified crops or other activity. Any record accumulating more than 1,000 points was considered inscope. For example, a respondent might have reported having 3 acres of corn for silage, and half an acre of Irish potatoes. Corn for silage was worth 220 points per acre, or 660 points for 3 acres, while Irish potatoes was worth 1,400 points per acre, or 700 points for half an acre. This particular farm then had an accumulation of 1,360 points and could be considered inscope for the census. Cases identified as inscope were re-edited and incorporated into the data file.

Format reject processing. Format rejects were created when keyed data failed specified checks prior to the complex edit. The records and the census report forms involved then had to be clerically reviewed and any problems resolved before being rekeyed. Format reject review and processing was handled by the LFCU and were referred to the unit from the edit review unit. As the reports were received, the LFCU staff checked coded reasons for rejection and used detailed written instructions to resolve specified format problems. For example, for a case referred because of ''item rejects'' (i.e., 10 or more keycodes and/or their associated data were rejected), the clerk checked the instructions for specific actions to be taken for identified problems, and reviewed the entire report form to correct all possible item rejects. Corrected forms were routed to the batching unit for rebatching and rekeying. Report forms identified as out of scope were stored, in CFN sequence, in the LFCU.

Statistical Estimation

General information. The final response rate for the 1992 Census of Agriculture was 84.5 percent. The published statistics from the 1992 census represent all farms in the United States because the Census Bureau used statistical estimation to inflate the data supplied by respondents to compensate for nonresponse and the use of sampling.

Nonresponse estimation. The statistical estimation procedure used by the Census Bureau excluded large, abnormal, and unique farm operations, since they were subjected to intensive followup during census processing. The agency contacted a stratified sample of the remaining nonrespondents, using the computer-assisted telephone interviewing (CATI—see chapter 5 for details of the CATI operations) system.

For nonresponse estimation, a five-strata sample—based on expected value of sales, previous farm census status, and whether the record was identified by the mail list model to receive the screener report form (the forms 92-A0401 through 92-A0411)—was defined and drawn from the nonrespondent file for telephone contact. When a nonresponse survey case could not be contacted, or no telephone number was found, the appropriate screener form was sent to the address by certified mail.

The Census Bureau estimated the proportion of census nonrespondents that operated farms for all five strata at the State level by applying the nonresponse survey results to the total number of nonrespondents in each stratum. The agency assumed that the distribution of farms and nonrespondent farms in each stratum at the county level was the same. County-level estimates for nonrespondent farms were synthetically estimated from estimated totals calculated for each stratum within each county.

Within each stratum in a county the Census Bureau calculated the ''nonresponse weight'' and assigned it to each eligible respondent farm record. This ''weight'' was the ratio of the sum of the estimated number of nonrespondent farms and the number of eligible respondent farms to the number of eligible respondent farms. The weight was never allowed to be greater than 2.0 using controlled collapsing procedures. The nonresponse weight was randomly rounded to 1.0 or 2.0 for each record for tabulating the complete count items for publication.[6]

Sample estimation. The 1992 census collected ''sample'' data (for items 21 through 26 on the sample form[7]) from about 20-percent of the agriculture census mail universe. The following types of addresses on the census mail list received sample report forms:

- Special insert cases.
- All addresses in Alaska, Hawaii, and Rhode Island.
- All must cases.
- All addresses expected to represent ''large'' farms (the definition of a large farm varied by State, from a minimum of 1,000 acres or $100,000 in sales, to as high as 10,000 acres and $200,000 in sales; these were all considered certainty cases).

[6]Certain respondent farms that produced ''rare'' commodities were identified as ineligible to represent the typical nonrespondent farms and were excluded from the nonresponse weighting operation.

[7]These items requested data on the following: (21) commercial fertilizers, (22) use of specified chemicals, (23) production expenses, (24) machinery and equipment, (25) estimated current market value of land and buildings, and (26) income from farm-related sources.

- All farms in counties with less than 100 farms identified in the 1987 census.
- A systematic sample of 1-in-2 addresses in counties that contained 100 to 199 farms in the 1987 census.
- A systematic sample of 1-in-6 addresses of counties that contained 200 or more farms in the 1987 census.

The sample estimates were designed to develop the totals that would have resulted had all census respondents been asked for the data requested for items 21-26. The estimates were calculated using a controlled collapsing procedure that assigned a ''weight'' to each respondent record containing a sample item or items. For any given county, the sample item total was estimated by multiplying the sample data items for each farm in the county by the respective sample weight assigned, and summing over all the sample records for that county.

The Census Bureau classified respondent sample records as ''certainty'' sample farms (i.e., the first five types of operations listed above, and hence, mostly large operations) or sample farms (mostly smaller operations). Certainty sample farms were assigned a weight of ''1'', since all farms of these characteristics were subject to intensive followup. The sample farms within each county were assigned weights based on specified characteristics. To calculate these weights, the Census Bureau used a three-step process, employing three variables. The first variable contained eight 1992 total value of sales (TVP) groups; the second contained two SIC code groups; and the third contained two acreage groups. The variables were as follows:

TVP	SIC Code Major Group	Acreage
$1 to $999	01 All crops	1 to 69
$1,000 to $2,499	02 All livestock	70 or more
$2,500 to $4,999		
$5,000 to $9,999		
$10,000 to $24,999		
$25,000 to 49,999		
$50,000 to $99,999		
$100,000 or more		

In the first step of the estimation procedure, all farms were classified into one of 32 mutually exclusive strata using the three variables groups. The total and sample farm counts were expanded to account for nonresponse. Each stratum then was assigned an initial sample weight equal to the ratio of the total farm count to the sample farm count. This weight was supposed to be approximately equal to the inverse of the probability of selecting a given farm for the census sample.

Once the farms had been classified and initial weights assigned, any stratum containing less than 10 sample farms (after nonresponse adjustment), or that had a weight more than twice the mail sample rate, was collapsed with another stratum. (The mail sample rate was either 2 or 6, depending on whether the county involved had a 1-in-2 or a 1-in-6 sampling rate.) After the collapsing process was completed, new total and sample farms counts were computed from each of the final strata and were used to calculate the final sample weights.

In the final step of the estimation process (actually performed after the analytical review), final weights were assigned to the sample farm records in each stratum. This weight was the ratio of total farm count to sample farm count in each stratum expanded to account for nonresponse. The noninteger weights were randomly rounded to an integer weight for tabulation. (E.g., the final weight assigned to farms in a particular stratum was 7.2, then one-fifth of the sample farms in the stratum were randomly assigned a weight of 8.0, while the remaining four-fifths received a weight of 7.0.)

Post-Edit Correction Processing

General information. After the computer edit and edit correction processing were completed, the Census Bureau conducted a final review of the data files to remove duplicate records that had not been identified before aggregating the individual records for analytical review. The individual records were tabulated by computer into a matrix called the analytical table. The main analytical table consisted of 2,200 rows of data. Accessory matrices—''call tables'' (CT's)—also were built. There were 10 CT's that collectively comprised approximately 2,000 additional rows of data. The Census Bureau used the matrices to extract data for analysis and correction of the county-level tabulations.

After analytical review, the data underwent final weighting. A small, State-level, table of selected basic data (called the ''C99'' or ''hand-off'' table) then was created and reviewed to ensure that the final weighting had not caused significant shifts in the data. Once the handoff table was approved, the data were aggregated into a single file—the master matrix (MM)—for each State and for the United States. The master matrix also underwent disclosure processing, and then was used to build all of the Volume 1 tables except the cross tabulations. The cross tabulations for the Volume 1 reports were generated separately from the master matrix and underwent independent disclosure analysis. All of the Volume 1 tables were downloaded electronically to a local area computer network for table review using the Census Bureau's Tabulation and Disclosure System (TADS).

Duplication review. Prior to conducting the analytical review of the census data, AGR staff carried out a final duplication review of each State file. During mail-list development, many names and addresses from different sources that, while similar, were not exactly alike, were retained by the matching operation done before mailout. Even exact name matches could be mailed two report forms when the

associated information (e.g., employee identification number (EIN), social security number (SSN), telephone number, etc.) differed. This final duplication review was designed to identify and delete these duplicate records from the data file.

In a further computer matching operation, the computer program matched records in each county in the State file under review. Records were sorted and matched in three phases, and any suspected duplicates identified on one phase of the review was removed from possible consideration in any other phase. The three phases successively reviewed and matched records by CFN, telephone number, and three-digit SIC code, then by selected keycode items within the matching records. If five keycode items matched, the records involved were displayed at an interactive workstation for analysts to review.

In their on-screen review, AGR staff checked the matched records to determine whether any should be deleted from the file. Reviewers assigned alpha codes to the CFN's involved for records they reviewed. CFN's requiring no action (i.e., that were not duplicates) were assigned a ''K'' code, and retained in the file. Those CFN's identified as positive duplicates were assigned ''D'' and were deleted and made out of scope by assigning them a referral disposition (''RD'') code of 5. CFN's about which some question remained were designated ''U'' and were referred to analytical review for final disposition.

The duplication review operation began as soon as the after-edit failure review was finished, and continued until all 50 States had been reviewed. Approximately 70,000 duplicate records were identified and deleted from the final files in this review.

Analytical review and data correction. Analytical review is the review of all census of agriculture data items, values, and selected data relationships in the data files for each State and county. The review staff used unpublished analytical tables (the computer generated a single analytical table for each State, and for each county within each State—these were the first tabulations of census data created after duplication review) displaying all census data items with positive data values in the 1992 or 1987 censuses—and the analysts used these tables to interactively review the data on the minicomputer system. Agriculture Division analysts performed the review and correction operation in several phases.

In an initial summary table review, senior subject-matter analysts checked the data for their specific areas of responsibility (farm economics, livestock, and crops). They looked for completeness and comparability with historical census data within expected limits. The interactive process allowed the analysts to examine detailed county data for any specific item that apparently had problems at the State level. This summary review was followed by an analytic review involving a systematic review of the county data by subject-matter specialists. Any problems identified early in the review process were checked for validity, and the current census data were compared to NASS and historical census data to check for disappearances, duplications, or changes involving larger agricultural operations in the county. During summary and analytical review, analysts wrote any specific criticisms to a ''criticism shell'' for each county.

After AGR analysts completed review of all the counties' data for a State, the tables were ready for review by NASS representatives. Visiting statisticians from each of the NASS's State offices examined State and county data and reviewed the problems identified in the Census Bureau's analytical review. (The NASS reviewers used the same analytical tables used by the Census Bureau analysts and were sworn in as temporary Census Bureau employees to maintain confidentiality protections, and to enable them to have the same access to the detailed databases for individual records that the Census Bureau's own analysts had.) The NASS reviewers could write criticisms from the tables, just as Census Bureau analysts did in the summary and analytical table review.

Once the NASS statisticians completed their review of a State file, supervisors in the analytical review staff carried out a final criticism review and edit to make certain identified problems were valid and merging NASS with Census Bureau criticisms. This final review included an automated outlier check to ensure that no large, uncriticized, differences between 1992 and historical census data on specific items escaped identification. After completing this review for a given State, EPD created a file containing the CFN's of records criticized in the table review, and printed out the list in the DPD office in Jeffersonville, IN. The DPD staff used the CFN listings to pull the report forms reviewed in the criticism-resolution process and established county folders containing the report forms requiring review. The DPD staff worked through each county file containing criticisms in criticism order and by CFN within criticism, using the interactive minicomputer systems to check each individual record for identifiable problems.

When all of the required corrections for all counties in a State were completed they were reviewed by a supervisory statistician in Jeffersonville. Once all corrections had been confirmed and the entire State was approved, the data were ready for data review and release for Volume 1 tabulations.

Tabulation for counties, States, and the United States. As data are keyed, edited, and reviewed, they were incorporated into the master data matrix for the census. There was a master matrix for each State and for the United States, each containing the number of farms and data values for every item defined in the master matrix dictionary. The data were stored in the master matrix in two ''universes''—all farms, and farms with annual value of sales of $10,000 or more.

The census tables, that is, the aggregation of data in rows and columns, were populated using the data in the master matrix. County and State table data were taken from the master matrix, while State cross-tabulation data

were taken from the detail data file. The tables for geographic areas above the State level—i.e., for the United States—were compiled by summing data from the individual States. Selected tables included historical data from previous censuses. The 1992 publication program did not include any advance reports; the tables were released in the Volume 1, *Geographic Area Series reports.*

Disclosure analysis. The Census Bureau is prohibited by law from publishing information that could be used to identify individual respondents. To ensure that this confidentiality is maintained, all of the data were checked prior to publication in a procedure called disclosure analysis. This involved analysts' reviewing the data tables that had items suppressed that, if published, would; (1) result in direct disclosure of data reported by a respondent, or (2) reveal information about a respondent by derivation—that is, by a data user adding or subtracting a published subtotal from a published total to reveal individual data.

The disclosure guidelines set lower limits on the number of farms that were required to have reported an item before it was published. Since some tables included identical information arranged under several different classifications, the suppression of data in one table required the suppression of the same data in other tables. Publishing the number of farms in a particular size or other category was not considered a disclosure.

The Census Bureau's automated equipment and programs performed the bulk of the analysis and suppression, but Agriculture Division staff carried out interactive table review using the Tabulation and Disclosure System (TADS).

Table review and preparation. For the 1992 agriculture census, the Census Bureau introduced a new table review system—TADS—to simplify the table review process by minimizing programming resources, reducing table adjustment errors, and eliminating nearly all of the paper involved in previous table reviews.

The TADS operated on DEC workstations. (For information on the procurement of the hardware for the TADS see Chapter 2, ''Planning and Preliminary Operations.'') The TADS procedures incorporated status tracking, interactive table review, and data flow. The status tracking was handled through a combination of a code management system (CMS) and relational database procedures. The CMS tracked the status of each State file and each table—whether pending review, approved, rejected, etc.

Table review was conducted using a spreadsheet program. Each table had a template—a ''shell'' containing various reference files, as follows:

- **Table sourcing document.** A grid consisting of rows and columns giving the master matrix location or key-code sourcing for each data cell in a publication table.
- **Data relationships.** The relationships of master matrix items written in equation form, used to accomplish complementary disclosure on data in a table.
- **Master matrix dictionary** (relevant to specific projects, such as the Volume 1).
- **Table cross reference.** Cross references to other publication tables where particular item is located.
- **Variable crop reference.** Information on which crops are published for a given State.
- **Acronyms.** A file of the acronyms used in the master matrix and associated with the published tables.

The data files (published and unpublished) provided by EPD were merged with the templates to create the tables that the analysts reviewed. The TADS could interactively display for any data cell in a table the corresponding items contained in the template. Three types of tables were reviewed—

1. State tables with master matrix sourcing in each cell.
2. Cross-tabulation tables with a combination of detail and master matrix sourcing in the stub and header of the table, and cells tabulated by the intersection of the stub and header sourcing.
3. County tables with master matrix sourcing for the first column only.

Analysts, using their workstations, clicked on buttons to perform ''lookups'' of the sourcing of an individual cell, the table cross reference(s) of cell, etc. The analysts checked the tables primarily for accuracy and completeness of the suppression patterns, and could, with supervisory approval, make changes to the data. Any changes were written to a State-level transaction file, which then was electronically transferred to the EPD to update the data contained in the master matrix for the State involved.

TADS processing began in October 1993 and continued through August 1994. After the tables for a State had been processed through the TADS, the EPD generated the tables using the Table Image Processing System (TIPS II—a processing system employed for large, centralized computer-based tables), and transmitted these tabulations for AGR review. Upon completing the TADS processing and review, the tables for each State were released for publication preparation.

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The 1992 Puerto Rico Census of Agriculture

INTRODUCTION

Historical Background

The Census Bureau carried out the first agricultural census of Puerto Rico as part of the 1910 decennial census program, and the Commonwealth continued to be covered in the decennial agricultural censuses from 1910 through 1950. The U.S. Congress authorized *quinquennial* censuses of agriculture of the United States in 1915 (although the first mid-decade agricultural enumeration was not done until 1925), but Puerto Rico was not included in this program until 1959. (The Puerto Rico Reconstruction Administration conducted a special census of agriculture in the Commonwealth in 1935, but this was a local effort.)

Congress modified the schedule of the agriculture censuses in 1952, requiring that they be conducted every 5 years for years ending in ''4'' and ''9.'' The legislation changing the dates of the censuses did not include Puerto Rico in the program, but the 1959 agricultural census in the Commonwealth collected data for the 1958-1959 crop year and the data were published as part of the 1959 census publication program. Thereafter, Puerto Rico remained part of the regular quinquennial agricultural enumeration.

In 1972 Congress changed the census schedule once again, directing that the agricultural and economic censuses be conducted for the same reference periods, and authorizing the Census Bureau to shorten the intercensal intervals between the 1974 and the two subsequent agricultural censuses by 1 year so that the census schedules converged by 1982 with a minimum disruption of census work. Following the 1977 Economic Censuses, however, the Census Bureau advanced the date of the agricultural enumeration in Puerto Rico by a full year to take advantage of the offices and office staff organized for the economic program. The agency repeated this arrangement for the following agricultural census, although the alteration of the schedule for the census in the 50 States meant that the Puerto Rico enumeration began just as the stateside census completed data collection.

For the 1987 and later censuses, the Census Bureau assigned the Agriculture Division (AGR[1]) responsibility for both the agricultural and the economic censuses in Puerto Rico. This enabled the agency to take advantage of some economies of scope created by combining control of the censuses in one area. The field office supervised census operations within the Commonwealth, including the field enumeration of the area sample farms, and field and telephone followup of nonresponse cases.

Uses of Agriculture Census Data

The census of agriculture is the principal source of agricultural production data for Puerto Rico and is the only source of consistent, comparable data at the municipio level. Census data are used by—

- The Federal Government to administer programs, including such things as relief efforts after hurricanes.
- Local governments to develop and change farm programs, measure the effects of these programs, benchmark their own data-collection activities, and administer a variety of other programs.
- Private industry in planning production and distribution of its products, as well as in designing and implementing marketing programs aimed at the agricultural community.

Legal Authority and Special Agreement

Title 13, United States Code, sections 142(a) and 191 require that the quinquennial censuses of agriculture for years ending in ''2'' and ''7'' cover the Commonwealth of Puerto Rico. The specific features of the census are governed by the provisions of Title 13 and the Commonwealth of Puerto Rico, Law No. 11—to the extent the provisions of such legislative acts are not in conflict with Federal law. The Director of the Bureau of the Census and representatives of the Commonwealth Government drew up an agreement concerning the conduct of censuses within the Commonwealth in 1958, and prior to each succeeding census officials of the Census Bureau and the Government of the Puerto Rico met to conclude similar agreements establishing their respective responsibilities and functions in each enumeration. The successive agreements have been added to the original 1958 accord as amendments. In October 1991, the Census Bureau and the Commonwealth Government signed the ''Memorandum of Agreement for Conducting the 1992 Agriculture and Economic Censuses in Puerto Rico,'' which became Amendment XIV to the 1958 document.

[1]The Census Bureau reorganized its Economic Directorate in October 1994, and the Agriculture Division (AGR) became the Agriculture and Financial Statistics Division (AGFS). Since the bulk of the work on the 1992 Census of Agriculture Census for Puerto Rico was carried out under the old organization, the *History* will use the AGR designation when referring to activities of the division throughout.

The Commonwealth Government agreed to—

1. Secure adequate space for testing and training enumerator personnel.
2. Encourage a wide variety of organizations and agencies to participate in recruiting qualified candidates for census jobs.
3. Assist the Census Bureau in publicizing the census.
4. Assist the Census Bureau in obtaining planning information from sources within the Commonwealth and in certifying boundary information and names for geographic areas to be used for data tabulation and publication.

The Census Bureau had final responsibility for planning and carrying out the enumeration, including appointing the census supervisor; assigning Census Bureau staff as census advisors; interviewing, testing, selecting, appointing, and training persons, and determining pay rates for the census staff; and maintaining confidentiality of the census data. The agency also had final authority to determine report form content and design, enumeration procedures, tabulations to be made, and data to be published, but agreed to consult advisory committees and interested agencies of the Government of Puerto Rico on these matters.

The Census Bureau bore the entire cost of the basic census program, with the Commonwealth Government responsible for the cost of any expansion of the basic census program (there was none). The agency also agreed to make available to the Puerto Rico Planning Board, on a cost-reimbursable basis, special statistical tabulations and tapes not included in the publication program. (The Commonwealth Government had the authority to publish these additional tabulations if they complied with census requirements.)

Farm Definition

The farm definition for the 1992 agriculture census in Puerto Rico was based on value of sales of agricultural products during the reference period. A place qualified as a farm, for census purposes, if it had, or normally could be expected to have, $500 or more in sales of agricultural products in the 12 months preceding June 30, 1993. This differed from the definition used for the 1987 census in that it no longer included operations with 10 or more cuerdas[2] of land and sales between $100 and $499. The new definition represented the Census Bureau's attempt to focus more on commercial, rather than subsistence, farming.

1992 Census of Agriculture

Census methodology. The 1992 Census of Agriculture for Puerto Rico differed significantly from earlier censuses in the Commonwealth in that it used a mailout/mailback strategy as the principal means of data collection. In addition, an area sample, conducted by personal interview, supplemented the mailout and provided coverage of small farms. In previous censuses, a field enumeration staff canvassed the island searching for places that met the farm definition, but this method was increasingly expensive, burdensome to nonfarmers, and yielded low quality data. The Census Bureau decided to redesign its methodology to reduce nonfarm response burden, contain costs, and improve the quality of the data.

The Census Bureau mailed report forms to farm operators with an expected total value of production of $2,500 or more and/or at least 20 cuerdas of land in the 1987 census, and newly identified farms that began operation after 1987. Farm operators were requested to complete and return their forms within 21 days—telephone and personal interviewers followed up nonrespondents. The area sample was designed to provide estimates for small farm operations (i.e., those with sales of less than $2,500). The Census Bureau adjusted the data from this sample to represent all farms that were not mailed report forms. (For details on sample design, see below.)

Scope and content of the census. The basis of the agriculture census was the individual operating unit—usually the individual farm. The 1992 agriculture census in Puerto Rico covered all farms that met the census definition, but made extensive use of sampling.

The census requested data on—

- Land (cuerdas) and land use in the last 12 months.
- Crops (cuerdas harvested and production).
- Irrigation (cuerdas irrigated and major source of water).
- Livestock, poultry, aquaculture, and other animal specialties.
- Total value of sales (crops, livestock, and aquaculture).
- Farm-related income.
- Type of organization.
- Operator characteristics.
- Fertilizers and agricultural chemicals used.
- Production expenses.
- Machinery and equipment.
- Hired workers, agregados[3], and sharecroppers.

[2]A cuerda is approximately .97 acre.

[3]An agregado is a member of a family living on a farm not operated by any member of the family. An agregado might or might not be an employee of the farm operator and might or might not produce any agricultural products. An agregado might own, rent, or use rent-free the house he/she lives in. The land operated by, livestock belonging to, and the products marketed by an agregado are included in the totals of the farm operator in charge of the place on which the agregado lives.

Reference periods and dates. The census requested land, land use, production, expenditure, farm labor, and sales data for the 12 months between July 1, 1992 and June 30, 1993. Data on inventory (livestock, poultry, and hogs), machinery and equipment, buildings and facilities, and number of sharecropper and agregado families, were requested as of July 1, 1993.

Data collection. The bulk of the data for the 1992 agriculture census in Puerto Rico was collected by mail. The Census Bureau assembled a mailing list of farms that had reported sales of $2,500 or more, and/or 20 cuerdas or more of land, in the 1987 census in the Commonwealth, and mailed report forms to approximately 14,500 addresses in June 1993. The initial mailout was followed by a reminder card sent to all addresses on the initial list, and by telephone followup of nonresponse cases by the census field office's staff. In addition, an area sample of smaller farms in selected barrios was carried out by enumerators, who visited and interviewed agricultural operators not included on the census mail list.

Data processing and publication. The Puerto Rico field office handled the data collection phase of census operations—other than mailout and mail followup—including interviewing sample farms and telephone and field followup. The completed report forms were processed and the data transcribed for editing and tabulation at the Census Bureau's Data Preparation Division's (DPD's) office in Jeffersonville, IN. The DPD staff used interactive systems employed in processing the census for the 50 States to check-in, review, and key responses to the census data file. The Outlying Areas Branch of the AGR handled the majority of work involving coverage review, correspondence, data review, disclosure analysis, table preparation, and table review. DPD staff assisted with pre-key processing and performed edit corrections.

The data from the 1992 Census of Agriculture in Puerto Rico were published in a printed report—Volume 1, *Geographic Area Series*, Part 52, *Puerto Rico*.

PLANNING

General Plans

Planning for the 1992 Census of Agriculture in Puerto Rico began early in 1991, when the Census Bureau began preliminary planning for data content and enumeration methodology, and the Commonwealth Government established an interagency planning committee (see below) to consult with the Census Bureau regarding the census. The objective of the preliminary planning was to reduce respondent burden and improve data quality without significantly increasing costs. By July 1991, the Census Bureau had proposed the final content for the Puerto Rico report form and had developed plans for using mail enumeration in the agriculture census. During the early fall of 1991 the Census Bureau and the Commonwealth Government drew up the special agreement covering the two parties' responsibilities in the enumeration (see above for details of the agreement), and began preparations for the census.

By the end of 1991, the general plan for the census in Puerto Rico called for a mail enumeration of large farms (those with sales of $2,500 or more, or 20 cuerdas of land or more), and an area sample to collect data for smaller operations.

Interagency Planning Committee

The Government of Puerto Rico organized an informal committee composed of representatives of various agencies of the Commonwealth Government concerned with the agriculture census. The following offices or agencies were represented on the committee:

- Bureau of the Census.
- Puerto Rico Planning Board.
- Puerto Rico Department of Agriculture.
- Puerto Rico Farm Bureau.
- Puerto Rico Agriculture Extension Service.
- University of Puerto Rico
  - Agriculture and Economics Department.
- Puerto Rico Rural Development Corporation.
- Credit and Rural Development Corporation.
- Sugar Corporation.
- Agricultural Development Administration.
- Bank of Puerto Rico.

Census Bureau officials met representatives of the member agencies and offices periodically, and communicated with them on a continuing basis, beginning in March 1991, to discuss plans for report form content and enumeration methodology.

PREPARATORY OPERATIONS

Report Form Design

The Outlying Areas Branch of the AGR, with the cooperation of the Puerto Rico Planning Board, designed a single report form for the agriculture census in Puerto Rico, the form 92-A1(PR)(SP). The report form was an 8-1/2″ x 11″ 8-page booklet, of white stock with printing and shading in brown ink. The standard version was in the Spanish language (hence the ''SP'' suffix); an English-language reference version also was produced with black ink on green paper.

During review of data users' recommendations, the report form design team decided to delete the section on production for home consumption. In addition, tobacco, molasses grass, milo, and elephant grass were no longer prelisted on the form, although the respondent could write them in under ''other crops.'' The value of sales for individual vegetable crops was dropped and replaced by a question asking for value of all vegetables and melons.

Two new questions—asking the number of cuerdas planted for individual fruit trees, and aquaculture production—were added to the form.

The final version of the 1992 report form consisted of 23 numbered sections and asked for data on the following—

- Cuerdas owned, rented, or used in the last 12 months.
- Agricultural products (including sugarcane, coffee, fruits, grains or farinaceous crops, vegetables or melons, lawn grass or ornamental plants, grasses or seedlings) harvested and products sold.
- Cultivated and/or improved pastures.
- Farm-related income.
- Hired farm workers.
- Irrigation.
- Land use.
- Cattle or calves, hogs, poultry, and their products sold.
- Aquaculture products for sale.
- Livestock inventory and sales.
- Farm related income.
- Farm organization.
- Characteristics and occupation of operator.
- Agricultural chemicals used.
- Production expenses.
- Machinery equipment, buildings, and facilities on farms.
- Number of agregado and sharecropper families on farms.

Mail-List Development

The mailing list for the 1992 Census of Agriculture in Puerto Rico was compiled from four principal sources—(1) the 1987 agriculture census database, (2) the Puerto Rico Agriculture Department's (PRDA's) general farm list, (3) the University of Puerto Rico's Extension Service's (UPRES's) farm list, and (4) the Puerto Rico Poultry Industry list. The AGR sorted the lists from the PRDA by region, municipio, and last name, and submitted the resulting file to the Economic Programming Division (EPD) for processing for mail list production. The EPD edited the mail list files to eliminate blank lines and add sequence numbers to records to provide a unique identification during manual review and as a reference number for matching and deleting duplicate addresses from the lists.

The edited files containing the PRDA address lists were matched against the 1987 census database for Puerto Rico to identify duplicate addresses. The EPD deleted positive duplicates from the final file, then reviewed the file once again to select all records with a total value of products sold (TVP) of $2,500 or more, or with a TVP of at least $500 and a minimum of 20 cuerdas of land (these records were considered to represent ''certainty'' farms, i.e., farms that would receive the census report form in the mail). To develop estimates on agricultural operations that did not meet the minimum criteria established for the mailing list—as well as any new operations that were not on the mailing list—the Census Bureau designed a statistical area sample to account for smaller farms (see below).

After editing, matching, and deleting all identified duplicate records, the Census Bureau merged all four major source files to create the 1992 Puerto Rico mail list file. After completing mail list compilation from available sources, the Census Bureau employed a private contractor in Puerto Rico, who had been authorized by the U.S. Postal Service to process USPS address files, to update and standardize the census mail list. After completing this procedure, the contractor returned the standardized mail file to the Census Bureau for the census mailing.

Sample Design and Selection

The agriculture census in Puerto Rico used sampling to collect data from selected municipios and developed statistical estimates of agricultural operations at the Commonwealth and municipio levels. The census used a mail segment that included all certainty farms and all noncertainty farms in specified enumeration districts (ED's), and an area sample comprising all farms in selected ED's in each municipio. The sample ''universe'' for the Puerto Rico, that is, the group or area from which the sample was selected, consisted of farms in all the ED's in Puerto Rico.[4] The Census Bureau used records from the 1987 Puerto Rico Census of Agriculture file to identify ED's that included certainty or noncertainty farms, based on the 1992 certainty/noncertainty definition. Certainty farms were those with reported sales of $2,500 or more, and 20 cuerdas or more of land. All other farms were noncertainty operations. Certainty/noncertainty status was coded on each farm record. The Census Bureau classified individual ED's as certainty or noncertainty based on the total number of

[4]The single exception to this was the single ED comprising the entire municipio of Catano, just west of San Juan. Catano has never reported a farm in the agriculture census. The Census Bureau contacted the Puerto Rico Government prior to the mail-list compilation to determine whether it had any indication that a farm or farms existed in Catano, and upon being informed that there were none, excluded the municipio from the area sample.

noncertainty farms identified in each; an ED with four or fewer noncertainty farms became a certainty ED. The census involved four categories of records

1. **Certainty farms.** The Census Bureau identified 10,659 certainty farms for the 1992 census in Puerto Rico. Additional farms were added from special lists supplied by Puerto Rico Government agencies (see mail list development above). To ensure coverage of this segment of agricultural activity (which accounted for 97.6 percent of the value of agricultural products sold in Puerto Rico in 1987); certainty farms were part of the mail enumeration.

2. **Noncertainty farms in certainty ED's.** The Census Bureau identified all ED's with fewer than four noncertainty farms from the 1987 Census of Agriculture name and address list and designated them as certainty mail ED's. The census included 293 certainty ED's that, in 1987, had contained 308 noncertainty farms.

3. **Noncertainty farms from a sample of noncertainty ED's.** The Census Bureau used an area sample to collect data from noncertainty farms in noncertainty farms in noncertainty ED's. In each municipio, the agency grouped noncertainty ED's into clusters with approximately equal numbers of noncertainty farms. The area sample randomly selected one cluster from each municipio and the field interview staff canvassed all farms in the cluster. The sample included a total of 108 ED's.

4. **"New" (i.e., newly identified) noncertainty farms from a coverage sample of certainty mail ED's.** The Census Bureau selected a sample of certainty ED's—3 for each agricultural region—for canvassing to identify any farms missed by the mail list compilation operation.

Printing and Addressing Report Forms

Printing report forms and assembling mailout packages. Private contractors printed the report forms, envelopes, instructions sheets and other enumeration materials and assembled the mailing packages before delivering them to the DPD office in Jeffersonville, IN. The quantities of report forms and principal associated materials printed are shown in table 7-1.

Table 7-1. **Report Forms, Envelopes, Letters and Other Enumeration Materials Printed**

Form	Description	Quantity
92-A1(PR)SP	Report form (Spanish)	35,000
92-A1(PR).	Report form (English)	1,000
92-A1(PR)L1(SP). .	Cover letter (Spanish)	35,000
92-A1(PR)L1	Cover letter (English)	1,000
92-A1(PR)SP(I) . . .	Information sheet (Spanish)	35,000
92-A1(PR)L2.	Follow-up postcard (Spanish)	20,000
92-A7A(PR)	Outgoing envelope	35,000
92-A8(PR).	Return envelope	35,000

Address labels. The Census Bureau prepared an address label for each address on the mail list. Each label contained the printed address and a machine-readable barcode containing the address as well as size and farm-type codes for the addressee. The EPD provided the mail-address file to the DPD in the second week of June and the DPD used the high-speed Printronix printers to produce the address labels for the mailing packages. Clerks affixed the labels to the report forms through the open windows of the outgoing envelopes. Labeled mailing packages were packed in cartons (each containing approximately 225 mail packages) according to postal requirements for presorted first-class mailings (i.e., by 3- and 5-digit ZIP Code), and sent for mailout.

Maps

The area census office and the field enumeration staff needed maps to carry out the area sample. Four office maps, showing municipio boundaries and names, were prepared for use in the Hato Rey field office, together with four sets of 123 enumeration district (ED) maps for the ED's selected for the agriculture census area sample. The 1992 ED's corresponded generally with those of the 1990 census—that is, they generally were drawn within the recognized barrio boundaries, although some boundaries were altered in built-up areas to allow for changes in land use.

The ED maps were scaled to fit on a single page (8-1/2″ x 11″) and had the same level of detail as the 1990 decennial census maps, showing roads, trails, water features, geographical boundaries, landmarks, and power lines. Office maps were wall maps.

The census maps for Puerto Rico were produced by the Census Bureau's Geography Division, using it's automated geographic database, the Topologically Integrated Geographic Encoding and Referencing (TIGER) system—developed in a cooperative effort with the U.S. Geological Survey (USGS). The TIGER system contained information for each geographic feature (e.g., the various individual segments that make up roads, railroads, rivers, etc.) such as geographic area codes, latitude/longitude coordinates of boundaries and features, and the name and type of any features. Geography Division delivered the various maps required for the agriculture census in Puerto Rico in early April 1993.

Field Organization

Field office organization. The Census Bureau established a field office in the San Juan suburb of Hato Rey to provide an administrative headquarters for the 1992 agriculture and economic censuses in the Commonwealth. The office opened in December 1992, after the Field Division rented suitable office space and rented or borrowed the necessary furniture. The Field Division assigned an employee to the office as office manager while the remaining office and field staff were recruited locally and employed for the duration of census operations in Puerto Rico.

The field office was organized under an area census supervisor, with an office manager responsible for administrative activities in support of the census (personnel, payroll, clerical cost and progress reporting, supply requisitioning, etc.) as well as the telephone followup staff, and a field operations supervisor who recruited, selected, trained, and supervised the field interview staff. The office manager had 3 lead clerks, 2 office clerks, and 10-15 telephone clerks (the staff size varied based on the level of activity in the field office; the highest staffing levels were attained during periods (May-early July) when substantial activities were underway for both the economic and agriculture censuses) to assist in office operations, while the field operations supervisor oversaw the field enumerator staff.

Areas of responsibility. The Hato Rey office and the field staff carried out the data-collection phase of the census while the Census Bureau's headquarters staff provided supervision and technical assistance. The Census Bureau's Field Division had primary operational responsibility for the field office and the field enumeration staff, while the Outlying Areas Branch of AGR, and the DPD in Jeffersonville, IN, prepared mail lists and mailed out report forms. (The mail portion of the agriculture census began in June. The area-sample data-collection effort began in June and lasted through mid-September.)

Respondents to the mail census returned their completed report forms to the Jeffersonville office. The report forms completed in the area sample canvass, and by the telephone followup operation at the Hato Rey office, were shipped to Jeffersonville. The report forms and their data were processed by the staff at Jeffersonville, and the AGR staff at Census Bureau headquarters, using interactive systems linking both offices.

Recruiting and training. The Hato Rey field office opened on December 7, 1992, but data collection for the agriculture census did not begin until the following June. Prior to the agriculture census the office worked on the economic censuses in the Commonwealth. Most of the office staff originally recruited for the economic censuses stayed on for the agriculture enumeration as well. The agriculture census field staff—12 crew leaders, who would be the immediate supervisors of the field enumeration staff, and 80 enumerators—was recruited in April and early May 1992, with selection based on scores on standardized tests. The office and field staffs were salaried, temporary employees of the Census Bureau and were paid at standard U.S. Government general schedule pay scales for the appropriate grades.

The field staff underwent training during the week of May 24. Census Bureau staff conducted a 3-day training session for the crew leaders, covering enumeration procedures, coverage and quality control procedures, administrative requirements, and so on. The crew leaders then each trained the enumerators they would be supervising.

Training and reference materials. The AGR and Field Divisions prepared training and reference guides for use in the agriculture census in Puerto Rico. The principal administrative reference used in the field office was the *Office Procedures Manual*. The manual covered basic administrative procedures for the field office, including local telephone followup operations and processing activities. The field operations assistant was responsible for training the crew leaders of the field enumeration staff, and used the Form A53(PR)SP, *Guide for Training Crew Leaders* as the primary training manual. The individual crew leaders each received a copy of the Form A7(PR)SP, *Crew Leader's Manual*, for their own reference, and used the Form A52(PR)SP, *Guide for Training Enumerators* for training the enumeration staff.

Each enumerator received a copy of the Form A10(PR)SP, *Enumerator's Manual* as the primary reference for the field enumeration. The enumerators also were provided with enumerator kits that included Form A5, *Record Book*, a list of large or special farms in the assigned ED, and a supply of form 92-A1(PR)SP report forms, and a map of the assigned ED. The list of large and special farms included the names and addresses of all farm operators that had been mailed a report form in the June mailout. Enumerators had to verify that the farmer had returned a completed census form, or, if no report form had been received, to visit the nonrespondent address and complete a report form by personal interview. The Record Book contained a supply of form A2(PR), Listing Sheets, which served as a record of the canvass of the ED. Each A3 sheet included a listing of the screening questions enumerators were to use to identify households that qualified as farms under the census definition and space for listing each household canvassed.

Agricultural Extension Office Support

General activities. The UPR-ES functions in the same fashion as the U.S. Department of Agriculture's Extension Service, that is, local offices assist farmers with information and advice on agricultural programs, problems, legal questions, and the like. The local offices have considerable knowledge of farming and farmers within their areas. The UPR-ES assisted the Census Bureau by providing its own farm list for the Census Bureau's census mail list compilation effort, in distributing publicity materials provided by the Census Bureau and promoting the enumeration among farmers in personal contacts, and by providing help to farmers in completing the census report forms.

Farmer assistance activities. The UPR-ES's network of local offices offered an obvious source of assistance to farmers who were being asked by the 1992 agriculture census to complete report forms distributed by mail. The Census Bureau conducted a series of four 3-hour training presentations for ES agents during the last week of May 1993 (held at the ES regional offices in Arecibo and Caguas, at the Tropical Research Station in Mayagez, and at the Agricultural Research Station in Rio Piedras) to familiarize the agents with the census program and to prepare them to answer questions from farmers. Approximately 100 ES agents received the training, which covered

an overview of the census, data collection methodology, the ES role in the census, and the 1992 report form, and concluded with practice exercises to familiarize the agents with the task of filling out the report form.

Publicity

The Census Bureau's AGR and Public Information Office (PIO) cooperated in developing the publicity plan for the 1992 agriculture census in Puerto Rico. The program had three major objectives—

- To aid in recruiting staff for the census operation.
- To encourage cooperation and prompt response by farmers to the census mail enumeration and area sample survey operation.
- To provide information to the public about the release of census data products.

The Census Bureau staff developed several items specifically for the publicity effort in Puerto Rico. The printed materials included two posters, an agriculture census information packet, a newsletter article with general information about the census (including timing, data collected, uses of the data, and so on), two information brochures (one containing general agriculture information and one specifically describing the agriculture census data), and a series of three press releases (''America Counts on Puerto Rico's Agriculture,'' ''Puerto Rico Counts on Complete Agriculture Census Data,'' and ''Puerto Rico's 13th Census of Agriculture Gets Underway''); while public service announcements (PSA's) for use by local radio stations were recorded and distributed as well. The posters came in a large (11″ x 14″) and small (8-1/2″ x 11″) size, and announced the census and that census staff job openings were available. In April 1993, 1,300 copies of the posters were distributed through local government offices and businesses for display in windows and on bulletin boards. The information packet contained—

- A transmittal letter.
- A sheet of frequently asked questions about the census, with answers.
- Copies of the Puerto Rico report form (92-A1(PR) and instruction (form 92 A1(PR)(I) sheet.
- The agriculture census information brochure.
- A census telephone contacts list.
- A copy of the small poster.
- The newsletter article.

The agency assembled and shipped the information kits to the Commonwealth for distribution to (and through) the Puerto Rico Planning Board, Commerce Department, and Department of Agriculture; local newspapers; the Small Business Administration's Hato Rey field office, the UPR-ES, and the U.S. Postal Service; and local colleges and agriculture-oriented organizations.

The PIO produced a series of four 30-second radio spots and distributed copies to radio stations throughout the Commonwealth for broadcast as public service announcements (PSA's) during the census. In addition, the agency produced a 30-second video spot, featuring the Puerto Rican Resident Commissioner, Carlos Romero Barcelo, and distributed copies to television stations in the Commonwealth for broadcast in July 1993.

The Census Bureau also asked the Governor of Puerto Rico to issue an official proclamation about the census. On June 28, 1993, the Governor signed a proclamation designating July 1993 ''Agriculture Census Month'' in the Commonwealth.

DATA COLLECTION

General Information

Early in 1993, the Census Bureau finalized its mail list of all agricultural operations in the Commonwealth that reported total value of agricultural production of $2,500 or more, and/or at least 20 cuerdas of land, in the 1987 census, and any known farms with these characteristics that began operation after 1987. On June 16, 1993, the Census Bureau mailed report forms to the approximately 14,500 addresses on its mail list, asking operators to complete the forms and return them within 21 days. The agency mailed a reminder/thank you card to all addresses on the mail list on June 30. Nonrespondents were followed up by telephone and personal interviews whenever possible. The mail enumeration achieved a 78.2 percent final mail response rate.

In addition to the mail enumeration, the Census Bureau developed and carried out an area sample to collect data on small farm operations. Selected ED's in each municipio (except Catano, which had no agricultural operations meeting the farm definition) were canvassed by a field staff, and any farms that had not received a report form were enumerated by personal interview. Approximately 2,500 farms were enumerated in the area sample. Their data were weighted based on the number of farms in the sample area compared to the number of farms in the municipio from the 1987 census.

Mailout and Mail Followup

The DPD mailed 14,468 census report form packages by first-class mail to farms in Puerto Rico on June 23, 1993. This was the only mailing involving report forms for the agriculture census in the Commonwealth. The Census Bureau carried out a single mail followup to all addresses on the census mail list for Puerto Rico, using Form

2-A1(PR)L2, *Reminder/Thank You Postcards*, by third-class mail on June 30. The DPD printed the addresses directly onto the cards using the ink-jet printers at the Jeffersonville, IN, office, then shipped the cards to the Hato Rey field office for mailout at the end of the month.

Telephone Followup Operations

By July 21 the Census Bureau had received 2,650 completed agriculture report forms in response to the mailout, together with some 3,741 forms returned as undeliverable as addressed (UAA). That left approximately 8,000 nonrespondents for followup operations. The DPD in Jeffersonville, IN, generated adhesive address labels for nonrespondent addresses in descending order of TVP and shipped the labels to the field office in Hato Rey for use in a telephone followup to nonrespondents. Clerks at the Hato Rey office researched telephone numbers for the nonrespondent addresses and began telephoning nonrespondents to try to collect the census data by telephone interview, or to encourage the respondent to agree to complete and return the report form by mail. If the farm operator involved was willing to provide the information the clerk interviewed him or her, and filled out a standard A1 report form using the data supplied. If the respondent was not willing to cooperate in a complete interview, or to complete and return a report form, the clerk tried to obtain enough basic production and inventory information (e.g., total acreage, number of cattle, etc.) to enable the Census Bureau to impute data for the operation based on its general characteristics and geographic location.

Clerks applied the appropriate adhesive address label, with the bar code required for check-in, to the completed report form for each telephone case, and shipped these report forms to Jeffersonville, IN, for check-in and processing.

At the same time, the DPD generated a duplicate set of labels, by municipio, attached them to one-page questionnaires, and shipped them to the UPR-ES. UPR-ES agents reviewed the cases for their respective municipios and provided the Census Bureau with any information they had on each nonrespondent case. By the end of the followup, all cases were resolved as (1) out of scope, (2) will file, (3) completed by telephone, or (4) completed using secondary-source information.

Area Sample Procedures

Field canvassing. The area sample for the agriculture census in Puerto Rico covered all the places that met the census definition of a farm, but had not been mailed a report form, in 123 selected ED's (108 selected for the general area sample, and 15 ''certainty'' ED's (3 from each agricultural region in the Commonwealth) chosen as a coverage sample to identify ''new'' noncertainty farms) throughout Puerto Rico. Two canvassing procedures were used in the field enumeration. In predominantly rural ED's the enumerators visited every household, while in urbanized ED's, and in built-up areas (i.e., a group of 25 or more houses or other structures, each on less than half a cuerda of land) of rural ED's, they were instructed to ''consult knowledgeable people'' to identify persons within the area that operated farms.

The enumerators began interviews in both urbanized and rural areas by asking for the name of the head of the household, and a series of screening questions to determine whether the household qualified as a farm. The questions asked whether—

1. The respondent had, in the previous 12 months, raised, produced, or sold any crops, vegetables for sale, ornamental flowering plants, or had 1 or more cattle, 1 or more pigs, or 15 or more poultry.
2. The respondent had sales of agricultural products in the previous 12 months, or expected sales this year, of $500 or more.
3. This place had 10 or more cuerdas of land, or sales of agricultural products in the previous 12 months, or expected sales this year, or $100 or more.

Enumerators assigned a farm serial number and interviewed the respondent to complete a report form for each place that met the census farm definition. The enumerators tried, whenever possible, to interview the head of each household visited, but when the head was not available, some other responsible adult member of the household could be asked to provide the information needed.

As they canvassed each ED the enumerators plotted each farm, nonfarm operator visited, built-up area, and so on, on their ED maps, so that they and their crew leaders could monitor each ED's coverage as the census continued. The enumerators also completed a Form 92-A4(PR)SP, *Nonresident Farm Operator/Closeout Data Card*, and assigned an A4 serial number, for any place that qualified as a farm, but (1) contained no housing unit, (2) had no operator(s) living there, or (3) for which no responsible and knowledgeable person could be located to provide the required information. The A4 card listed the name and address of the nonrespondent or absent operator and whatever basic information could be obtained from neighbors or other sources. The enumerators gave copies of the A4 cards completed each week to their crew leaders who referred the cases to either the appropriate enumerator within their own area, or to another crew leader responsible for the canvass in the area where the absentee operator lived.

Quality control. Crew leaders supervised the field canvass quality control operation, observing enumerators during canvassing to ensure that interviewing and coverage met requirements, and formally reviewing each enumerator's work during weekly meetings, and again at the completion of canvassing for each ED. The formal review checked—

- Records on the listing sheets with plotted line numbers on the ED maps to make certain the ED was completely canvassed.

- The A3 listing sheets and A4 Nonresident Operator Cards to ensure they had been completed accurately and legibly.
- Completed records against the listing sheets.
- Completed report forms for completeness, legibility, and accuracy.
- Coverage for prelisted large and special farms, and for built-up areas.

Prior to the census, quality control (QC) enumerators visited each area sample ED and, starting from four randomly selected locations on the ED map, proceeded in a specified direction and canvassed the first five houses visited. The QC enumerator carried out a short interview to determine whether a report form should be completed for each place and entered the information on A3 Listing Sheets. The crew leaders used these sheets to check coverage obtained by the regular enumerators for each ED. In cases where a matching address was identified as a farm in the QC prelisting operation, but not in the area sample canvass, the enumerator was counseled about procedures and instructed to revisit the place to resolve the discrepancy. Crew leaders carried out interviews and completed report forms as needed to ensure complete and accurate coverage. Typically, the crew leaders handled difficult refusal cases that enumerators had not been able to resolve.

DATA PROCESSING

General Information

The Census Bureau's DPD in Jeffersonville, IN, processed the report forms from the Puerto Rico agriculture census. After check-in and review of any problem cases or correspondence attached to completed forms, the DPD staff keyed the data from the questionnaires. The resulting computerized records were subjected to a detailed computer edit for consistency and reasonableness. The edit also corrected obviously erroneous or inconsistent data, supplied missing data based on imputation (using characteristics from similar farms to impute information), and assigned farm classification codes needed in tabulating the data. After editing, records were classified as either passed or failed. The DPD staff corrected all failed records until they passed the edit, or were determined to be out of scope.

Before publication, AGR statisticians reviewed the tabulations for inconsistencies and potential coverage problems. The 1992 totals were compared to previous census data, as well as other available information and any problems was examined. When necessary, the staff made corrections to the data records and retabulated the affected totals.

Precomputer Processing

Receipt and check-in. Returned mail cases were checked in by optical scanning equipment that identified each case by the bar code on the mailing label, while report forms completed by personal interview were checked in using assigned identification numbers keyed directly to the database. The first receipts arrived at the DPD office in June, and continued on a flow basis until the last week of September 1993, when the last of the completed report forms were shipped to Jeffersonville from the Hato Rey office at the close of the data collection operation.

After check-in the report forms were routed to the batching control unit where the control clerks batched them into work units of up to 95 report forms using the CATS system (see Chapter 6, ''Data Processing,'' for a details of the CATS system), which printed a Data Entry Batch Cover Sheet for that batch. At the same time the system accepted the batch, it automatically updated the CFN tracking record to show that the report forms in the batch were now going to ''data entry.''

Consistency and coverage review. The Census Bureau maintained historical data from the 1987 census for Puerto Rico in the database used in processing the 1992 agriculture census for the Commonwealth. Large cases preselected for review were identified by a specific processing sort code and were automatically sorted for review by analysts. In their review of the individual cases, analysts checked for internal inconsistencies and matched the 1992 data for a specific case against the historical file to evaluate the reasonableness of any changes.

Data entry. Data entry (or keying) involved transcribing data from the census report forms to a machine-readable data file for edit and tabulation. The DPD's Data Services Branch (DSB) used a key-to-disk interactive system that combined the clerical review of the individual census questionnaires with the data entry operation. Each key station had a keyboard, and monitor that allowed the keyer to display and edit keyed data, as well as receive messages or questions from the input program. Quality control procedures included reviewing samples of each keyer's work and, when necessary, correcting keyer errors and retraining keyers.

The keying unit supervisors distributed work batches to keyers, who opened the plastic envelopes containing the report forms and other documents, wrote a keyer/verifier identification number on the cover sheet, and reviewed each report form for problems as data were entered. Keyers rejected report forms for data entry and assigned ''reject reason codes'' for any of the following reasons:

Code	Reject reason
04	More than 99 CFN's in a batch
06	Blank report form
08	Maximum value failure (a data field entry exceeds the maximum acceptable value)
10	Report form not keyable

The keyers rejected, but did not key a reject reason code for, report forms with invalid CFN check digits.

The interactive data entry system program assigned ''screens.'' Keyers used screen 1 to key the CFN, and screen 2 for entering name and address corrections and adds, and GAC (municipio) information. Screens 3-26 were used for entering data from sections 1-24 of the report forms.

After entering any written in corrections to the identification and address data from the address label area (keyers also entered these data manually for the area sample cases) and section 1 of each report form, keyers began keying the data sections. Keyers did not enter the keycodes for data cells; rather, the keycodes were preprogrammed and assigned to individual data cells based on the location of the data cell on the screen. Once the keyer entered the data for a specific field, he or she used the field release or pressed the ''F6'' function key to go to the next field.

The keyer continued on through each report form, entering the various codes as needed. As data were keyed and verified, DSB lead operators transferred the data electronically to the Charlotte, NC, facility for further processing.

Computer Processing

General information. After keying, the data from each report form were subjected to a computerized edit. Analysts reviewed and verified any substantial changes generated by the computer edits to the data file prior to tabulation. The data were tabulated by municipio and for the Commonwealth and AGR statisticians reviewed all tabulated totals to identify inconsistencies and potential coverage problems. The statisticians carried any required corrections to the individual data records and the specific totals involved were retabulated. After disclosure analysis, the data file was ready to be released for publication.

Computer edit and imputation. The data from each farm record were subjected to a detailed, item-by-item, computer edit. This complex edit—

- Determined whether each record represented an agricultural operation meeting the census farm definition and deleted out-of-scope operations from the file.
- Assigned farm classification codes needed for tabulating the data, including acreage, tenure, product sales, and type of organization (SIC) code.
- Checked consistency between and within sections of each record.
- Checked for reasonable relationships between and among data items, values for various sizes of farms, and combinations of commodities.
- Imputed missing or obviously erroneous data for farms based on information in the same record, or on responses of similar farms in the same geographic area.

Data records that failed to meet the census farm definition, or that had undergone substantial computer-generated changes to the data, were reviewed to ensure that the data had been keyed correctly and/or that the changes were justified. Edit referral cases (i.e., cases that failed edit and were flagged by the computer for review) were reviewed for keying accuracy to ensure that the edit results were correct. Any cases for which the computer edit results were found to be unacceptable were corrected as required and reedited.

Whenever possible, edit imputations, deletions, or other changes were based on related data from the respondent's report form. For some items, such as operator characteristics, data from previous censuses could be used. Values for missing or unacceptable reported data were calculated based on reported quantities and known prices, or by using information from other, generally similar farm operations.

Sample estimation. The 1992 agriculture census in Puerto Rico collected data from only a sample of noncertainty farms, so the Census Bureau had to assign weights to the sample farms to account for data not obtained from those farms excluded from the sample. The Census Bureau also assigned weights to farms in certainty mail ED's to account for farms not on the mail list, and used weighting to compensate for nonrespondent farms as well.

The agency calculated weights separated for three groups of farms—

- **Certainty farms.** For certainty farms, respondent and nonrespondent farms were classified into three strata based on value of sales reported in the 1987 census, and the Census Bureau calculated the number of respondent and nonrespondent farms in each strata. The nonresponse weight assigned to each respondent farm in each stratum was equal to the sum of the respondent and nonrespondent farms divided by the number of respondents. All certainty farms received a sample weight of one, while the final weight for each certainty farm was equal to the product of the nonresponse and sample weights; the final weight assigned to a given farm for estimation purposes was equal to the nonresponse weight assigned to that farm.
- **Noncertainty farms in noncertainty ED's.** In each municipio, the Census Bureau assigned a sample weight to each noncertainty farm in each noncertainty ED equal to the number of clusters (see above) in that municipio. In addition, in each municipio the agency also assigned a nonresponse weight equal to the sum of the numbers of respondent and nonrespondent noncertainty farms, divided by the number of respondent noncertainty farms in that municipio. The Census Bureau multiplied the sample and nonresponse weights for each noncertainty farm to yield the final weight.

- **Noncertainty farms in certainty mail ED's.** In each region, the Census Bureau obtained an estimate of farms in certainty mail ED's that were not on the mail list from the coverage sample, and developed estimates of farms not on the mail list at the municipio level using a synthetic estimation procedure. The agency assigned final weights at the municipio level to sample respondent farms in certainty mail ED's that were equal to the sum of the number of respondent and nonrespondent farms mailed report forms, and the estimated number of farms not on the mail list, divided by the sum of the numbers of respondent farms mailed a report form and respondent farms enumerated for the coverage sample, but not on the mail list.

The Census Bureau estimated item totals by rounding the final weight assigned to each farm to an integer, then multiplying each farm's data values for each item by the integer weight and summing those weighted values over all farms in the municipio. Repeating the process at the regional level produced the regional estimates, and for all farms in Puerto Rico for the island-level estimates.

Tabulation and Data Review

Tabulations. For Puerto Rico, the Census Bureau prepared and published data tables all farms, and (for summary tables at the Commonwealth level only) for farms total value of sales of agricultural products reported of $2,500 or more. Tables showed data for the Commonwealth, the five agricultural regions defined by the Puerto Rico Department of Agriculture, and for municipios.

Table review. The Census Bureau's automated equipment and programs performed the bulk of the analysis and suppression, but AGR staff carried out interactive table review using the Tabulation and Disclosure System (TADS) procedures prior to release of the data for publication. The TADS used interactive workstations (for more information on the TADS see Chapters 2, ''Planning and Preliminary Operations,'' and 6, ''Data Processing''), and the work procedures incorporated status tracking, interactive table review, and data flow. Table review was done using a spreadsheet program; each table had a template containing the various reference files, and the data files were merged with the templates to create the tables that analysts reviewed.

Analysts could make changes to the data, and on supervisory approval, the changes were written to the appropriate file, then the file was electronically transferred to the EPD to update the master matrix.

After all the tables had been reviewed and data and suppression patterns verified, the EPD produced the tables using the Table Image Processing II (TIPS II—a processing system used for large, centralized, computer-based tables) and transmitted these tables to the AGR for review.

Disclosure analysis. The Census Bureau is prohibited by law from publishing information that could be used to identify individual respondents to any of its censuses or surveys. To ensure that this confidentiality is maintained, all of the data tabulations are checked prior to publication in a procedure called disclosure analysis. This involved a review of the data tables that identified and suppressed specific items that, if published, (1) would result in direct disclosure of data reported by a particular respondent individual or company or (2) would reveal information about an individual by derivation—that is, by a user adding or subtracting a published subtotal from a published total to reveal individual data.

PUBLICATION PROGRAM

The Census Bureau published the 1992 agriculture census statistics for Puerto Rico in Volume 1, *Geographic Area Series*, Part 52, *Puerto Rico*. The report showed estimates for all farms in the Commonwealth, for 5 agricultural regions, and for 77 individual municipios. Tables 1-15 contained data for all agricultural operations in Puerto Rico; tables 16-68 showed municipio-level data; and tables 69-71 presented more detailed tabulations for major data items for farms with sales of $2,500 or more.

The basic data shown for all farms included the following:

- Farms, land in farms, and land use.
- Tenure, characteristics, and main occupation of operator.
- Hired workers, agregados, and sharecroppers.
- Selected machinery, equipment, and buildings.
- Agriculture chemicals used, including fertilizers.
- Irrigation.
- Selected farm production expenses.
- Market value of agricultural products sold.
- Farm-related income.
- Livestock and poultry (inventory and sales (including sales of livestock and poultry products)).
- Crops harvested.
- Horticultural specialties.
- Fish and aquaculture (for the Commonwealth).

The tables showed 1992 and comparable 1987 data.

For farms with sales of $2,500 or more, tables 69-74 showed summary statistics (i.e., at the Commonwealth level) for 1992 classified by tenure, type of organization, main occupation and age of operator, size of farm (cuerdas), market value of products sold and type of farm.

The Census Bureau released data highlights from the printed report through its CENDATA™ ''online'' system. In addition, tables taken from the TADS were placed into a spreadsheet format and provided on flexible diskette to the Puerto Rico Department of Agriculture and the University of Puerto Rico Extension Service.

Contents

Chapter 8.

1992 Census of Agriculture for Guam and the U.S. Virgin Islands

INTRODUCTION

Historical Background

The United States purchased the Virgin Islands from Denmark in 1917 and carried out a special census that included an agricultural enumeration that same year. The islands were not included as part of the regular agriculture census operation until 1930, when the Federal Government incorporated an enumeration of the islands into the decennial census program. The first agricultural census on Guam was carried out in 1920, as part of the decennial-census of that year. Thereafter, an agricultural enumeration of the island continued as part of the decennial census program through 1960. In 1964, Title 13, United States Code, Section 191(a) was changed to include both the U.S. Virgin Islands and Guam in the quinquennial censuses of agriculture. (Two other areas—American Samoa and the Northern Marianas Islands—have been included in the agricultural censuses every 10th year; the data are collected during the decennial population and housing census, but are published as part of the preceding agriculture census program. The Northern Marianas Islands became a Commonwealth in association with the United States in 1987. Thereafter, Title 13 was amended to include them in the quinquennial census, beginning with the 1997 enumeration.)

Uses of Agriculture Census Data

The census of agriculture is the principal source of agricultural production data for Guam and the U.S. Virgin Islands and is the only source of consistent, comparable data at the detailed geographic level. Census data are used by the local governments in (1) developing and changing farm programs, (2) measuring the effects of these programs, (3) benchmarking for designing and evaluating their own data collection activities, and (4) for administering a variety of other programs. Private industry uses census statistics in planning production and distribution of its products, and in designing and implementing marketing programs aimed at the agricultural community.

Scope and Legal Authority

The conduct of the agriculture censuses is authorized by Chapter 5 of Title 13, United States Code—Census. Section 142(a) of Chapter 5 directs that agriculture censuses be carried out in 1979, 1983, and every fifth year thereafter, and Section 191(a) specifies that the agricultural enumerations may cover the U.S. Virgin Islands, Guam, the Commonwealth of the Northern Marianas Islands, and other possessions and areas over which the United States exercises jurisdiction, control, or sovereignty. Section 191(b) authorizes the Secretary of Commerce to use data collected by the Governors or other Federal officials (provided the data are collected using plans approved or prescribed by the Secretary) for censuses in any of these places.

In practice, agriculture censuses have been carried out on Guam and in the U.S. Virgin Islands every five years since 1964, while agricultural enumerations in the other outlying areas generally have been conducted decennially, as a component of the population and housing censuses program. (The 1990 decennial census of the Commonwealth of the Northern Marianas Islands included an agricultural enumeration (the data were released as part of the 1987 Census of Agriculture publication program), so the area was not enumerated again for the 1992 census.)

Reference Periods and Dates

Reference periods and dates differed between Guam and the Virgin Islands. On Guam, the agriculture census collected inventory data (i.e., acreage, numbers of livestock and poultry, and so on) as of the day of enumeration, while crop and livestock production, sales, and expense data were requested for the calendar year 1992. In the Virgin Islands, inventory data were asked as of the day of enumeration as well, but crop and livestock sales, production, and expense data were for the 12-month period preceding June 30, 1993.

Farm Definition

Prior to the 1987 agriculture census, any place on Guam or in the Virgin Islands from which any crop, vegetable, or fruit was harvested or gathered, or on which there were any livestock or a specified number of poultry, was identified as a farm. The agriculture census in the 50 States began using volume of sales of agricultural products as the principal criterion for defining a farm in the late 1970's, but local conditions in the areas led the territorial governments and the Census Bureau to retain the broader definition until 1987. The 1987 Census of Agriculture on Guam and in the Virgin Islands introduced a new farm definition based on

dollar value of sales; any place that had, or normally would expect to have, a total annual value of sales of agricultural products of $100 or more was considered a farm. The Census Bureau continued to use this definition for the 1992 census in these areas.

PREPARATORY OPERATIONS

Planning

General information. The 1992 agriculture census in Guam and the U.S. Virgin Islands was a cooperative effort of the Census Bureau and the respective territorial governments. Census Bureau staff began meeting with representatives of the governments of the U.S. Virgin Islands and Guam in May and June 1991, respectively, to negotiate the special agreements that would govern the conduct of the census in each area, and to develop general plans for the enumeration. The Census Bureau also began preparing the procedures, edit programs, and tabulation programs for handling the information to be collected.

Initially, the overall designs for the censuses were almost identical to those for the 1987 agriculture censuses; field interviewers would canvass the islands and collect the agriculture data, using the same definitions employed in 1987, and the report forms and data would be processed at the headquarters.

The general plans for the censuses were formalized in special agreements negotiated by Census Bureau and the area governments.

Special agreements. On October 23, 1991, the Commissioner for the Department of Economic Development and Agriculture for the U.S. Virgin Islands, and on November 6, 1991 the Director of Commerce for Guam, signed memoranda of agreement with the Census Bureau for carrying out agricultural censuses in their jurisdictions. Under the terms of these agreements, the governments of the respective territories assumed responsibility for appointing a census coordinator for each, and for conducting the field enumeration. The local authorities also were responsible for—

1. Recruiting qualified personnel for census jobs.
2. Training persons hired for the census following procedures established by the Census Bureau.
3. Determining local pay rates, subject to review by the Census Bureau for consistency and overall funding availability.
4. Arranging office space, equipment, and supplies required by the census operation within each jurisdiction.
5. Maintaining administrative and financial records for the census and providing weekly reports to the Census Bureau.
6. Publicizing the census locally (the Census Bureau provided promotional materials).

The Census Bureau was responsible for procuring and distributing maps, manuals, and supplies, and for the development of any special procedures that might be required for the enumeration within each territory, together with designing (in consultation with the respective local governments) and printing the report forms, instruction manuals, training materials, and related forms. In addition, the agency provided training for the enumerators and crew leaders, established a calendar of operations, and provided technical advice, as needed, to clarify concepts and procedures. Finally, the Census Bureau bore the total cost of the agricultural censuses in each of the areas.

Report form content. The Census Bureau designed the report forms for Guam and the U.S. Virgin Islands in cooperation with the respective governments. The report forms—the form 92-A1(G) for Guam, and the form 92-A1(VI) for the Virgin Islands—were of similar design and layout. Each form was a single sheet of white stock, measuring 17″ x 14″ folded to 8-1\2″ x 14″, with four numbered pages. The A1(G) was printed in black ink with salmon shading, while the A1(VI) had blue shading. Each form requested information on—

- Land in farms and land use.
- Farm labor.
- Organization.
- Crops harvested (acres and pounds) for sale.
- Vegetables or melons (acres and pounds harvested for sale).
- Fruits, nuts, or nursery crops (inventory and pounds harvested for sale).
- Livestock and poultry (inventory and sales).
- Fish or aquaculture (number and acres of ponds, quantity (pounds) and value of sales).
- Total value of agricultural products sold.
- Expenditures.
- Operator characteristics.

The A1(G) included an additional section requesting data on irrigation (acres irrigated, major source of water, whether a private or public system was used, and the type of rate charged).

The A1(VI) had 13 and the A1(G) 14 sections, including an enumerator's record of the individual interview. The enumerator completed this section with information about the person who supplied the data for the questionnaire, any remarks about the place, owner or operator, crops or livestock, involved, as well as the location of the land, and the enumerator's signature.

[redacted]

[redacted]

Preparation of Enumerator Materials

Printing report forms and enumeration materials. The report forms, materials for the enumerator record books, and administrative forms used in the 1992 agriculture censuses for Guam and the Virgin Islands were printed by private contractors supervised by the Government Printing Office (GPO). All printed materials were delivered to the Data Preparation Division (DPD) office in Jeffersonville, IN, where the staff assembled 500 enumerator record books (using instructions provided by the Agriculture Division (AGR) staff) for each of the areas, and shipped the record books and agriculture census report forms to the AGR in Suitland, MD, at the end of April 1992. The AGR forwarded the materials to the respective census managers for distribution to the field enumeration staff.

Maps. The agriculture census on Guam and in the Virgin Islands was a door-to-door canvass of agricultural operations and accurate maps were crucial to a successful enumeration. The Census Bureau's Geography Division prepared a set of maps for use by the area offices and staffs on Guam and in the Virgin Islands, using the 1990 Topologically Integrated Geographic Encoding and Reference (TIGER) Line files as the geographic data base for the maps. For each area, four office maps were required, showing enumeration districts (ED's), and ED numbers, together with three complete sets of ED maps for use by the enumerators.[1]

Record books and enumeration kit. Each enumerator was provided with a record book and enumeration kit. The record book consisted of a rigid chipboard (for protection of materials and to serve as a writing surface when required), 2 copies of the Form 92-A4(OA), Enumerator's Daily Record, 2 copies of the Form 92-A3(OA), Enumerator's Weekly Report, 20 Form 92-A2(OA), Listing Sheets, and 1 copy each of the Form 92-A4(OA), Cover Sheet and Form BC-356, Envelope. The chipboard, envelope, individual record/report and listing sheets, and the cover sheet were perforated and bound together when each record book was assembled (the envelope was bound to the chipboard with the flap up and to the right, so that it could be opened without disassembling the record book). After assembly of the individual record books, ED maps were folded and inserted in the envelope with the map identifier facing upward for quick identification.

The A2 Listing Sheets served as the record of the canvass in each ED, and listed a series of screening questions enumerators' used to determine whether a place qualified as a farm. The A2 also had prelisted names and addresses of known farms in each ED. Each day, enumerators listed the island name and ED number of the area being canvassed, date, miles traveled, hours worked, number of report forms completed that day, and number of cases pending on the A4 Daily Record. After each week of canvassing, the enumerator completed a Form A3, Weekly Report using this information to date, and turned it over to the responsible crew leader.

A total of 250 record books were prepared for each territory, with about a dozen available for each ED if needed.

Each enumerator also was supplied with a Form A20 Enumerator Manual, and a supply of the appropriate report forms.

Staffing and Training

The staffs for the agriculture censuses in the areas were organized into a small office staff and the field enumeration staff. The census manager for each area functioned as both the general supervisor for the census and the head of the census office. Each area's staff was as follows:

Staff	Guam	Virgin Islands
Total	**21**	**7**
Project manager	1	1
Crew leaders	4	1
Enumerators	16	5

The census staffs received salaries as temporary employees of the local governments, paid on the standard U.S. Government general schedule (GS) pay scale for the appropriate grades.

The local governments appointed the project managers who were responsible to the Census Bureau for the conduct of the enumeration in their areas. Their broad responsibilities included precensus preparatory activities, such as securing office space, recruiting, testing, and selecting personnel, and publicizing the census. They also had general supervisory responsibility for the enumeration and for keeping Census Bureau headquarters informed about the progress of the enumeration. Relatively little clerical work was done at the area offices in the 1992 census, but the project managers were responsible for ensuring that once the enumeration was complete all required materials were secured and forwarded to Bureau headquarters for processing and tabulation.

The crew leaders assisted the managers and directly oversaw the enumeration, reviewed enumerators' work, and made periodic progress reports to the manager. They also carried out any related duties assigned by the manager. The enumerators actually conducted the census, interviewing agriculture operators in their assigned districts.

Census Bureau staff visited Guam in June and the Virgin Islands in July 1993 to train the census managers, crew leaders, and enumerators. Some enumerators left the

[1]The AGR carried out both the 1992 Census of Agriculture and the 1992 Economic Census in the areas. The set of four office maps was used for both census operations, but separate sets of enumerator maps, one for the agriculture operation and one for the economic census, were supplied for both the Virgin Islands and Guam.

census operation prior to completing the census; any replacements that had to be hired received training in enumeration procedures from the local managers.

DATA COLLECTION

Enumeration Methodology

The Census Bureau employed personal interviewing by a field staff for the agriculture censuses for Guam and the Virgin Islands. The enumeration began in July and was completed by mid-August 1993. On Guam, the island's 19 election districts were used as enumeration districts (ED's), while the Census Bureau delineated 20 ED's in the Virgin Islands. An enumerator was assigned to canvass each ED, visiting addresses provided to them as probable farms and asking enough questions about tracts of land on which no one lived to determine whether the person in charge of the land should be interviewed to collect agricultural data. Enumerators also looked for other places, not prelisted, but that evidently had commercial agricultural operations. The enumerators checked with respondents, local feed stores, service stations, and any other knowledgeable source to obtain information on nonlisted places with agricultural activities. Any place that had any crops, livestock, or poultry was listed in the enumerators' record books. If the place(s) appeared likely to have annual sales of agricultural products of $100 or more, the enumerators visited the place and completed a report form for any operation. In cases when no one was at home, the enumerators tried to obtain information from other persons, such as hired workers or neighbors, to decide whether a report form had to be completed for that place. If so, the enumerator made a ''callback'' later to complete the enumeration of the operation.

When visiting a place for field enumeration, enumerators identified the ''operator'' as the person with day-to-day management of the farm and interviewed that person to obtain the necessary information. For partnerships, the partner in charge of the actual farm operations, or the senior partner, was listed as the operator. For land owned by institutions, and used for agricultural purposes, the institutional owner was listed as the operator, and the name of the individual in charge of activities at the place was entered as the ''manager'' in the remarks section of the report form.

For places with two or more tracts of land, or with land in more than one ED, the enumerator completed a single report form covering all the land operated by one person, regardless of location. The enumerator identified the location of each tract of land included on the form to avoid duplication of the data. Operators with land and agricultural activities in more than one ED were enumerated in the ED in which they resided. Once the enumerator identified the person who operated the farm, and could supply the requested information, he or she assigned the place a 10-digit farm serial number (FSN)[2] as a unique identification and wrote it into the appropriate space on the report form, then went ahead with the interview.

Callbacks

For a variety of reasons—the operator was not present, necessary records were not available, or some other reasons not connected with an operator's outright refusal to respond—enumerators sometimes were unable to complete report forms during the first visit to a household. In these cases, the enumerator made arrangements for a return visit—a ''callback''—at a time convenient to the operator. Callbacks were to be made as soon as possible after the initial visit, but enumerators were not to conduct more than two personal visit callbacks unless their crew leader decided special circumstances warranted additional attempts.

Refusals

In cases where an operator refused to respond to the census, the enumerators were to first try to persuade the operator to provide the data needed and to explain the legal requirement for response. When individuals continued to refuse to cooperate, the enumerator identified the case either as a partial or complete refusal (some refusals did provide partial information) in the record book and reported the case to the crew leader (on Guam) or to the office supervisor (in the Virgin Islands). The supervisor was then responsible for determining the correct course of action for obtaining the data.

Field Review

The crew leaders were responsible to the project managers for the actual conduct of the enumeration. They supervised and reviewed the work of their enumerators and made periodic progress reports to the census managers. The crew leaders' reviews included observing each of their enumerators at least once during canvassing, selecting for early observation those enumerators that seemed most likely to have difficulty getting started on the job. The crew leader spent approximately half a day accompanying each enumerator, observing canvassing procedures, including route planning for covering the assigned ED, interview procedures, whether forms and listing sheets are fully and accurately completed, and so on. When interview or other problems were observed during canvassing the crew leader discussed these with the enumerator involved after the interview. After completing each observation period, the crew leader and the enumerator observed/discussed the latter's performance, and the crew leader completed an

[2]The FSN was a 10-digit identification number composed of four parts—the geographic area code, island code, ED number, and line number from the listing sheet.

observation report form. The crew leaders arranged second observations for enumerators that were having difficulties and, where necessary, conducted retraining to correct problems identified during the field observations. (Crew leaders could recommend that enumerators who they rated ''unsatisfactory'' be replaced. In those cases, the final decision was made by the census manager, based on the crew leader's recommendation.)

Crew leaders also monitored the progress of the enumeration, receiving periodic progress reports from their enumerators (the form 92-A3(OA) Enumerator's Weekly Record of Progress). The crew leaders verified both the cumulative figures reported by each enumerator, and completed weekly progress reports for the census manager.

Results

The 1992 agriculture census data collection effort in Guam and the Virgin Islands began in the second week of June 1993 and was completed at the end of July. (The agriculture field enumeration was carried out simultaneously with field work associated with the 1992 Economic Census in the Outlying Areas.) In Guam, the agriculture census enumerated 199 farms with 1,919 acres, of which 1,373 acres were in cropland. The average size of a farm in Guam in the 1992 census was just 9.6 acres. In the Virgin Islands, the census counted 202 farms, with 13,666 acres, of which 861 acres were cropland. The average farm in the Virgin Islands had 67.7 acres.

DATA PROCESSING

The AGR staff at Census Bureau headquarters in Suitland, MD, processed the report forms from the agriculture censuses in Guam and the Virgin Islands. After check-in and review of any problem cases, the AGR staff keyed the information from the questionnaires to a computer data file. The resulting computerized records were subjected to a detailed computer edit for consistency and reasonableness. The edit also corrected obviously erroneous or inconsistent data, supplied missing data based on imputation (using characteristics from similar farms to impute information), and assigned farm classification codes needed in tabulating the data. Any significant change in the data in any given report by the computer edit was reviewed and verified by agricultural analysts in the DPD office.

Before publication, AGR statisticians reviewed the tabulations for inconsistencies and potential coverage problems. The 1992 totals were compared to previous census data, as well as other available information and any problems were examined. When necessary, the staff made corrections to the data records and retabulated the affected totals.

Precomputer Processing

While the local area staffs reviewed the report forms to ensure they had been filled out correctly, they did not carry out any detailed editing or other processing. After the field enumeration was complete, the census manager boxed and shipped the report forms directly to the AGR in Suitland for data preparation and processing. At Suitland, AGR staff reviewed the individual report forms for—

- A farm serial number.
- An ED number.
- Correct geographic area code.
- The name and address of the operator.
- A positive entry under ''land in agriculture.''
- Either crop production or livestock/poultry inventory.

The edit identified report forms for operations that did not meet the farm definition; each such case was verified by an analyst. The remaining report forms were reviewed for accuracy, consistency, and completeness. Reporting errors in computations, units of measures, data inconsistencies, misplaced entries, and so on, were corrected, deriving the missing information from reported data for similar type and size farms in nearby areas.

After review, AGR's Outlying Areas Branch staff keyed the data from each record using a database program on microcomputer equipment at Census Bureau headquarters. The program employed was designed to create data for output in the same format used by the DPD staff at Jeffersonville, IN, for transmitting keyed census data to the Economic Programming Division (EPD) at Suitland for computerized processing. The keyers selected the database option when beginning data entry, creating a file for keying. The computer screen displayed the layout for entering data into the file and the keyer then entered the required identification information for each record, a sequence number (i.e., the number of that record in keying sequence during each data entry session), and the form number. The keyer then moved on to the first data field, entered the field keycode, and keyed the data in that field, and continued on through the report form, entering the keycodes and data for each field containing information. After keying the last entry, the keyer added the completed record to the file by pressing the ''y'' key, which saved the record and automatically moved on to the first field of a new record.

After data entry was completed, the AGR submitted the resulting files to an edit program that prepared them for transmission to EDP for processing, loaded the files to the minicomputer system used for file transfer, and the EPD copied each file to the appropriate data base for processing and tabulation.

Computer Processing

General information. After loading the file to the system, the data from each report form were subjected to an item-by-item computerized edit. Analysts reviewed and verified any substantial changes generated by the computer edits to the data file prior to tabulation. The data were tabulated by ED and for each area as a whole, and AGR

statisticians reviewed all tabulated totals to identify inconsistencies and potential coverage problems. The statisticians carried any required corrections to the individual data records and the specific totals involved were retabulated. After disclosure analysis, the data file was ready to be released for publication.

Computer edit and tabulation. The computerized data files were edited by computer for completeness and consistency. Inconsistent entries or other problem items were ''flagged'' by the edit program and were reviewed by AGR analysts. Inconsistent or other problem data were compared to previous census data, as well as to other available information. The interactive computer system enabled AGR analysts to review up-to-date tallies of selected data items for various criteria or sets of criteria, which could include geographic levels, farm types, sales levels, or other specific characteristics. Any errors or problems were reviewed and researched by reexamining individual data records. Any corrections required were keyed to the records and the corrected data file reedited.

Whenever possible, edit imputations, deletions, or other changes were based on related data from the respondent's report form. For some items, such as operator characteristics, data from previous censuses could be used. Values for missing or unacceptable reported data were calculated based on reported quantities and known prices, or by using information from other, generally similar farm operations. The data from the individual records then were tabulated to produce the statistical table files that would be used for publication.

Disclosure analysis. The Census Bureau is prohibited by law from publishing information that could be used to identify individual respondents to any of its censuses or surveys. To ensure that this confidentiality is maintained, all of the data tabulations are checked prior to publication in a procedure called disclosure analysis. This involved a review of the data tables that identified and suppressed specific items that, if published, (1) would result in direct disclosure of data reported by a particular respondent individual or company or (2) would reveal information about an individual by derivation—that is, by a user adding or subtracting a published subtotal from a published total to reveal individual data.

Table review. The Census Bureau's automated equipment and programs performed the bulk of the analysis and suppression of the data tabulations, but the AGR staff carried out interactive table review using the Tabulation and Disclosure System (TADS) procedures prior to release of the data for publication. The TADS used interactive workstations (for more information on the TADS see Chapters 2, ''Planning and Preliminary Operations,'' and 6, ''Data Processing''), and the work procedures incorporated status tracking, interactive table review, and data flow. Table review was done using a spreadsheet program; each table had a template containing the various reference files, and the data files were merged with the templates to create the tables that analysts reviewed. Analysts could make changes to the data, and on supervisory approval, the changes were written to the appropriate file, then the file was electronically transferred to the EPD to carry the changes to the system files.

After all the tables had been reviewed and data and suppression patterns verified, the EPD produced the table images using the Table Image Processing II (TIPS II—a processing system used for large, centralized, computer-based tables) and transmitted these tables to the AGR for review.

PUBLICATION PROGRAM

The Census Bureau published the statistical data from the 1992 Census of Agriculture for Virgin Islands and Guam, in March and June 1995, respectively, in Volume 1, *Geographic Area Series,* Part 53, *Guam*, and Part 54, *Virgin Islands of the United States*.The publication program did not include any advance reports for the outlying areas.

The report for the Virgin Islands showed statistics for the territory, for Saint Croix, and for Saint John and Saint Thomas (combined). The report for Guam showed data for the island, and for 19 election districts. The statistical tables included data on—

- Number of farms.
- Farm characteristics.
- Land in farms and land use.
- Operator characteristics.
- Selected farm expenses.
- Acres planted, amount harvested, and sales value of fruits and nuts, vegetables and fieldcrops.
- Selected machinery and equipment.
- Inventory and sales of livestock and poultry and their products.

The Census Bureau initially released highlights from the printed reports for Guam and the U.S. Virgin Islands on the agency's CENDATA^{TM} online information service. The data files for the areas later were made available in spreadsheet format on the final 1992 Census of Agriculture CD-ROM release.

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Chapter 9.

1994 Farm and Ranch Irrigation Survey

INTRODUCTION

General Information

The agriculture census began collecting selected data about on-farm irrigation in 1890, and in 1900 the Congress authorized a census of farms using irrigation. The Census Bureau conducted censuses of irrigation (and later drainage) as part of the decennial censuses through 1950, and a survey of on-farm irrigation in selected States was added to the 1954 and 1959 agriculture censuses. Surveys of on-farm irrigation, using samples drawn from agriculture census respondent lists have since been carried out following the 1978, 1982, 1987, and the 1992 Censuses of Agriculture.

In 1990, approximately 81.1 percent of all fresh water consumed for all purposes in the United States was used for agricultural irrigation. The 1992 Census of Agriculture showed that 14.5 percent (approximately 279,000) of all farms in the United States were irrigated, and those farms accounted for approximately 35 percent of total value of sales of agricultural products and 51.9 percent of the value of all crops sold. Information on agricultural irrigation was crucial to legislators and policymakers, economists and farmers, and planners and hydrologists concerned about the nation's supply of both food and fresh water. *The 1994 Farm and Ranch Irrigation Survey* (FRIS) supplemented the basic irrigation data collected from all farm and ranch operators in the 1992 agriculture census, asking a sample of 1992 agriculture census respondents who reported using irrigation for information about their irrigation practices.

Legal Authority

Title 13, United States Code—Census, authorizes the Census Bureau to conduct periodic censuses of agriculture in the United States. Title 13 governs the agency's operations, establishes what censuses shall be taken, the intervals between them, specifies certain administrative procedures, and describes the duties of particular officials. (See appendix A for excerpts of Title 13 applicable to the agriculture census.) Chapter 5 (Censuses), of the title, section 142, directs that agriculture censuses shall be taken ''in every fifth year beginning after 1983.'' Section 182 of the chapter authorizes the use of surveys, while Section 195 provides for the use of sampling (except for the determination of population for purposes of apportionment), to collect and furnish annual or other data on subjects covered by the census. The Census Bureau conducted the 1994 FRIS as a sample survey under the provisions of this section.

Scope and Reference Year

The Census Bureau has normally carried out a farm and ranch irrigation survey, and other follow-on sample surveys, in the year immediately following the agriculture census. That is, in the usual course of events, census data collection would be done in the first six or seven months of the year following the census reference year and the agency would have drawn the survey sample and done other preparations for the survey(s) immediately afterwards. For the 1992 census, this would have meant the irrigation survey report forms would have been mailed in January 1994, to request irrigation data for 1993. However, budget restrictions required a general ''stretching out'' of census operations to save cost. In consequence, the irrigation survey was delayed to the following calendar year and asked for irrigation data for calendar 1994.

The survey requested relatively detailed data, but limited overall response burden by asking only about 1 in every 12 irrigators—identified from the 1992 census file—for information. The sample excluded all farms in Alaska and Hawaii, as well as abnormal and horticultural specialty operations, and was designed to provide reliable estimates of irrigation practices for the 18 water resources areas (WRA's)[1] of the 48 conterminous States, and for the 27 leading irrigating States.[2]

The survey asked respondents to supply data on land use, irrigation, and maintenance expenditures, as well as inventory items for calendar year 1994, while irrigated and nonirrigated crops data were requested for the 1994 growing season.

[1]Defined by the Water Resources Council, WRA's are geographic units, fluvial drainage areas tied to county boundaries at the lowest level. They may intersect State boundaries, but cannot intersect county boundaries.

[2]The leading irrigation States were Arizona, Arkansas, California, Colorado, Florida, Idaho, Illinois, Kansas, Louisiana, Michigan, Minnesota, Mississippi, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, Wisconsin, and Wyoming.

Estimation

The survey used two types of statistical estimation procedures. Statistical estimation was used because not all census irrigators were included in the sample and not all irrigators contacted by the survey responded. The survey estimates were computed by weighting the data for each respondent irrigator by an expansion factor that was the product of the whole farm nonresponse weight, the sample weight, and the ratio estimation weight.

The Census Bureau used whole farm nonresponse weight to expand the survey data to account for the irrigators who did not respond to the survey—for whatever reason—and for the survey report forms that could not be delivered (undeliverable as addressed). For each stratum group, a noninteger nonresponse weight was calculated at the stratum level and assigned to each in-scope respondent record. (The noninteger nonresponse weight is the ratio of the total number of in-scope sample cases to the total number of in-scope responding cases within a stratum.) The underlying assumption of this approach was that survey respondents and nonrespondents within a stratum constitute a homogenous population, allowing respondents to represent nonrespondents.

The sample weight expanded the survey data to estimate universe totals as if a complete census of irrigators had been conducted. All respondent survey records received a sample weight. The sample weight, calculated at stratum level, is the ratio of the universe estimated number of irrigating farms in a stratum to the count of sample farms within the same stratum. A third weight, the ratio estimation weight, was used to obtain agreement between survey estimates and census estimates of universe in-scope irrigated acres at publication level within stratum.

The final weight, the product of the sample weight, the nonresponse weight, and the ratio estimation weight, was randomly integerized for tabulation. If, for example, the final weight for the number of irrigators in a particular stratum was 7.2, then one-fifth of the irrigators in this stratum were randomly assigned a weight of 8 and the remaining four-fifths received a weight of 7. The survey total for a given characteristic was estimated by multiplying the data value by the corresponding sample farm final weight and summing over all sample farms for the respective geographic area.

PREPARATIONS

Planning

Planning for the 1994 FRIS began in 1992, when the Census Bureau's Agriculture Division (AGR) conducted a review of previous farm and ranch irrigation surveys. The Census Bureau mailed letters to selected persons in water-related government organizations, the irrigation and agriculture industries, and academic positions, asking for comments and suggestions on report form content. In addition, the Census Bureau also mailed letters to selected respondents to the 1988 irrigation survey, enclosing a brief description of the proposed new survey, and asking for suggestions on content and any comments on the respondents' experiences in the 1988 survey. Census Bureau staff reviewed responses for use in evaluating data needs and other questions, such as respondent burden.

Comparatively early in the preparation cycle, budget limitations compelled the Census Bureau to stretch out the entire agriculture census program, which led to postponing the irrigation survey until 1994. This meant that the data-collection effort would begin at the end of 1994 and processing, tabulation, and publication would be done in 1995.

Sample Design and Selection

The Census Bureau designed the sample for the 1994 Farm and Ranch Irrigation Survey to produce a relative standard error not exceeding 5 percent on estimated irrigated acreage for the United States, at the State level for the 27 leading irrigation States, and collectively for the combined 21 other States. The agency calculated that these requirements could be met with a sample of approximately 20,000 operations. The universe from which the sample was selected included all farms or ranches—excluding abnormals, horticultural specialty operations[3], and farms and ranches in Alaska and Hawaii—that reported using irrigation in the 1992 agriculture census.

All farm operations eligible for the survey were stratified into 34 stratum groups, each consisting of the irrigators in the 27 major irrigation States (covering the Midwest and Western regions) and the 7 Water Resources Areas (WRA's) defining the Eastern region. Stratum assignment within each stratum group was based on the 1992 reported irrigated acreage, and varied from stratum group to stratum group. The Census Bureau selected an independent systematic sample of farms for each stratum of each stratum group.

The sample included all farms that reported a minimum number of irrigated acres in the 1992 agriculture census (i.e., ''certainty'' farms for irrigation survey purposes), as follows:

[3]Horticultural specialty farms are those farms with a standard industrial classification (SIC) code of 018, or that reported annual horticulture sales exceeding $1,999.

Minimum acres irrigated	States
5,000	California, Nevada
3,500	Arizona
3,000	Florida, Kansas, Mississippi
2,500	Arkansas, Colorado, Georgia, Idaho, Michigan, Texas, Wyoming
2,000	Missouri, Montana, Nebraska, Oklahoma, Oregon, Washington
1,500	All other States

A total of 1,175 certainty irrigators were selected for in the survey.

The sample size assigned to each of the uncertainty strata was defined as the maximum of a Neyman allocation and an allocation proportional to the individual stratum's share of the stratum group's 1992 total irrigated acreage. The sample included 18,823 farms selected from the noncertainty strata.

The Census Bureau selected the sample systematically and independently for each stratum of a stratum group, beginning from a random start. The final sample file for the survey consisted of 19,998 records, representing about 8.1 percent of all farms and ranches in the conterminous 48 States reporting irrigation in the 1992 census, and 33.1 percent of the 47.4 million acres of irrigated land.

Report Form

The 1994 FRIS questionnaire, form 94-A62, was an 8-1/2″ x 11″, 12-page booklet on white stock, with printing in black ink and shading in a blue wash. The report form incorporated a cover letter asking for the respondent's cooperation on page 1, and general information on the survey, assistance available to respondents, and confidentiality, on pages 11-12. The main body of the report form consisted of 20 sections. One section asked for the name and telephone number of the person completing the form, while the remaining 19 requested detailed information on—

- Acreage.
- Land use.
- Whether any land was irrigated.
- Method of water distribution.
- Acres irrigated and estimated quantity of water used by source.
- Acres harvested and crop yields.
- Irrigation frequency, method of water distribution, and use of commercial fertilizers and pesticides in irrigation water by selected crops.
- Number of irrigations wells, well depth and pumping capacity.
- Pumps other than well pumps.
- Energy used for pumping irrigation water by power source.
- Maintenance and repair costs for irrigation equipment and facilities.
- Expenditures for irrigation facilities.
- Irrigation practices.
- Other uses of irrigation water.
- Participation in Federal Government commodity programs or wildlife programs.
- Improvements to irrigation systems to reduce energy and/or conserve water used in irrigation.
- Sources of irrigation information.
- Irrigated land in 1992, and (if no irrigation in 1994) reasons for discontinuing irrigating.

With the exception of Item 19 (''Irrigated Land in 1992'') all of the data were requested for calendar 1994.

DATA COLLECTION

General Information

The 1994 irrigation survey was carried out using mailout/mailback enumeration and followup, supplemented by telephone followup to large irrigation operations. The initial mailout for the survey involved mailing 19,998 survey packages to irrigators in January 1995, followed by a thank you/reminder card approximately 4 weeks later, and three mail followups, each consisting of a cover letter, a report form, and a return envelope. The Census Bureau completed data collection in June 1995 and the publication results were released in November 1995.

Mailout and Mail Followup

Private contractors printed the report forms and associated materials (Form 94-A62, Report Form, outgoing and return envelopes, for the initial mailout and the report form followups, and the reminder/thank you card), and delivered them to the Data Preparation Division (DPD) office in Jeffersonville, IN, in early December 1994. The staff there printed the address labels for the mailout using the computerized address file compiled by the AGR, and the clerical staff at Jeffersonville assembled the mailout packages. The initial mailout consisted of a Form 94-A62, Report Form, a brochure explaining the need for the irrigation data, and a return envelope. The initial mailout, and the second, third, and fourth followup mailings involved complete report form packages, while the first mail followup used a card reminding addressees' of the requested response date, and thanking them if they already had responded.

After each mail response cutoff date the Census Bureau's staff generated an updated computerized list of nonrespondents, which was then used by the DPD staff to print address labels for the followup mailings. The Jeffersonville clerical staff attached the labels to followup mailing packages during the 3-5 day intervals between the response cutoff dates and the next mailout. The initial survey mailout, and the followup mailings were as follows:

Mailout	Type	Date	Forms mailed
Survey mailout	Report form	12/29/94	19,998
First followup	Reminder/thank you card	01/13/95	19,998
Second followup . .	Report form	02/10/95	11,800
Third followup.	Report form	03/16/95	8,300
Fourth followup . . .	Report form	04/21/95	6,716

Mail data collection was closed down at the end of the second week of June.

Telephone Followup

After the final followup mailing, the AGR staff prepared a list of the irrigation survey certainty cases that remained nonrespondent for possible telephone followup. Given the limited size of the sample for the irrigation survey, the Census Bureau considered the data from large-scale irrigators critical to developing reliable statistical estimates, and subjected these cases to intensive followup. Clerks at Jeffersonville, IN, researched telephone numbers for the selected cases and on May 10 began calling the certainty cases that remained nonrespondent (478 of the 1,175 certainty cases were nonrespondent as of May 8). The telephone staff attempted to contact operators to obtain the basic acreage, crop, and irrigation data required for the survey. The telephone followup activities continued until June 2, by which time responses had been obtained from all but 18 of the original nonrespondent list. AGR staff pulled the 1992 census reports for these cases to review them and determine whether data could be projected for them for incorporation into the irrigation survey estimates.

Results

The 1994 FRIS attained a final overall response rate of 73.6 percent, representing 14,373 receipts, excluding 477 undeliverable as addressed (UAA) cases. This was about 1.6 percent below the final response rate obtained for the 1988 survey. The Census Bureau employed statistical estimation procedures to develop State, WRA, and national estimates for the over 248,000 irrigators and 47.4 million acres of irrigated land in the 48 conterminous United States.

DATA PROCESSING

General Information

The 1994 FRIS report forms were returned to the Jeffersonville office for data processing. All the forms were reviewed upon receipt and check-in to identify significant inconsistencies, and to ensure that the data entries could be keyed to the data file. Remarks by respondents were reviewed for possible response by the agency or to make certain accurate information was added to the data file, and any inconsistencies or obvious errors were corrected before keying. After the data were entered into the data file, the file was subjected to a detailed computerized review and edit at the Census Bureau's headquarters in Suitland, MD. Before publication, the tabulations from the FRIS data file were reviewed, using data from the 1992 census, to identify inconsistencies or potential coverage problems.

Receipt and Check-In

The FRIS report forms, as well as UAA's, were checked in at the processing office using the wand/keyboard stations. The returning report form packages then were slit open and the report forms removed for check-in. Forms with attached congressional correspondence (notes indicating that a respondent intended to contact a congressional office counted as congressional correspondence) were pulled from the processing operation stream and sent directly to the AGR at Census Bureau headquarters in Suitland, where they were held and processed once the correspondence had been resolved. Materials sent to the attention of a particular analyst (i.e., the analyst's name appeared on the envelope, report form, or in attached correspondence) were forwarded to the analyst. All other checked-in materials went to the agriculture processing unit for clerical review before data entry.

Correspondence and Telephone Assistance

The FRIS processing staff at the Jeffersonville office included a correspondence and telephone assistance unit to handle respondent-originated correspondence (ROC) and telephone calls generated by the survey. The unit received ROC materials on a flow basis from the check-in area and reviewed the items to determine action required for resolution. In fact, only 10 ROC items were received by the Jeffersonville office; 8 of these were resolved by clerks during review of the enclosed materials. Clerks contacted the two remaining cases by telephone for completion.

The initial mailing package, and all the followup mailings, included a toll-free telephone number for respondents to use if they had questions about the FRIS or needed assistance in completing their report form. The Jeffersonville telephone staff handled incoming calls, providing assistance to any respondents who needed help and answering any questions callers had about requirements to respond, whether or not their farm qualified as an irrigation operation for the purposes of the survey. The telephone staff updated the FRIS check-in file using computer work stations and interactive processing systems. Whenever a callback was required (e.g., to obtain additional information from the respondent, or to confirm that a report form had been received) the telephone clerks asked for a telephone

number and the most convenient time to call. The Jeffersonville office received some 400 calls relating to the FRIS, approximately 170 from respondents requesting help in completing their report forms. About 70 callers asked for information on whether they actually had to respond to the survey, while a further 60 claimed to have already filed a report form. (Clerks used the interactive systems to check the FRIS check-in file to determine whether questionnaires had been checked in for the respondents who claimed to have filed.) Approximately 70 callers said they no longer irrigated, and 15 more were outright refusals to respond.

Prekey Review

The Jeffersonville clerical edit staff received report forms on a flow basis from the open and sort unit, and reviewed them prior to data entry. The edit clerks pulled blank forms from the processing stream for remailing to the respondent (a cover letter requesting response was included when such forms had to be remailed). The prekey review involved both the report forms and interactive systems. The prekey review clerks reviewed the individual report forms and annotated them as needed. The reviewers began the review of each form by checking item 3 (''Was any land on the farm or ranch you operated irrigated at any time in 1994?'') and item 19 (''Irrigated Land in 1992''). If the respondent answered ''no'' to both items, the clerk marked the form as being out of scope. (Approximately 1,600 report forms returned to Jeffersonville were determined to be out of scope of the survey, and some 1,065 more survey addresses were determined to have discontinued farming since 1992.) Report forms from large farms that reported irrigation in the 1992 census, but none in the FRIS, were followed up by telephone to clarify the apparent discrepancy. (The review clerks could make these followup calls directly from their work stations.)

After determining that a report form was inscope, the clerks conducted an item by item review of the form, using written edit guidelines. The review checked for the completeness and consistency of reporting (e.g., that acreage included land owned, land rented from others, minus land rented to others; that the individual land-use items added up to the total acres in the place; that the methods of water distribution reported were consistent throughout), moved ''tenths'' reported to the tenths column when necessary, converted decimals and fractions to the proper whole numbers, deleted cents when reported in the dollar column, converted bracketed and range data to a single item as required, converted improper units to proper units when required, and struck out unnecessary symbols (e.g., for feet (') or inches (″)).

Out-of-scope records were assigned an action code of ''57'' using the interactive systems, and the report forms were routed to the analysts' area where they were maintained in a serialized file until FRIS processing was completed. In-scope report forms were sent to the batching area to be grouped into work units for data keying.

Data Entry

Batch for data entry. Following the prekey review, the report forms were routed to the Jeffersonville Data Systems Branch (DSB) for data entry. The batches arrived, with data entry batch sheets attached, in plastic envelopes, and were distributed to individual keyers. The keyer(s) used the interactive minicomputer systems employed in the general census for entering the data, beginning by logging onto the agriculture/economic data entry batching menu and entering the appropriate user name, password, and three-digit operation code (FRI) required for the FRIS, then the batch information (batch size and identification codes).

Data entry. The keyer(s) followed procedures generally similar to those used for the agriculture census report forms in entering the data from the individual reports. Each keyer opened the plastic envelope containing the batch to be keyed and checked each report form for problems as the data were entered. Keyers rejected report forms for data entry and assigned ''reject reason codes'' for blank forms (code 01—items 1-19 on the report form were blank), maximum value failures (02—the data field(s) exceeded the maximum allowable value for that field), or the batch contained more than 99 CFN's with ''good'' data (03). Report forms also could be rejected and no reject reason code assigned for a CFN check-digit failure, or because the State code was invalid. Keyers pulled rejected report forms from the batches and referred them to a supervisor.

The interactive system assigned a series of screens for the keyers to use in keying the data. Screens 1-2 were used for keying the CFN and any information in the Census Use Only (CUO) Box 022, and for name and address corrections. Screens 3-12 led the keyer through the rest of the report form. Individual keycodes were not entered, since the processing system already had these internally programmed, but were automatically assigned to data fields based on their location on the screen. The keyer entered the data for each data field, then either used the field release command to move on to the next data field, or pressed the ''F6'' function key, which enabled the keyer to specify a particular field.

Quality control. Quality control procedures for the FRIS data keying operation were similar to those employed in the agriculture census (see Chapter 6, Data Processing). Keyers were subject to the same two-stage verification regime in training, and the work batches were reviewed and verified at the same rates, depending on the size of the individual batches.

Work unit size	Verification rate (percentage)	Sampling interval
Less than 24	100	All
24-44	12.5	8
45-74	6.67	15
74-99	4.0	25

After completing keying or verification for a batch, the keyer wrote a keyer/verifier ID number, the number of report forms and data fields keyed/verified, the number of report forms rejected, and the date on the Data Entry Batch Cover Sheet, and routed the batches to a holding area where they were retained until computerized edit was completed.

Computer Edit and Final Edit

The individual data from all the report forms were passed through a computerized edit review. An initial review identified missing entries, entries outside acceptable ranges, and inconsistencies between predefined items. Based on the number and types of problems identified in the initial review, analysts either prescribed computer edit procedures to correct individual data items, or initiated corrections of data items on a record by record basis.

Tabulation

The Census Bureau tabulated the FRIS data using the SAS software package. The tabulation program compiled 35 tables containing detailed estimates of irrigation data from farm operators reporting irrigated land in the 1992 census and the 1994 FRIS. AGR analysts reviewed the national and State tabulations as they were produced for inconsistencies and potential coverage problems, comparing the tables to 1992 census data. Any corrections needed were made to the data file before running the final tabulations and releasing the statistics for publication.

PUBLICATION

Data from the 1994 Farm and Ranch Irrigation Survey were published in the *1992 Census of Agriculture*, Volume 3, *1994 Farm and Ranch Irrigation Survey*. The printed report presented summary irrigation data for all States, with more detailed tabulations for the 27 leading irrigation States and for the 18 Water Resources Areas. The tables showed data for calendar 1994 on farms irrigated, land use, quantity of water applied, land irrigated and method of water distribution, estimated quantity of water applied by source, wells and pumps on farms; selected expenditures for energy, equipment, and maintenance; selected crops harvested; application of chemicals; other uses of irrigation water; Standard Industrial Classification (SIC) code; market value of crops sold; water management systems used; participation in Federal commodity programs; energy and water conservation improvements; sources of irrigation information used to reduce costs; and farms with diminished crop yields resulting from irrigation interruption by cause. Most tables included 1988 and earlier historical data for comparison.

The survey data also were released on CD-ROM, and highlights of the report were released online through the Census Bureau's CENDATA™ service.

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Chapter 10.

Coverage Evaluation and Research

1992 COVERAGE EVALUATION

Introduction

Background and objectives. The Census Bureau began conducting regular coverage evaluations of the agriculture census in the 1945 program and first released the results of the evaluation study as part of the 1950 census publications. Since then, the agency has routinely evaluated each agriculture census for the accuracy and completeness of the farm count and for coverage of selected data items (e.g., land in farms, total value of agricultural products sold, and so on). The methodology used has remained relatively unchanged—an area sample survey combined with a list sample survey—although specific techniques and sample designs have been refined and improved with each census.

The principal objectives of the 1992 Census of Agriculture coverage evaluation program were to provide—

- State estimates of the number of farms not on the mail list.
- Census region estimates of the number of farm operators incorrectly classified, and of duplicate farms.
- Census division estimates of selected agricultural characteristics of undercounted farms.

The 1992 coverage evaluation program estimated that 252,646 farms were not on the census mail list, 61,965 farms were omitted from the census tabulations due to incorrect classification as nonfarms, 50,400 nonfarms were counted as farms, and 23,505 extra farms were counted due to respondents returning more than one census report form.

General procedures. The Census Bureau established an agriculture census coverage evaluation unit at the Data Preparation Division (DPD) office in Jeffersonville, IN, in January 1993. The unit consisted of clerks assigned from the DPD staff and an agriculture data analyst attached to the DPD office from the Agriculture Division (AGR) at the Suitland, MD, headquarters. The coverage evaluation unit carried out clerical and analytical review of the data from the census using other data from the U.S. Department of Agriculture (USDA).

The 1992 coverage evaluation program used USDA's National Agricultural Statistics Service's (NASS's) 1992 June Agricultural Survey (JAS) and the 1992 Classification Error Survey (CES—carried out as part of the 1992 agriculture census) for developing its coverage estimates. The JAS is an annual national area sample survey designed to measure planted acreage and number of livestock by State. The JAS was a field canvass of selected area segments, and the Census Bureau matched the segment records to its census mail list. Matched and nonmatched addresses were mailed census report forms—the matched ones as part of the regular census mailing (the initial mailing in December 1992 and followups (as necessary)) and the nonmatched cases as additional mailings. The NASS conducted the JAS, and the Census Bureau used the 1992 JAS data to estimate the number and characteristics of farms not on the census mailing list.

The Census Bureau used the 1992 CES data to estimate the number of misclassified (i.e., farms incorrectly classified as nonfarms, and nonfarms incorrectly classified as farms) and duplicate farms in the census. The survey used mail enumeration, with followup of nonrespondents by telephone. The Census Bureau compared the CES farm status (i.e., classification as farm or nonfarm) to the census farm status to determine whether a given sample farm had been correctly classified in the census.

Sample Survey Designs and Methodologies

1992 June Agricultural Survey (JAS). The USDA's National Agricultural Statistics Service (NASS) conducts the June Agricultural Survey (JAS) to measure planted acreage of crops and number of livestock. The JAS results serve as a base for subsequent NASS surveys (e.g., the September, December, and March agricultural surveys). The area sample frame portion of the JAS is enumerated by personal interview during the first 2 weeks of June each year, using June 1 as the data reference date.

The NASS samples from an area frame to conduct the JAS. The basic stratification divides all land for a State into six to eight land-use strata—e.g., intensive cultivation, urban area, rangeland, etc. Cultivated land was divided into several strata based on the degree of cultivation. Primary sample units (PSU's) were land parcels selected within each land-use stratum, and each randomly selected PSU was further divided into several additional sampling subunits or segments. The size of the PSU's varied, but a

typical one had six to eight segments. Segments were drawn to have an average of three farms, and had to include at least one resident operator.

The JAS employed a two-stage, stratified probability sample of U.S. farm operations. The first stage of the actual survey was the selection of PSU's for inclusion in the sample. The PSU's were selected with probability of selection proportional to the number of segments within each PSU of the substratum. In the second stage, a segment was selected with equal probability from each PSU. The land area within each selected segment was completely enumerated so that the segment, rather than the individual farm, was the sampling unit.

The Census Bureau's JAS files were compiled from three files provided by the NASS—

- The JAS name and address file supplied by the NASS in July 1992. This file consisted of the names, addresses, and other identifier information for all JAS area segments that had any indication of agricultural activity.
- The JAS detail file, containing all the requested supplemental data items from the JAS, including identifying and whole-farm agricultural data.
- A list of farm status changes compiled by the NASS between June and December, 1992, and transmitted to the Census Bureau early in 1993. (This status-change list was checked against the JAS name and address list and any needed corrections were made.)

Once the sample segments had been selected, field interviewers canvassed them to establish who operated the land within the segment. Each separate farm operation was identified as a tract, although a single farm might include ''tracts'' in more than one segment, and each tract became a reporting unit. Unlike the 1987 census, the 1992 agriculture census estimate from the JAS was based on a weighted segment estimator, which used a proportion of data from each farm operation in the segment, regardless of the where the respective farm operator resided.

1992 Classification Error Survey (CES). The 1992 Classification Error Survey (CES) was a reinterview of a sample of 1992 agriculture census cases, using a different, shorter report form to collect information to determine the true farm status of the operations contacted. The CES was designed to develop estimates at the national and census region level of—

- Farms incorrectly classified as nonfarms.
- Nonfarms incorrectly classified as farms.
- Farms duplicated on the census mail list.

The survey used an independent, regionally stratified, systematic random sample of addresses from the census mail list, excluding farms in Alaska and Hawaii, operations with expected sales of $500,000 or more, multiunits, and abnormals.[1] The sampling rates within census regions were based on the estimated proportion of farms misclassified or duplicated in the 1987 census and a specified coefficient of variation.[2] The universe from which the sample was drawn consisted of 3,447,112 mail list records. The sampling rates used in the census geographic regions were as follows:

Region	Sampling rate
Northeast	1 in 176
Midwest	1 in 166
South	1 in 157
West	1 in 160

Sample Survey Data Collection

The NASS collected the data for the 1992 JAS by field canvass of each segment in June 1992. The Census Bureau received the JAS data files, containing the names, addresses, and agricultural data on all area-segment residents with any agriculture activity at the time of the survey, matched the file to the census mail-list development file, and assigned special processing codes to all JAS records not found on the mail list. These codes identified the JAS records once they were added to the census mail file.

The 1992 CES was a mail and telephone enumeration operation. The Census Bureau obtained the report form check-in status for all sample addresses at two designated cut-off dates using a unique CES evaluation code set in the census data base at the time of sample selection. Form 92-A90, Evaluation of the 1992 Census of Agriculture report forms were mailed to CES sample addresses in two waves, the first in April 1993, the second in the following July. These mailings totalled 16,804 sample survey cases. A reminder followup mailing was carried out 2 weeks after each initial mailout, using a post card to request response, and a second followup, including a report form, was done 2 weeks later. The Census Bureau carried out a telephone followup to all CES cases still nonrespondent from each mail group 8 weeks after that group's initial mailing.

Processing

JAS file processing. The Census Bureau matched the JAS name and address list against the census mail list to identify the JAS area sample records as either matched or unmatched to the census mail list, and assigned a census file number (CFN) and an evaluation code for census processing to each JAS record. Any JAS records not on the census mailing list were added and included in the census

[1]Operations in Alaska and Hawaii, and multiunits (i.e., complex organizational units with farming operations in more than one location) and abnormals (including Indian reservations, research stations, and other institutional farms) were considered inappropriate for the CES because of their unique characters, and because all were subjected to intensive followup in the census.

[2]A ''coefficient of variation'' is the standard deviation of a distribution divided by the arithmetic mean, sometimes multiplied by 100.

report form mailout. The JAS name and address file and the detail file were used to create a JAS-census control file with the JAS identification and weighting information for each record, and a JAS-census detail database containing the identifying and agricultural detail data.

During census processing, the DPD identified report forms for JAS-census cases using the pre-assigned evaluation codes. These cases were sorted out of the main census cases and microfilmed before being returned to the census processing cycle. All the JAS-census cases went through normal census processing, including data entry, edit, and imputation. However, the Census Bureau withdrew the nonmatched JAS-census cases data before tabulation and analytical review of the aggregate census estimates.

JAS-census cases that did not respond to the census were followed up in the same manner as regular census cases, except that after a specified cut-off date (based on the processing schedule), all JAS-census nonrespondents were telephoned for information. The Census Bureau used JAS information to impute data for cases that did not respond to the telephone followup.

The DPD's agriculture coverage evaluation unit processed the JAS-census cases, comparing the data reported in the census for each case with the data reported in the JAS to ensure valid matches. The coverage evaluation unit used the reported data for each case to independently determine the farm status of unmatched JAS cases. The unit reviewed the coverage classification codes assigned to each JAS sample case after each State closeout for analytical review. These codes showed each JAS case's relationship to census mail-list cases (i.e., whether the record matched an address on the mail list) and the farm status assigned by the JAS, the census processing unit, and the coverage evaluation unit.

The Census Bureau used the JAS nonmatch records to estimate the total number and selected characteristics of farms not on the census mail list for States, divisions, regions, and the United States. The data required for these estimates were transmitted to the Census Bureau's Suitland, MD, headquarters from the DPD office in Jeffersonville, IN, on a State-by-State basis after closeout for final analytical review. The edited farm data for matched and unmatched records constituted the sample for deriving estimates of farms not on the mail list.

CES processing. The 92-A90 questionnaires were microfilmed as they were checked in at the DPD processing office. The DPD staff also identified and microfilmed the 1992 agriculture census report forms for the CES cases. Clerks reviewed the CES report forms to classify each record as either a farm or nonfarm, based on reported data, and then the CES-derived farm status was compared to the census farm status to identify cases incorrectly classified. The clerks referred cases with apparent errors to analysts for further review. The analysts attempted to reconcile any differences between the CES and census records, using telephone followup as needed to confirm suspect information. The processing staff assigned coverage evaluation codes to each record to identify its classification (and the relationship between the CES farm status and census farm status). Microfilm and data files were transferred to the Census Bureau's Suitland, MD, facility for editing and tabulation.

Estimation

The Census Bureau used the final data file from the JAS in conjunction with CES data to produce coverage-error and classification-error estimates for the census. The estimated true number of all farms in the United States is the census published farm count, plus the number of undercounted farms, minus the number of overcounted farms.

The undercount number can be divided into two major components—farms on the census mail list misclassified as nonfarms, and farms not on the mail list. The overcount comprises those nonfarms misclassified as farms in the census, and farms duplicated in the enumeration.

The Census Bureau used statistical modeling to prepare its estimates for the undercount and overcount. The model used an independent survey—in this case, the JAS—in conjunction with the census (adjusted for classification and duplication errors using CES results) to estimate the true total number of farms. The model assumed—

- Both the census and the JAS attempted to measure the same statistical universe (i.e., all agricultural operations in the United States that met the census farm definition) for the same period of time.
- The probability of a farm being on the census mail list was independent of its probability of being included in the JAS.
- The likelihood of being missed by either the census or the JAS was the same for a a given size category.
- Census and JAS results could be matched without errors.
- Spurious events, such as nonexistent cases, had been eliminated from both the census and the JAS.
- Sufficient data were collected about nonrespondents in both the census and the JAS to permit accurate classification.
- If post-stratification was done, the variable used was correctly recorded for all farms.

Estimates of classification error were based on the ratio of such errors identified by the CES. Sample counts of such errors were expanded to represent all farms by multiplying the ratio of all farms in the region to farms sampled in the region for study. Estimates of duplication error (overcount) were based on counts of farms determined by review of CES data to have been reported more

than once in the census. (For details of the estimation methodology, see the *1992 Census of Agriculture*, Volume 2, *Subject Series*, Part 2, *Coverage Evaluation*.)

At the region or United States level, the census farm count and totals for selected farm characteristics were adjusted for farm classification and duplication error. State and division level estimates of farms not on the mail list were not adjusted for classification or duplication errors because estimates for those factors were not available at that geographic level. Division, region, and United States estimates were developed by summing lower-level estimates before adjusting for classification error.

Results and Publication

Coverage error estimates. The 1992 coverage evaluation program estimated net farm coverage error to be 11.1 percent, plus or minus 0.7 percent, resulting in an estimated census coverage for the United States of 88.9 percent of all farms. This was down from the 1987 coverage estimate of 92.8 percent of all farms. The coverage error, both undercount and overcount, was largest for small farms. The estimated gross undercount for farms with sales of less than $2,500 was 35.5 percent (plus or minus 1.5 percent), while the estimated overcount was 4.7 percent (plus or minus 1.9 percent), yielding a net coverage error of 30.8 percent. For farms with sales of $2,500 or more, estimated gross undercount was 6.6 percent (plus or minus 0.4 percent), while overcount was 2.9 percent (plus or minus 0.5 percent), which resulted in a net coverage error for these farms of just 3.7 percent. The evaluation indicated that approximately 80 percent of undercounted farms were not on the census mail list; the remainder were principally farms misclassified as nonfarms. Of the undercounted farms, 67.8 percent had 49 acres or less, and two thirds were livestock operations.

Nonsampling error. The coverage estimates are subject to nonsampling error; which may result from flaws in the statistical model design and/or report form design; incomplete enumeration; inaccurate census and JAS list matching procedures; and incorrect or inaccurate data reporting and processing for the JAS, CES, and the census. The Census Bureau made extensive efforts to minimize nonsampling errors in the surveys used for the coverage evaluation through quality control and other verification measures. Nevertheless, potential sources of nonsampling error remain, such as the failure to classify some 205 of the total JAS sample cases. The estimates were not adjusted specifically to compensate for these cases, so there remains a small potential bias in the estimates for farms not on the census mail list.

Publication. The Census Bureau published State-level estimates of the number and characteristics of farms not on the census mail list in the Volume 1, *Geographic Area Series* report for each State. The State-level estimates for farms not the mail list, as well as the classification error estimates, were released in a separate report, the *1992 Census of Agriculture*, Volume 2, *Subject Series*, Part 2, *Coverage Evaluation*. The report included text describing the evaluation program and the statistical methods employed and charts and tables showing State estimates of farms not on the mail list; United States and regional estimates of census farm coverage, farms by selected characteristics and components of coverage, and number of farms misclassified; and United States, regional, and divisional estimates of selected characteristics of missed farms.

CLASSIFICATION AND REGRESSION TREE (CART) MODEL EVALUATION

General Information

The initial mail list for the agriculture census typically included a proportion of addresses that did not meet the census farm definition. Collecting the required information as economically as possible is a major objective of the census, hence the Census Bureau made every effort to reduce the number of nonfarm addresses on its agriculture census mail list. For the 1992 agriculture census, the initial mail list contained 3.78 million individual addresses; a combination of budget considerations and the need to attain the best possible coverage of farm operations compelled the Census Bureau to reduce the total size of the mail list to approximately 3.55 million records. The methodology used to do this involved using a classification and regression tree (CART) statistical modeling procedure that classified records into groups of probable farm and nonfarm operations. Those groups least likely to be farms were dropped until the list was reduced to the 3.55-million record cutoff level. Subject matter analysts reviewed all records dropped from the mail list by the CART model and made changes to derive the final dropped records. (For details of the 1992 CART modeling operation see Chapter 3, ''Preparatory Operations.'')

The Agriculture (AGR) Division staff evaluated the effectiveness of the CART methodology by examining—

- Associations between expected and observed farm proportions for all mail list CART groups.
- Differences between expected and observed farm proportions and possible variables that explain any differences.
- Measures for comparing the 1992 and 1987 models.
- Differences between the original CART drops and analysts' adjustments, and comparisons to what was expected.
- The overall performance of the model, including measures for correct record classification.

After completing the evaluation, the staff drew up a list of recommendations for improving the CART methodology for use in the 1997 Census of Agriculture.

Statistical Methods

General information. The model drop survey evaluation used nonparametric comparisons (i.e., comparisons not involving estimating parameters of the statistical tests) in sample paired tests to analyze the proportion of expected farms and observed farms in model groups on the final mail list. The statistical tests determined whether—

- There was a dependence between the expected and observed paired observations (the results indicated the proportions were dependent).
- The expected and observed farm proportions had a positive or negative association (the proportions had a strong positive association).

Once dependence was established, the Census Bureau tested the interchangeability or exchangeability of the expected and observed farm proportions. The results indicated that there was not enough information available to determine whether the respective proportions were interchangeable. The Census Bureau also determined that there was a systematic difference between the expected and observed proportions.

On the 1992 agriculture census mail list the observed farm proportions were consistently greater than the expected proportions for each model group. This was the opposite of the Census Bureau's experience in the 1987 census, due primarily to differences in the overall proportion of farms on the mail list from census to census.

In examining the differences between expected and observed farm proportions, the Census Bureau's evaluation tested for the possible impact of several other factors on the proportions, such as the State involved (the CART modeling was done by State) and the size of the model group. Neither of these showed a significant impact on explaining the variation in the differences.

Model Drop Survey analysis. In September and October 1993, the Census Bureau carried out a Model Drop Evaluation Survey using a sample of approximately 7,900 addresses drawn from a national sample frame comprised of the 229,180 addresses deleted from the census mail list by the CART procedures. The survey universe records were divided into five strata based on expected farm probability of the record group assigned to it by the CART. A simple systematic sample was selected for each strata. A total of 5,892 responses were obtained by the survey, of which 5,526 were classified as farm or nonfarm addresses.

Farm proportion estimation. The records used for the model drop survey evaluation[3] were classified in four categories based on CART model selection and the results of the subject-matter analysts' review. The categories were—

- Cases selected for mailout by the CART, and status confirmed by analysts' review.
- Cases selected for mailout by the CART, but changed to nonmail by analysts.
- Cases dropped from the mailout by the CART, but restored to the mailout list by analysts.
- Cases dropped from the mailout by the CART and status confirmed by analysts' review.

Results from the Model Drop Survey and from the 1992 agriculture census were combined to create the farm proportions for all four CART evaluation record categories. The expected farm proportion for each category was estimated from the 1987 census mailout, while the observed farm proportion was calculated using information on the 1992 census mailout and the Model Drop Survey. By comparing the observed and expected farm proportions, analysts determined that the observed farm proportions were higher than expected for all four record categories. The largest differences were in the groups of records originally dropped by the CART procedures but restored to the mail list by analysts. The comparisons between records dropped from the mail list by the CART procedures, and those dropped by subject-matter analysts showed that the analysts' adjustments improved the accuracy of the mail list. The proportion of records that proved to represent farms was larger (40.77 percent) among those records added back to the mail list by analysts than in either the original CART-dropped or analyst-dropped categories. As a result, the proportion of farms on the mail list was estimated to have increased from approximately 58 percent to approximately 58.4 percent after analysts' adjustments, while the estimated proportion of farms among records dropped from the list fell dramatically, from just under 35 percent, to just under 26 percent.

Evaluation Results

The general conclusion of the evaluation was that the CART methodology was successful in selecting which addresses should be included on the final census mail list. The CART methodology had been used in the 1987 census, and the 1992 version proved to be an improvement over the earlier model, explaining twice as much of the variation in the observed farm proportion. The evaluation showed that 88.7 percent of the records on the mail list were correctly assigned ''farm'' status. Approximately 64 percent of the records dropped from the mail list were received from the National Agricultural Statistics Service (NASS), and over half of these records had a NASS farm source only.

Despite the relative success of the CART model and other measures, approximately 26 percent of the records dropped from the mail list (229,810 in all) actually represented farms. There was no significant difference in the proportions of farms dropped by analysts and those dropped

[3]Multiunits, abnormal farms, special list cases, and records selected for the census coverage evaluation were excluded from the CART model. All of these records were ''certainty'' cases, and were subject to intensive followup to ensure response.

by the statistical model (and not restored to the list by analysts), but the overall figure was much higher than expected (the original estimate was that between 17 and 18 percent of the dropped records would meet the census farm definition). The AGR staff suggested doing additional research on improving the CART methodology, recommending—

- Improving CART input values.
- Increasing the minimum model group size.
- Developing additional steps in the CART methodology to reduce analyst adjustments, such as including 100 percent of all States with small farm counts (e.g., New England), identifying groups for inclusion or exclusion before model application, and developing drop model groups by State.
- Selecting sample for the model drop survey by State.
- Investigating other possible methodologies for determining expected farm status for mail list records.

RESEARCH STUDIES

Film Optical Sensing Device for Input to Computer (FOSDIC) Test

General information. Data entry—the transfer of information supplied by respondents on their report forms to the electronic files that will be used for processing and tabulating the data—is one of the most expensive and labor intensive processing operations in any census. As part of a general effort to improve efficiency and reduce future costs, the Census Bureau evaluated an alternative method of data capture in the 1992 agriculture census in a test that tried to adapt the agency's film optical sensing device for input to computers (FOSDIC) system to the agriculture census processing requirements.

The Census Bureau has used the FOSDIC system as the primary data-capture system in the decennial censuses since 1970, as well as in demographic surveys. For the 1992 agriculture census, the FOSDIC equipment was used in combination with data keying using a computer terminal connected to a microfilm access device (MAD—the complete system was referred to as either the FOSDIC/MAD or FOSDIC/Key system). The FOSDIC system employs a simple optical mark recognition design; the system recognizes a mark in a given answer position (it does not recognize characters).

The objectives of the Census Bureau's test were to evaluate the potential of the FOSDIC/Key system to—

- **Reduce processing time.** The Census Bureau expected the FOSDIC/Key system to reduce overall processing time by eliminating the need for keyers to handle the paper report forms and by reducing the number of keystrokes required to key data to the electronic file.
- **Improve data quality.** The agency expected the FOSDIC/Key system to have reduced error rates compared to conventional data entry.
- **Reduce costs.** Less data keyed and faster data keying would mean costs would be reduced. (However, adopting the FOSDIC/Key system involved additional activities, such as microfilming, purchasing and reconditioning microfilm readers, etc.).
- **Indirect benefits.** The Census Bureau expected that the experience gained from the FOSDIC/Key test could be applied to other systems, such as the development of digitized imaging for write-in responses, high-speed data capture systems, and so on.

Test methodology. The AGR conducted the FOSDIC/Key system test in conjunction with the 1992 agriculture census. A special report form—the form 92-A0202(F)—was adapted from the standard sample report form design used in report form Region 2.[4] The agriculture FOSDIC form required modifications to the FOSDIC equipment and scan program so that the reference marks used could be recognized by the system.

To simplify processing, the AGR decided that the sample report forms for a given State in Region 2 (Illinois, Nebraska, and Ohio) would be either all FOSDIC or all non-FOSDIC, except for Iowa, in which half the sample mail list would receive the FOSDIC form and half the non-FOSDIC form. The report forms were mailed out as part of the regular census report form mailings and followup operations. A total of 96,833 FOSDIC and 64,295 non-FOSDIC questionnaires were mailed to addresses in the test area. Altogether, 81,104 FOSDIC and 53,364 non-FOSDIC report forms were returned; 49,919 of the FOSDIC forms required keying.

The States that were mailed non-FOSDIC forms served as control States for use in comparing overall response rates. Data for all the FOSDIC report forms returned were double-keyed—i.e., the data were keyed using both the conventional keying system (see Chapter 6, Data Processing, for details of the data entry operation) and the FOSDIC/Key system. The AGR staff used information from the two keying systems for all tests on cost, time, quality, and response rates. Originally, the two systems were to be in operation simultaneously, but this proved impossible and the FOSDIC/Key section began operations only after the conventional keying section had already completed data entry for the States involved.

[4]The Census Bureau decided that the agriculture census FOSDIC report form should resemble, as closely as possible, the standard sample report form. Hence, the agriculture FOSDIC report form did not have the FOSDIC index marks (black printed squares that serve as reference marks by the FOSDIC equipment to locate answer positions) used on the decennial census and other report forms. Instead, the horizontal dotted lines on the regular agriculture census report form were converted into solid horizontal arrows for use as FOSDIC reference points. Special FOSDIC markings also were printed on the borders of the form to identify questionnaire pages.

Evaluation of FOSDIC operations. Once all the data from the report forms from the test areas had been entered in the data file the AGR staff reviewed the performance of the FOSDIC/Key system and compared it to the conventional systems for comparable report forms to determine if the former represented any significant advantage over conventional equipment and procedures.

To determine whether processing time could be reduced using FOSDIC, AGR staff compared the average time and number of keystrokes per document required using the alternative systems. The results of this comparison showed that the FOSDIC/Key system had a significant advantage in terms of the average time required to key and verify report forms—the average time requirement reduction ranging from about 21 percent (13 percent when adjusted for the time needed to microfilm the report forms) for keying to 23.5 percent for verification. The FOSDIC/Key system also produced an approximate 37 percent reduction in the average number of keystrokes needed per document.

Cost comparisons were less favorable, although a reduction in total keying time for the FOSDIC/Key system translated into considerable savings in keying costs. However, part of this reduction was offset by the cost of microfilming, scanning, and reconditioning the MAD units. The total projected data entry savings for the agriculture census if the FOSDIC/Key system was used for data capture was just $9,000.[5]

In terms of data quality, the FOSDIC/Key system proved a disappointment; the error rate for the FOSDIC/Key system was 2.2 percent, compared to 1.2 percent for the paper system.

Results. The Census Bureau analysis of the FOSDIC/Key test results showed that while the new system offered substantial advantages in certain areas of processing—e.g., average keystrokes required per document for data entry—there was no clear advantages to using the FOSDIC/Key system for keying future agriculture census report form data. Furthermore, the agency considered that more advanced data capture technologies, such as electronic imaging, may be available in the near future. The overall recommendation resulting from the test was that the Census Bureau not use the FOSDIC/Key system in the 1997 Census of Agriculture, and that any resources available be invested in developing more advanced systems.

Special Inserts Evaluation

General information. The Census Bureau has routinely used instructional inserts in selected agriculture census report form packages. For the 1992 census, these inserts provided special instructions for 10 different types of farm operations—multiunits, abnormal farms(i.e.,Indian reservations, institutions, farms, and grazing associations), cattle feedlots, nursery and greenhouse operations, poultry contractors, bee and honey producers, fish and aquaculture operations, and laboratory animal producers. Each insert informed the recipients that their operation was considered a farm for census purposes, identified the sections within the report forms they received that should be completed, and provided information on how to report the data (e.g., laboratory animal producers were to report any animals such as mice, rats, cavies (short-tailed, rough-haired South American rodent), dogs, etc., writing in the name of each species). The Census Bureau decided to test the effectiveness of the special inserts, evaluating particularly whether using the inserts improved the response rate, the in-scope rate, and data response sufficiently to justify the extra costs involved in using them as part of the 1992 agriculture census.

Study methodology. The special insert evaluation study used a sample drawn from the census mail list. Since most of the farm types receiving the inserts had a relatively small number of farms, the sample was drawn from the three major types of insert recipients—poultry contractors, cattle feedlots, and nursery and greenhouse producers. Cattle feedlots were selected for the study because they were subject to intensive followup anyway (thus no additional costs would be incurred in adding them to the sample), poultry contractors were added because of the poor data received previously, while nursery and greenhouse operations were included because of their size.

The three farm industries were divided into two categories, those addresses that would receive the appropriate insert, and those that would not. The Census Bureau assigned numeric package codes (1-6) to each category. Codes ‘‘1’’ and ‘‘2’’ were assigned to the cattle feedlots, ‘‘3’’ and ‘‘4’’ to the nursery and greenhouse operations, and ‘‘5’’ and ‘‘6’’ to poultry contractors. The agency assigned the codes sequentially through each group, then selected those packages with odd numbered codes to receive the inserts. The total number of records mailed with and without inserts in each farm industry was as follows:

Total Number of Records

Farm type	Received insert	Did not receive insert
Cattle feedlots	4,805	4,812
Nursery and Greenhouse	28,253	28,238
Poultry contractors	17,482	17,489

The AGR staff evaluated the responses using unedited census data for sample records provided by the agriculture census processing operation. The research compared data from records for farms that received the inserts to data from farms that did not. The evaluation involved the following five activities:

- Analysis of response rates.

[5]Adoption of the FOSDIC/Key system, however, would obtain additional savings in future censuses—assuming it proved a reliable alternative to conventional systems—through the availability of indexed microfilm for use in edit resolution and table review.

- Analysis of farm proportions.
- Comparison of data capture rates (i.e., presence or absence of data in each key code) .
- Analysis of early response (i.e., farms responding to the first census mailing).
- Cost analysis.

The staff conducted each analysis separately for each farm type and computed estimates of the five specific areas of interest for the United States and for the leading States for each farm type.[6] The staff developed its estimates and the associated variances using a simple random sampling methodology.

Results. Analysis of response rates showed there was no significant difference in responses between those receiving the inserts and those that did not for any of the three major farm types used in the study. The response rate for cattle feedlots receiving the insert, for example, was 99.04 percent, while those not receiving the insert responded at the rate of 98.96 percent.

Similarly, the farm proportion (i.e., the number of respondents that met the census farm definition and were inscope) showed little or no difference for cattle feedlots and nursery and greenhouse producers. For poultry contractors, there was a significant difference of 1 percent between those records that received the special insert and those that did not—71.76 percent of respondents receiving the insert were inscope, compared to 70.68 percent that were inscope and had not received the insert.

Overall, the review of the presence or absence of data in key codes showed little variation between categories. None of the three major farm types showed a significant increase in the presence of any given section that could be correlated with the use of the inserts. There were, however, some improvements at the State level; e.g., cattle feedlots in Texas and Minnesota showed improvements of 3 percent and 2 percent, respectively, in the presence of data of with the use of the inserts. Nursery and greenhouse operations in Florida also improved in this area by about 1 percent with the use of the insert. On the other hand, contracted poultry in Arkansas showed an overall improvement in data presence without the insert.

The cost analysis of the use of the special inserts showed that using them for the three major farm types, in addition to bee and honey producers, laboratory animal producers, and fish and aquaculture operations, cost the Census Bureau approximately $12,000 ($2,000 for design and printing, and about $5,000 each for postage and additional clerical work). Using inserts with multiunit and abnormal farms also represents additional cost to the census of about $2,000.

Recommendation. The special insert study showed that using the inserts for the three major farm types did not lead to any significant improvement in response rate or farm rate, and only very small improvement in the presence of data in each key code. The improvements realized did not seem to justify the additional costs associated with the use of the inserts.

The analysts involved in the study recommended the 1997 Census of Agriculture—

- Drop the use of the inserts for the three major farm types covered by the study—cattle feedlots, nursery and greenhouse operations, and poultry contractors.
- Include a 50-percent sample study of insert effectiveness for bee and honey producers, fish and aquaculture operations, and laboratory animal operations.
- Continue to use special inserts for multiunit and abnormal operations.
- For new commodities, such as maple sap and Christmas trees, the instructional inserts will be sent to all operators.

[6]The cutoff levels for State calculation varied by farm type. For cattle feedlots, the evaluation developed estimates for eight States: Colorado, Illinois, Iowa, Kansas, Minnesota, Nebraska, South Dakota, and Texas. For nursery and greenhouse operations, estimates were prepared for 10 States: California, Florida, Michigan, New York, North Carolina, Ohio, Oregon, Tennessee, and Texas. The major poultry contractor States were Alabama, Arkansas, Georgia, and North Carolina.

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Publication Program

INTRODUCTION

General Information

The Census Bureau's mission is to collect and disseminate statistics on the population and economy of the United States, not only to various government offices, but to the general public. Consequently, each census includes an extensive publication program designed to make census data available to users as economically as possible. The 1992 agriculture census publication program provided that data be published in a variety of formats—printed reports, computer tapes, and compact-disc read only memory (CD-ROM)—accessible to the largest audience possible.

The Census Bureau issued detailed county- and State-level tabulations in the Volume 1, *Geographic Area Series* printed reports—one for each State, Puerto Rico, the Virgin Islands of the United States, and Guam, and the United States. The data file used for the Volume 1 reports formed the core of the statistical data from the 1992 census, and also was disseminated on computer tape and CD-ROM. The file included statistics on all agricultural operations that met the census farm definition (e.g., in the 50 States, any place from which $1,000 or more of agricultural products were sold, or normally could be expected to have been sold, during the census year) as well as additional detailed data for farms with annual sales of $10,000 or more.

The Composition Systems

The two principal components of the census data publications are statistical tables and explanatory text and graphics. The vast bulk of material published for the 1992 census was in the form of statistical tables, and for the 1992 agriculture census publications, the Agriculture Division (AGR) introduced the Tabulation And Disclosure System (TADS) for developing and reviewing statistical tables electronically. Prior to the 1992 census, the Administrative and Publication Services Division (APSD[1]) used its Census Electronic Publication System (CEPS) and a commercially available electronic graphics system (EGS) in conjunction with the Table Image Processing System (TIPS) II for preparing materials for publication. The introduction of the TADS required modification of the TIPS II system for use with the DEC hardware employed by the TADS, which also could provide some of the graphics components. These systems together provided computerized composition capacity for the census materials.

The CEPS enabled the publication staff to develop automated page layout for text, tables, and graphics; code text and table files directly on the publication sponsor's electronic file; merge graphics files and text as needed, and translate files from a variety of microcomputer and word processing systems. The TIPS II had been developed by the Census Bureau's APSD and Systems Software Division to be used to produce large numbers of statistical tables in printed reports. The system actually was a computer program that controlled the computer-output-to-microform video composition system (COMp80) or the Government Printing Office's (GPO's) Videocomp system. Modified for use with the tables developed using the TADS, the TIPS II created tape files that were sent to GPO for use in producing photographic negatives of the publication pages. The negatives and tapes then were returned to APSD for review, and after each page had been approved, they were assembled and sent for publication.

Photo-offset reproduction was used for the printed reports in the standard 8″ x 11″ page size.

Quantity of 1992 Statistics Published

Budget constraints led the Census Bureau to both stretch out the publication program for the 1992 census, and to reduce the total volume of material published to the extent possible without reducing the usefulness of the census data. The 1987 census publication program had included 2-page advance reports for each county and State, but no advance reports were released for the 1992 census, which reduced the total volume of published pages by 6,200. The 54-part Volume 1, *Geographic Area Series, State and County Data,* series AC92-A-1 to -54, set included final State and county (or equivalent) detailed data for the 50 States, Puerto Rico, Guam, the Virgin Islands of the United States, and a United States. The set contained over 24,800 pages of tabular data and text, compared to approximately 23,000 pages in the 1987 reports. The Volume 2, *Subject Series*, for 1992 comprised five reports:

[1]The APSD was retitled the Administrative and Customer Services Division (ACSD) in the summer of 1995. Since the bulk of the 1992 agriculture census publications were prepared and published while the division was still called APSD, that title will be used throughout this *History*.

1. *Agricultural Atlas of the United States*, AC92-S-1, with 204 pages of maps and charts illustrating national agricultural statistics.

2. *Coverage Evaluation*, AC92-S-2 (not printed; issued on CD-ROM and online).

3. *Ranking States and Counties*, AC92-S-3, with 111 pages of tables showing the comparative ranking of States and counties for selected subjects.

4. *History*, AC92-S-4.

5. *ZIP Code Tabulation of Selected ITems From the 1992 Census of Agriculture*, AC92-S-5, showed tabulations of basic data items by five-digit ZIP Code areas, and was available only on CD-ROM.

The Volume 3, *Farm and Ranch Irrigation Survey (1994)*, AC92-FRIS-1, contained 178 pages of irrigation data for the United States, States, and for 18 water resources areas.

PUBLICATION MEDIA

General Information

The Census Bureau has traditionally published its major data findings in printed reports. The introduction of computers, and their use by both public and private data users, led the Census Bureau to begin publishing data in electronically readable form, first on reels of computer tape, and later, as technology developed, on flexible diskettes, compact disc-read only memory (CD-ROM), and online. The 1992 agriculture census data were published in printed reports, computer tape, CD-ROM, and (for some tabulations) online. The Government Printing Office (GPO) sold the printed reports, while the Census Bureau was the only primary source for its own data on electronic media.

Printed Reports

Volume 1, Geographic Area Series, Series AC92-A-1 to -54. This volume comprised separate reports for the United States, the 50 States, the Commonwealth of Puerto Rico, the Virgin Islands of the United States, and Guam. Each State or area report included an introductory text giving a general description of the enumeration, two chapters of detailed statistical tables—chapter 1 shows State or area data and chapter 2 the detailed tables for counties or county-equivalents—and appendixes with information on coverage and error rates, a facsimile of a typical questionnaire, and definitions. (Part 51, *United States*, showed national-level data in chapter 1, with summary State statistics in chapter 2.)

Table 1, in chapter 1, in each State or area report included historical highlights of the State's agriculture from the 1959 through the 1992 censuses, followed by 51 tables of detailed statistics covering every item collected from agricultural operators in the subject State or area, including—

- Farms.
- Land in farms, land use, and irrigated land.
- Crop production and value of sales.
- Livestock and poultry inventories and sales.
- Selected characteristics of farms operated by females, and by persons of Spanish origin and specified racial groups (Black, Asian and Pacific Islander, and American Indian).
- Tenure and operator characteristics.
- Value of machinery and equipment.
- Agricultural chemicals and fertilizer used.
- Total production expenses and selected farm expense items.
- Commodity Credit Corporation (CCC) loans.
- Government payments and other farm-related income.
- Characteristics of farms by Standard Industrial Classification (SIC) code.
- Value of direct sales.
- Number of hired workers.
- Injuries and deaths.

The State tables usually showed comparable 1987 data. Tables 46 through 52 also showed 1992 State data cross-tabulated by various farm classifications, such as size of farm (based on sales and/or acreage), tenure of operator, type of organization, SIC code, and so on.

Chapter 2 presented county-level highlights and 39 additional tables of selected data for all counties or county-equivalents for most of the subjects covered in the State tables, plus—

- Market value of agricultural products sold.
- Net cash return from agricultural sales, Government payments, other farm-related income, direct sales, and Commodity Credit Corporation (CCC) loans.
- Characteristics of farms with annual sales of $10,000 or more.
- Number of hired workers.
- Major and minor crops.
- Value of land and buildings.

The first Volume 1 report (Delaware) appeared in December 1994, and the last (for the Virgin Islands of the United States) in March 1995.

Volume 2, Subject Series. The Volume 2, *Subject Series*, consisted of five reports, series AC92-S-1 through -5.

- *Agricultural Atlas of the United States*, AC92-S-1, presented a profile of American agriculture in a series of U.S. dot and multicolor pattern maps. Clear mylar overlays showing State and county outlines, in a pocket inside the back cover, enabled data users to use even the half-page size maps to see county-level geographic information. (Issued September 1995.)
- *Coverage Evaluation*, AC92-S-2, (available in print, on CD-ROM, and online) offered State level estimates of the number of farms not on the census mailing list; national and regional estimates of the number of operations incorrectly classified, and the number of duplicate farms; together with national, regional, and census geographic division estimates of selected agricultural characteristics for missed farms.
- *Ranking of States and Counties*, AC92-S-3, showed the ranking of the leading 20 States and counties (the number varied from table to table) for selected items from the 1992 Census of Agriculture. Most tables included comparative statistics from the 1987 census, as well as cumulative total percentages of products or other items for the highest ranked States and counties. (Issued December 1995.)
- *History*, AC92-S-4, described the major census operations and reproduced selected data-collection forms and materials.
- *ZIP Code Tabulation of Selected Items From the 1992 Census of Agriculture*, AC92-S-5, available only on CD-ROM, this file contained farm counts by ZIP Code for selected items from the 1992 census, such as number of farms, land in farms, land in farms by size, market value of agricultural products sold, and market value of products sold by size, livestock inventory, selected crops, and other data items.

Volume 3, *Farm and Ranch Irrigation Survey (1994)*, AC92-RS-1 (issued February 1996). The irrigation survey report presented statistics about on-farm irrigation practices collected from a sample of irrigated farm operations identified in the 1992 census in the 48 conterminous States (excluding abnormal farms and horticultural specialty operations). The survey data supplement the basic irrigation information collected in the census. The survey report showed information for the 18 water resources regions (WRR's) of the 48 conterminous States, as well as for the 27 leading irrigation States. The major data items shown included—

- Acreage in 1994.
- Land use and acres irrigated by category of land use.
- Acres and yields for irrigated and nonirrigated crops.
- Expenditures in 1994 for maintenance and repair of irrigation equipment and facilities.
- Method of water distribution used in 1994.
- Source of water used.
- Energy use.
- Irrigation practices in 1994.

Other Publishing Media

Public-use computer tape. Despite the popularity of the CD-ROM products, the Census Bureau found that a market still existed for agriculture census data on computer tape and released the major 1992 files on that medium as well as on CD-ROM. The tape publication program involved the final county and State data tabulations. The county tapes contained final data available for each State and county or equivalent in the 50 States. The final State data were released in two files: the *A file* had simpler tabulations—essentially tables 1-45 of the Volume 1, *Geographic Areas Series,* printed reports; the *B file* showed more detailed tabulations and cross tabulations drawn from tables 46-52 of the Volume 1 reports.

The Census Bureau released the final county data file for selected States (that is, the buyer could request county data for selected States (up to 40 on a single high-density tape cartridge)), and a complete consolidated set on two high-density reels. The final State files were released on two tape reels, one each for the A and B files.

The Census Bureau's computer tapes were available in 9-track, 6,250-bpi (bits per inch) recording density, and in either Extended Binary Coded Decimal Interchange Code (EBCDIC) or the American Scientific Code for Information Interchange (ASCII) recording languages. Price for the data tapes covered production, documentation, handling, and postage costs. Users could purchase the complete files, or tapes containing only the data for specified States.

Compact disc-read only memory (CD-ROM). The rigid compact disc (CD) used for electronic data file publication in the 1992 census can hold up to 600 million characters (600 megabytes) of information—the equivalent of about 1,500 flexible diskettes, or 4 high-density (6250 bpi) computer tape reels. The Census Bureau first released agriculture census data on CD-ROM in 1985, when the complete final 1982 census data file was issued as part of the data content of two CD's produced for test purposes. The Census Bureau issued two CD-ROM's for the 1987 agriculture census, one containing the State aggregate data and the county-level data for the 1978, 1982, and 1987 censuses; while the second had selected data from the volume 2, 3, and 4 reports.

The Census Bureau originally planned to issue only two CD-ROM's for the 1992 census as well, the first covering the first 25 or so States for which the Volume 1 reports had been released, while the second would cover all 50 States and the U.S. summary report for theVolume 1, *Geographic Areas Series*. However, soon after processing began, the CD-ROM program was expanded. The basic State and county data were issued on three discs—1992 Census of Agriculture, *Geographic Area Series*, series CD-92AG-1A through -1C. Disc *1A* included the first 27 State files processed, covering basic State and county data, with crop tables for selected crops only. Discs *1B* and *1C*, issued as a set, contained the basic data for all States and counties, plus the national-level summary data and cross-tabulations by tenure of operator, size of farm, type of organization, SIC classification, value of products sold, government payments, and occupation of operator. In addition to the three discs covering the geographic areas data, the Census Bureau issued *CD-92AG-ZIPS*, with selected data at the five-digit ZIP Code level for the United States and Puerto Rico, and planned to release two more—

1. *CD-92AG-SPECIALTY*, showing data for—
   - The 1994 Farm and Ranch Irrigation Survey, together with comparable data from the 1988 irrigation survey.
   - Congressional districts (103rd Congress).
   - 1992 Public Use Files, containing sample data on 119 selected items.
   - The 1992 census coverage evaluation, with coverage estimates for the 1992 Census of Agriculture.
2. *CD-92AG-ATLAS*, containing the base image files (BMF's) for the *1992 Agricultural Atlas of the United States (CD-92AG-ATLAS* will be issued if funding is available).

On-line access. The Census Bureau's Data User Services Division (DUSD) administered the agency's online service—CENDATA™. The service is available to users through two commercial vendors—CompuServe and DIALOG. The system carried highlights of the 1992 *Geographic Area Series*, Volume 2, *Subject Series*, and Volume 3, *Farm and Ranch Irrigation Survey* (1994) reports. In addition, selected agriculture census highlights were made available through a third vendor, the AgriData Network. The introduction of the Internet system and its use by the Census Bureau led to the agency releasing selected data on the Internet system.

PUBLICATION PROCESS

General Information

The Census Bureau began general editorial and composition work on the agriculture census publications in December 1989 in order to finish as much of the preparatory work associated with the data publication operations before the completion of the census. The 1992 publication plans included the introduction of the Tabulation and Disclosure System (TADS), which enabled the AGR staff to develop and review statistical tables electronically (for details of the TADS, see Chapter 6, "Data Processing"). The AGR was responsible for developing the statistical tables and wrote the text for the 1992 census data volumes, while the APSD prepared these materials for publication. The AGR and DUSD cooperated in the production of the electronic data files (i.e., computer tapes and compact disc-read only memory (CD-ROM)).

Preliminary Preparation

Text and graphics components. The APSD staff produced the text components of the census reports on the CEPS and used the EGS for the graphics materials. The AGR staff wrote standardized text (e.g., introductory material, definitions of terms, abbreviations, and symbols, etc.) for the census publications and sent it to the APSD on flexible diskette for editing and incorporation into the report file. Once the text was finalized, the APSD staff entered the required codes into the electronic file containing the text for processing the text itself through the CEPS or, for text related to graphic illustrations, the EGS, and generated laser proofs (paper facsimiles of the planned final printed pages) for review and approval by the AGR staff. The APSD staff processed any corrections or changes and recycled the laser proofs until all were approved, then copied the electronic files containing the final text to the mainframe computer at the Suitland, MD, headquarters for later merging with other publication components.

The APSD staff prepared the variable text (i.e., text containing segments dependent on the results of the data collected in the census) "shells" in advance, using the same general procedures employed for the standard text, and held them on the CEPS for final production processing.

The census publications used three principle kinds of graphics—artwork for the report covers and title pages, and bar and piecharts displaying summary statistical data and maps. The APSD and AGR staffs prepared the cover artwork and title pages on the EGS. When finalized, the artwork was transferred to the CEPS for merging with other publication components (i.e., titles and text) to produce the covers and title pages. AGR analysts also used the EGS to prepare the basic chart "shells"—without plot points and other variables while the Geography Division supplied the APSD with negatives of the various maps required. (Each Volume 1 report included a map (showing counties (or equivalents) of the subject State or territory.) These materials also were held for the final assembly before each report was sent to the printer.

Statistical tables. AGR staff used the TADS to prepare and review statistical tables in electronic data files, but the APSD still had to develop the table layout parameters (TLP's, or table "shells"—essentially the table boxheads and stubs, minus the variable geography and data) for the

statistical tables using electronic files supplied by the AGR. The APSD staff followed the same general procedures employed in preparing the standard texts for the reports, except that they used the TIPS II on the mainframe computer for developing the TLP's. The staff edited the table manuscript and prepared the TLP computer files, processed them through the TIPS II, and submitted the resulting tables layouts to AGR for review and approval. Once AGR approved the tables, the final TLP file was held in the mainframe computer for merging with the appropriate State or national data files and other publication materials during the final production processing.

Final Production Processing

During final production processing, AGR supplied any additional information needed for the variable text components and charts to APSD. The AGR supervised Economic Programming Division (EPD) staff in executing various APSD programs to link the appropriate publication components and generate electronic files for transmission to the GPO for production of printing negatives. GPO sent the printing negatives to the Census Bureau, where APSD printing and editorial staff and AGR editors reviewed them for conformity to Census Bureau publishing and printing standards. All the 1992 census publications were printed, through the GPO, by private contractors, after APSD prepared the required printing documents and submitted the various packages of materials to the contractor printers for publication.

The APSD staff inspected the printed materials received from the contract printer to ensure that the individual reports were complete and met print quality standards. Inspectors randomly selected 1-5 individual copies (depending on the total size of each shipment, with up to 5 copies pulled from each carton for the largest shipments) from each carton of volume 1 reports for checking by an APSD printing specialist. While the overall quality of printing was high, the inspection showed problems with the reports for several States (e.g., one contractor, printing the data reports for both South Carolina and Florida, had inadvertently intermingled pages from each State in each of the reports). When required, the reports for a State were returned to the contractor involved for reprinting.

Electronic Media Products

In addition to disseminating selected data online through the CENDATA™, the DUSD also reproduced electronic media products (for the agriculture census, computer tapes and CD-ROM discs) from master data tapes supplied by the AGR. The AGR and DUSD staffs prepared the technical documentation (TD) for each data file. The TD's contained an abstract and detailed technical descriptions (e.g., geographic coverage, identification numbering system, coding) of the file, file indexes and a data dictionary describing the contents and record layout of the entire file.

The Census Bureau released all of the 1992, Volume 1, *Geographic Area Series* electronic data files on computer tape and CD-ROM, as well as highlights online. The ZIP Code Tabulation of *Selected Items From the 1992 Census of Agriculture* (Part 5) from the Volume 2, *Subject Series* reports was released on CD-ROM only, while highlights of Part 3, *Ranking States and Counties*, were prepared and issued online. Selected tables from Volume 3, *Farm and Ranch Irrigation Survey (1994)* were also made available online.

Pricing and Distributing Reports

The Census Bureau of the Census collected and tabulated the agriculture census and survey data, and prepared and released the electronic data files. Copies of the computer data tapes for all files were supplied to the State data centers (SDC's), and the Census Bureau distributed CD-ROM discs containing the agriculture data to about 150 Federal depository libraries and to any SDC's or business and industry data centers (BIDC's) that requested them. The Census Bureau also sold census tapes and CD-ROM discs to the public.

The Census Bureau also prepared the text and tables, and did all the other preparatory work for each of the printed publications, but printing, pricing, and sales of the census printed reports was the responsibility of the Superintendent of Documents at the Government Printing Office (GPO). The Census Bureau paid all production costs, as well as for printing copies for its own use. The GPO set prices for individual publications sold through its offices, based on a price schedule established by the GPO based on the actual production (that is, printing), postage, and handling costs of the reports purchased.

The GPO also handled distribution of Census Bureau publications, including the agriculture census reports, to some 1,500 Federal Government and Census depository libraries.[2] About 10 percent of the Federal depository libraries—usually those at large universities—received all, or nearly all Census Bureau publications. The remainder received only those reports or products they specifically requested.

The Census Bureau distributed copies of its principal data publications to its own 12 regional offices, to the International Trade Administration's (ITA's) district offices, and to over 300 SDC's, as well as to the BIDC's, and their affiliates (over 1,000 in all) in the 50 States, the District of Columbia, Puerto Rico, Guam, and the Virgin Islands of the United States. (The SDC's and BIDC's received the principal publications for their own States, while the affiliates were sent only those reports they requested.)

[2]The Federal depository libraries received a selection of the publications from a variety of Federal departments and offices, including the Census Bureau. Census depository libraries—about 130 in all, usually local public libraries—typically received the census publications for their local area or State.

The Data Preparation Division (DPD) office in Jeffersonville, IN, maintained a supply of the Census Bureau's various publications, but the Superintendent of Documents had primary responsibility for the storage and sales of census printed reports.

The Census Bureau publicized the availability of its data publications (print and electronic) through the GPO, the ITA and its district offices, and other organizations. The agency issued press releases about new publications (for example, a separate press announcement describing the report, and including selected statistical highlights, was released for each State report for the Volume 1, *Geographic Areas Series*) and distributed order forms, publication schedules, a *Monthly Product Announcement*, and an annual *Census Catalog and Guide*. Most of the publicity materials and catalogs included brief descriptions of the products, as well as actual or estimated publication dates, and purchase price. The DUSD issued a monthly newsletter, *Census and You*, with articles on agency activities and publications, including the agriculture census, and the DUSD and AGR staff jointly produced the *Guide to the 1992 Census of Agriculture and Related Statistics*, containing a description of the 1992 agriculture census publications and information on data from other related Census Bureau activities.

COMPARABILITY OF THE DATA

A major objective of the data tabulation and publication program is to maintain a reasonable degree of comparability of agriculture census data from census to census. Data comparability will be affected by changes in the price structure of the general economy, changes in the definitions of data concepts being measured, the introduction of new procedures for collecting and processing the data, and by the methods adopted for estimating and/or imputing data.

The census farm definition used in the 1992 census has been in place since 1974, and the basic data published in the censuses are directly comparable in that sense. Acreage, production, and inventory totals throughout the period 1974-1992 are generally comparable, although dollar totals for expenses and sales are given in current dollars for each census, unadjusted for inflation or deflation. Data for censuses carried out prior to 1974 are not directly comparable to post-1974 enumerations because of changes in the farm definition.

Appendix A.
Provisions of Title 13, United States Code, Relating to the 1992 Census of Agriculture

CHAPTER 1.—ADMINISTRATIVE

Subchapter I—General Provisions

1. Definitions

As used in this title, unless the context requires another meaning or unless it is otherwise provided—

(1) ''Bureau'' means the Bureau of the Census;

(2) ''Secretary'' means the Secretary of Commerce; and

(3) ''respondent'' includes a corporation, company, association, firm, partnership, proprietorship, society, joint stock company, individual, or other organization or entity which reported information, or on behalf of which information was reported, in response to a questionnaire, inquiry, or other request of the Bureau.

2. Bureau of the Census

The Bureau is continued as an agency within, and under the jurisdiction of, the Department of Commerce.

5. Questionnaires; number, form, and scope of inquiries

The Secretary shall prepare questionnaires, and shall determine the inquiries, and the number, form, and subdivisions thereof, for the statistics, surveys, and censuses provided for in this title.

6. Information from other Federal departments and agencies; acquisition of reports from other governmental and private sources

(a) The Secretary, whenever he considers it advisable, may call upon any other department, agency, or establishment of the Federal Government, or of the government of the District of Columbia, for information pertinent to the work provided for in this title.

(b) The Secretary may acquire, by purchase or otherwise, from States, counties, cities, or other units of government, or their instrumentalities, or from private persons and agencies, such copies of records, reports, and other material as may be required for the efficient and economical conduct of the censuses and surveys provided for in this title.

(c) To the maximum extent possible and consistent with the kind, timeliness, quality and scope of the statistics required, the Secretary shall acquire and use information available from any source referred to in subsection (a) or (b) of this section instead of conducting direct inquiries.

7. Printing; requisitions upon Public Printer; publication of bulletins and reports

The Secretary may make requisitions upon the Public Printer for miscellaneous printing necessary to carry out the provisions of this title. He may further have printed by the Public Printer, in such editions as he deems necessary, preliminary and other census bulletins, and final reports of the results of the several investigations authorized by this title, and may publish and distribute such bulletins and reports.

8. Authenticated transcripts or copies of certain returns; other data; restriction on use; disposition of fees received

(a) The Secretary may, upon written request, furnish to any respondent, or to the heir, successor, or authorized agent of such respondent, authenticated transcripts or copies of reports (or portions thereof) containing information furnished by, or on behalf of, such respondent in connection with the surveys and census provided for in this title, upon payment of the actual or estimated cost of searching the records and furnishing such transcripts or copies.

(b) Subject to the limitations contained in sections 6(c) and 9 of this title, the Secretary may furnish copies of tabulations and other statistical materials which do not disclose the information reported by, or on behalf of, any particular respondent, and may make special statistical compilations and surveys, for departments, agencies, and establishments of the Federal Government, the government of the District of Columbia, the government of any possession or area (including political subdivisions thereof) referred to in section 191(a) of this title, State or local agencies, or other public and private persons and agencies, upon payment of the actual or estimated cost of such work. In the case of nonprofit agencies or organizations, the Secretary may engage in joint

statistical projects, the purpose of which are otherwise authorized by law, but only if the cost of such projects [is] shared equitably, as determined by the Secretary.

(c) In no case shall information furnished under this section be used to the detriment of any respondent or other person to whom such information relates, except in the prosecution of alleged violations of this title.

(d) All moneys received in payment for work or services enumerated under this section shall be deposited in a separate account which may be used to pay directly the costs of such work or services, to repay appropriations which initially bore all or part of such costs, or to refund excess sums when necessary.

9. Information as confidential; exception

(a) Neither the Secretary, nor any other officer or employee of the Department of Commerce or bureau or agency thereof, may, except as provided in section 8 of this title—

(1) use the information furnished under the provisions of this title for any purpose other than the statistical purposes for which it is supplied; or

(2) make any publication whereby the data furnished by any particular establishment or individual under this title can be identified; or

(3) permit anyone other than the sworn officers and employees of the Department or bureau or agency thereof to examine the individual reports.

No department, bureau, agency, officer, or employee of the Government, except the Secretary in carrying out the purposes of this title, shall require, for any reason, copies of census reports which have been retained by any such establishment or individual. Copies of census reports which have been so retained shall be immune from legal process, and shall not, without the consent of the individual or establishment concerned, be admitted as evidence or used for any purpose in any action, suit, or other judicial or administrative proceeding.

(b) The provisions of subsection (a) of this section relating to the confidential treatment of data for particular individuals and establishments, shall not apply to the censuses of governments provided for by subchapter III of chapter 5 of this title, nor to interim current data provided for by subchapter IV of chapter 5 of this title as to the subjects covered by censuses of governments, with respect to any information obtained therefor that is compiled from, or customarily provided in, public records.

12. Mechanical and electronic development

The Secretary is authorized to have conducted mechanical and electronic development work as he determines is needed to further the functions and duties of carrying out the purposes of this title and may enter into such developmental contracts as he may determine to be in the best interest of the Government.

Subchapter II—Officers and Employees

21. Director of the Census; duties

The Bureau shall be headed by a Director of the Census, appointed by the President, by and with the advice and consent of the Senate. The Director shall perform such duties as may be imposed upon him by law, regulations, or orders of the Secretary.

22. Qualifications of permanent personnel

All permanent officers and employees of the Bureau shall be citizens of the United States.

23. Additional officers and employees

(a) The Secretary may establish, at rates of compensation to be fixed by him without regard to the Classification Act of 1949, as many temporary positions as may be necessary to meet the requirements of the work provided for by law. Bureau employees who are transferred to any such temporary positions shall not lose their permanent civil service status by reason of the transfer. The Secretary may make appointments to such temporary positions in conformity with the civil service laws and rules.

(b) In addition to employees of the Department of Commerce, employees of other departments and independent offices of the Government may, with the consent of the head of the respective department or office, be employed and compensated for field work in connection with the work provided for by law without regard to section 301 of the Dual Compensation Act.

(c) The Secretary may utilize temporary staff, including employees of Federal, State, or local agencies or instrumentalities, and employees of private organizations to assist the Bureau in performing the work authorized by this title, but only if such temporary staff is sworn to observe the limitations imposed by section 9 of this title.

24. Special employment provisions

(a) The Secretary may utilize the services of nontemporary employees of the Bureau (by assignment, promotion, appointment, detail, or otherwise) in temporary positions established for any census, for not to exceed the period during

which appropriations are available for that census. Whenever the Secretary determines that the services of an employee which have been utilized under this section are no longer required in such a temporary position, he may, without regard to the provisions of any other law, return the employee to a continuing position, with rank and compensation not less than that which he held in his last permanent position in the Bureau: Provided, That no employee shall, by reason of his service in a temporary position under this subsection, lose the protection of any law or regulation with respect to his separation, suspension, furlough, or reduction in rank or compensation below the level held in his last permanent position in the Bureau. Service by a nontemporary employee in a temporary position under this subsection shall be creditable for step increases (both periodic and longevity) under title VII of the Classification Act of 1949, as amended, as though it were a continuation of service in his last permanent position.

(b) As used in this title with respect to appointments or positions, ''temporary'' shall be construed to mean not in excess of one year, or not in excess of the specific period during which appropriations are available for the conduct of a particular census, whichever is longer. No employee of the Bureau who holds only a temporary appointment within the meaning of this section shall be considered as other than strictly temporary for purposes of any other provision of law relating to separations, suspensions, or reductions in rank or compensation.

(c) The enlisted men and officers of the uniformed services may be appointed and compensated for service in temporary enumerator positions for the enumeration of personnel of the uniformed services.

(d) The Secretary may fix compensation on a piece-price basis without limitation as to the amount earned per diem, and payments may be made to enumerators for the use of private automobiles on official business without regard to section 4 of the Travel Expense Act of 1949, as amended (5 U.S.C. 837), but at rates not in excess of the rates provided by that Act.

(e) The Secretary may authorize the expenditure of necessary sums for travel expenses of persons selected for appointment for attendance at training courses held by the Department of Commerce with respect to any of the work provided for by law.

(f) Notwithstanding any other provision of law prohibiting the expenditure of public money for telephone service, the Secretary, under such regulations as he shall prescribe, may authorize reimbursement for tolls or charges for telephone service from private residences or private apartments to the extent such charges are determined by the Secretary to have been incurred to facilitate the collection of information in connection with the censuses and surveys authorized by this title.

25. Duties of supervisors, enumerators, and other employees

(a) Each supervisor shall perform the duties imposed upon him by the Secretary in the enforcement of chapter 5 of this title in accordance with the Secretary's orders and instructions.

(b) Each enumerator or other employee detailed to serve as enumerator shall be charged with the collection in his subdivision of the facts and statistics called for on such schedules as the Secretary determines shall be used by him in connection with any census or survey provided for by chapter 5 of this title.

26. Transportation by contract

The Secretary may contract with field employees for the rental and use within the continental limits of the United States of means of transportation, other than motorcycle, automobile, or airplane, and for the rental and use outside of the continental United States of any means of transportation, which means may be owned by the field employee. Such rental contracts shall be made without regard to section 4 of the Travel Expense Act of 1949, as amended (5 U.S.C. 837). The rentals shall be at rates equivalent to the prevailing rental rates of the locality. The rental contracts within the continental United States may be entered into only when the use by the field employee of such other means of transportation is safer, more economical, or more advantageous to the Government than use of his motorcycle, automobile, or airplane in conducting the census.

CHAPTER 5.—CENSUSES

Subchapter II—Population, Housing, Agriculture, Irrigation, and Unemployment

142. Agriculture and Irrigation

(a) The Secretary shall in 1979, in 1983, and in every fifth year beginning after 1983, take a census of agriculture.

(b) In conjunction with the census to be taken under subsection (a) of this section in 1979, in 1988, and every tenth year beginning after 1988, the Secretary shall take a census of irrigation.

(c) The data collected in each of the censuses taken under this section shall relate to the year immediately preceding the year in which such census is taken.

Subchapter V—Geographic Scope, Preliminary and Supplemental Statistics, and Use of Sampling

191. Geographic scope of censuses

(a) Each of the censuses authorized by this chapter shall include each State, the District of Columbia, the Virgin Islands, Guam, the Commonwealth of the Northern Mariana Islands, and the Commonwealth of Puerto Rico, and as may be determined by the Secretary, such other possessions and areas over which the United States exercises jurisdiction, control, or sovereignty. Inclusion of other areas over which the United States exercises jurisdiction or control shall be subject to the concurrence of the Secretary of State.

(b) For censuses taken in the Virgin Islands, Guam, the Commonwealth of the Northern Mariana Islands, or any possession or area not specifically designated in subsection (a) of this section, the Secretary may use census information collected by the Governor or highest ranking Federal official, if such information was obtained in accordance with plans prescribed or approved by the Secretary.

(c) If, pursuant to a determination by the Secretary under subsection (a) of this section, any census is not taken in a possession or area over which the United States exercises jurisdiction, control, or sovereignty, the Secretary may include data obtained from other Federal agencies or government sources in the census report. Any data obtained from foreign governments shall be obtained through the Secretary of State.

193. Preliminary and supplemental statistics

In advance of, in conjunction with, or after the taking of each census provided for by this chapter, the Secretary may make surveys and collect such preliminary and supplementary statistics related to the main topic of the census as are necessary to the initiation, taking, or completion thereof.

195. Use of sampling

Except for the determination of population for purposes of apportionment of Representatives of Congress among the several States, the Secretary shall, if he considers it feasible, authorize the use of the statistical method known as ''sampling'' in carrying out the provisions of this title.

CHAPTER 7.—OFFENSES AND PENALTIES

Subchapter I—Officers and Employees

211. Receiving or securing compensation for appointment of employees

Whoever—

(1) receives or secures to himself any fee, reward, or compensation as a consideration for the appointment of any person as supervisor, enumerator, clerk, or other officer or employee of the Department of Commerce or bureau or agency thereof, referred to in subchapter II of chapter I of this title; or

(2) in any way receives or secures to himself any part of the compensation paid to any person so appointed— shall be fined not more than $3,000 or imprisoned not more than five years, or both.

212. Refusal or neglect of employees to perform duties

Whoever, being an employee referred to in subchapter II of chapter I of this title, and having taken and subscribed the oath of office, neglects or refuses, without justifiable cause, to perform the duties enjoined on such employee by this title, shall be fined not more than $500.

213. False statements, certificates, and information

(a) Whoever, being an officer or employee referred to in subchapter II of chapter I of this title, willfully and knowingly swears or affirms falsely as to the truth of any statement required to be made or subscribed by him under oath by or under authority of this title, shall be guilty of perjury, and shall be fined not more than $2,000 or imprisoned not more than five years, or both.

(b) Whoever, being an officer or employee referred to in subchapter II of chapter I of this title—

(1) willfully and knowingly makes a false certificate or fictitious return; or

(2) knowingly or willfully furnishes or causes to be furnished, or, having been such an officer or employee, knowingly or willfully furnished or caused to be furnished, directly or indirectly, to the Secretary or to any other officer or employee of the Department of Commerce or bureau or agency thereof, any false statement or false information with reference to any inquiry for which he was authorized and required to collect information provided for in this title—shall be fined not more than $2,000 or imprisoned not more than five years, or both.

214. Wrongful disclosure of information

Whoever, being or having been an employee or staff member referred to in subchapter II of chapter I of this title, having taken and subscribed the oath of office, or having sworn to observe the limitations imposed by section 9 of this title, publishes or communicates any information, the disclosure of which is prohibited under the provisions of section 9 of this title, and which comes into his possession

by reason of his being employed (or otherwise providing services) under the provisions of this title, shall be fined not more than $5,000 or imprisoned not more than 5 years, or both.

Subchapter II—Other Persons

221. Refusal or neglect to answer questions; false answers

(a) Whoever, being over eighteen years of age, refuses or willfully neglects, when requested by the Secretary, or by any other authorized officer or employee of the Department of Commerce or bureau or agency thereof acting under the instructions of the Secretary or authorized officer, to answer, to the best of his knowledge, any of the questions on any schedule submitted to him in connection with any census or survey provided for by subchapters I, II, IV, and V of chapter 5 of this title, applying to himself or to the family to which he belongs or is related, or to the farm or farms of which he or his family is History of the 1992 Census the occupant, shall be fined not more than $100.

(b) Whoever, when answering questions described in subsection (a) of this section, and under the conditions or circumstances described in such subsection, willfully gives any answer that is false, shall be fined not more than $500.

(c) Notwithstanding any other provision of this title, no person shall be compelled to disclose information relative to his religious beliefs or to membership in a religious body.

223. Refusal, by owners, proprietors, etc., to assist census employees

Whoever, being the owner, proprietor, manager, superintendent, or agent of any hotel, apartment house, boarding or lodging house, tenement, or other building, refuses or willfully neglects, when requested by the Secretary or by any other officer or employee of the Department of Commerce or bureau or agency thereof, acting under the instructions of the Secretary, to furnish the names of the occupants of such premises, or to give free ingress thereto and egress therefrom to any duly accredited representative of such Department or bureau or agency thereof, so as to permit the collection of statistics with respect to any census provided for in subchapters I and II of chapter 5 of this title, or any survey authorized by subchapter IV or V of such chapter insofar as such survey relates to any of the subjects for which censuses are provided by such subchapters I and II, including, when relevant to the census or survey being taken or made, the proper and correct enumeration of all persons having their usual place of abode in such premises, shall be fined not more than $500.

224. Failure to answer questions affecting companies, businesses, religious bodies, and other organizations; false answers

Whoever, being the owner, official, agent, person in charge, or assistant to the person in charge, of any company, business, institution, establishment, religious body, or organization of any nature whatsoever, neglects or refuses, when requested by the Secretary or other authorized officer or employee of the Department of Commerce or bureau or agency thereof, to answer completely and correctly to the best of his knowledge all questions relating to his company, business, institution, establishment, religious body, or other organization, or to records or statistics in his official custody, contained on any census or other schedule or questionnaire prepared and submitted to him under the authority of this title, shall be fined not more than $500; and if he willfully gives a false answer to any such question, he shall be fined not more than $10,000.

225. Applicability of penal provisions in certain cases

(a) In connection with any survey conducted by the Secretary or other authorized officer or employee of the Department of Commerce or bureau or agency thereof pursuant to subchapter IV of chapter 5 of this title, the provisions of sections 221, 222, 223 and 224 of this title shall apply—

(1) with respect to the answering of questions and furnishing of information, only to such inquiries as are within the scope of the schedules and questionnaires and of the type and character heretofore used in connection with the taking of complete censuses under subchapters I and II of chapter 5 of this title, or in connection with any censuses hereafter taken pursuant to such subchapters;

(2) only after publication of a determination with reasons therefor certified by the Secretary, or by some other authorized officer or employee of the Department of Commerce or bureau or agency thereof with the approval of the Secretary, that the information called for is needed to aid or permit the efficient performance of essential governmental functions or services, or has significant application to the needs of the public, business, or industry and is not publicly available from nongovernmental or other governmental sources;

(3) in the case of any new survey, only after public notice, given by the Secretary or other authorized officer or employee of the Department of Commerce or bureau or agency thereof at least thirty days in advance of requesting a return, that such survey is under consideration.

(b) The provisions for imprisonment provided by section 222 of this title shall not apply in connection with any survey conducted pursuant to subchapter II of chapter 3 of this title, or to subchapter IV of chapter 5 of this title.

(c) The provisions of sections 221, 222, 223, and 224 of this title shall not apply to any censuses or surveys of governments provided for by subchapters III and IV of chapter 5 of this title, nor to other surveys provided for by subchapter IV of such chapter which are taken more frequently than annually.

(d) Where the doctrine, teaching, or discipline of any religious denomination or church prohibits the disclosure of information relative to membership, a refusal, in such circumstances, to furnish such information shall not be an offense under this chapter.

Subchapter III—Procedure

241. Evidence

When any request for information, made by the Secretary or other authorized officer or employee of the Department of Commerce or bureau or agency thereof, is made by registered or certified mail or telegram, the return receipt therefor or other written receipt thereof shall be prima facie evidence of an official request in any prosecution under such section.

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Appendix B.

Appendix B.
Historical Notes

ORIGINS OF THE CENSUS

The First Censuses: 1790-1840

The Constitutional Convention in 1787 set many precedents, among which was the incorporation in the governing instrument of the new Nation of a requirement for a periodic count of the population of that Nation for purposes of the equitable distribution to each State of taxes and representation in the House of Representatives. Article I, section 2, of the United States Constitution required an enumeration of the ''whole Number of free Persons, including those bound to Service for a Term of Years, and excluding Indians not taxed, three-fifths of all other Persons...within three Years after the first Meeting of the Congress of the United States, and within every subsequent Term of ten years....''

The first census was carried out by the new Government in 1790, but even some members of the Constitutional Convention had recognized that a periodic and universal enumeration of the country could be used to gather much useful information on more than the population. James Madison, when a member for Virginia of the first House of Representatives, introduced a bill to use the census to collect information on occupations and other economic subjects, as well as basic data on the age, sex, and race of the population. The House approved the idea, but the Senate rejected it, and Madison had to content himself with a census collecting information only on the number of inhabitants, their age, sex, and whether slave or free. Nevertheless, the rapid growth of the new Nation soon caused the Federal Government and others to look for some means of measuring that growth, and in 1810—during the first administration of President James Madison—items on the kind, quantity, and value of goods manufactured were included in the third national enumeration.[1]From its founding until well into the 19th Century, the United States was primarily an agricultural nation—95 percent of the population counted in the first census lived on the land. The 1820 census was the first to include any question on agriculture, and it asked only how many persons in each household were engaged in agriculture. (Approximately 70 percent of the total population at the time were so engaged.)

[1]The Federal Government published a separate report covering the nondemographic data collecting in the third census: *A Statement of the Arts and Manufactures of the United States of America, for the Year 1810.* This document may be considered the forerunner of the Census Bureau's enormous economic statistical publishing program.

The 1840 census introduced separate schedules of questions relating to mining, agriculture, commerce, manufactures and trades, and navigation. The agriculture schedule included questions on cereals and other crops, and on livestock, and the results were published with the rest of the census data. Even this expanded information was considered unreliable and lacking in detail, and there were demands that the census collect more detailed information, and that the Government pay more attention to ensuring the accuracy of the data collected and published.

The Agriculture Census

The dissatisfaction with the 1840 census prompted Congress to give particular attention to the organization and data content of the 1850 census. A select committee of the House of Representatives recommended that the Federal Government establish a permanent census office. The Senate shared many of the concerns expressed by the House, but declined to support the measure, so a permanent census office had to wait another half-century. Nevertheless, the 1850 census assumed much of the specialized organization that has since characterized the censuses, and is often considered the first ''modern'' enumeration.

The increased specialization began at the top, where the Congress transferred the responsibility for supervising the census from the Department of State to the newly formed Department of the Interior. The census was organized into six subject areas for data collection, including agriculture, each with a separate list of questions. The agriculture questionnaire, or ''schedule,'' asked for the name of the person(s) in each household who operated a farm, and made relatively detailed inquiries on acreage and agricultural activities, including quantities produced of selected products; the value of farm implements and machinery, livestock, animals slaughtered, and homemade manufactures; and the cash value of the farm. The 1850 census publications included the total number of farms for the United States (1.4 million) and each State; acreage (294 million acres under cultivation); and total value of farms, buildings, livestock, machinery, and equipment (nearly $4 billion).

The censuses became more detailed as the century progressed. The census law of 1879 provided for the appointment by the President (with Senate confirmation) of up to 150 local supervisors for the 1880 census (at least 1 for each State or territory) as well as for employing

specialists to collect data on certain census subject matter areas, such as manufactures and mining. The local supervisors were responsible for the actual data collection, as well as for hiring suitable enumerators. This enlarged staff permitted closer supervision of the enumeration and thus, it was hoped, greater accuracy. The 1880 agriculture census schedule included new items on tenure, weeks of hired labor, costs for building and maintaining fences, and cost of fertilizer purchased, and used specialized questionnaires to collect detailed production information on selected crops and livestock.

The agriculture census expanded further for 1890, when the agriculture schedule doubled in length—including new inquiries on agricultural organizations, floriculture, and irrigation—and again used special questionnaires for selected operations. The population census also collected agricultural data, asking for information on farm mortgages.

The 1900 agricultural census introduced a question on the race of the farm operator, but was otherwise similar to the previous enumeration. The 1900 census saw the agriculture census enter the age of automated data processing when the census staff used punchcards and electric tabulating machines to process and tabulate the statistics (the punchcard tabulating equipment had first been used for processing in the 1890 population census). This equipment tabulated the results of the 1890 population census, and was adapted for the agriculture enumeration by the development and addition of an automatic sorter (required because of the large number of crop cards used in processing the agriculture data) and the use of a new keypunch machine.

THE 20TH CENTURY

Program Development

The establishment of a permanent Census Bureau. The first 12 U.S. censuses used temporary organizations, established a few months before the official census date and disbanded once the data had been collected and published. It soon was evident that the elaboration of the census operation, and of the kinds and volume of data tabulated and published, required more time and resources than could be provided by a staff and office organized and disbanded for each census. The results of the 1880 census dissatisfied many data users, and led to a campaign by interested professional and commercial organizations—e.g., the National Board of Trade, the American Statistical Association, and the American Economic Association—for a permanent census office. The 12th census, for 1900, was the last carried out on the old ad hoc basis. In 1902 the Congress authorized the establishment of the permanent census office within the Department of the Interior. The new unit, later designated the Bureau of the Census, moved to the newly created Department of Commerce and Labor in the following year, and when the Department was divided in 1913, was assigned to the Department of Commerce, where it has since remained.

Agriculture census programs. By 1880, the various censuses' statistics had proved so useful that the former chairman of the American Statistical Association suggested expanding the decennial census by adding a mid-decade enumeration. Many of the same persons and associations pushing for a permanent statistical office also urged this, as well as the addition of specialized censuses to the agriculture program. In 1910, the agriculture census program began to expand, adding related enumerations, as follows—

- In 1910, the Congress directed the Census Bureau to carry out a decennial census of irrigation as part of the agriculture census.
- In 1920, the Congress required the Census Bureau to conduct decennial censuses of drainage. (The legal requirement for a census of drainage lasted into the 1980's, but in 1985, lack of interest among data users prompted Congress to remove it from the census law.)
- Special censuses of horticultural specialties also were added to the agriculture census program, although at irregular intervals, i.e., as part of the 1890, 1930, 1950, 1959, 1969, 1978, and 1987 censuses.

The ''special'' censuses usually were carried out for the year following the general agriculture census's reference year (the 1994 Farm and Ranch Irrigation Survey—originally scheduled for 1993—was postponed a year due to budget constraints), using operator lists drawn from the census respondent lists.

Congress also considered the question of mid-decade enumerations, and, in 1919, after wavering back and forth on the question for some years, authorized a mid-decade agriculture enumeration beginning with a census for 1925 (in addition to the decennial censuses for years ending in ''0''). Subsequent agricultural censuses have been on a 5-year cycle in years ending in ''0'' and ''5,'' collecting data for the preceding crop year. This system continued until 1954, when Congress codified the Census Bureau's operations in Title 13, United States Code—Census. Title 13 established the new reference years for the agricultural census—years ending in ''4'' and ''9'' (again collecting data for the preceding year), although the agricultural (and irrigation and drainage) censuses, ostensibly done in years ending in ''9,'' actually continued to be carried out as part of the decennial census operation.

The advantages of obtaining agricultural and economic census data for the same year, providing a single ''snapshot'' of the national economy, were obvious to most observers, and it was not long before there was considerable support for simultaneous agricultural and economic censuses. The Department of Commerce and the Census Bureau recommended in 1972 that the dates of the agriculture census be changed to coincide with those of the economic censuses; in 1976 Congress enacted Public Law 94-229, requiring agriculture censuses for 1978, 1982, and every fifth year thereafter, making them concurrent, for 1982 and after, with the economic censuses.

Enumeration dates, timing, and methodologies. Prior to the 1950's, the agriculture census was usually carried out during the first months of the year following the reference year. The Census Bureau enumerated agriculture at the same time as the population censuses in decennial census years—e.g., in April of the census year for 1910, and from 1930 through 1950 (the 1920 census date was January 1 of that year)—to make use of the field and office staffs already in place. The long gap between the end of the reference year and the beginning of the censuses in these years presented a significant problem for respondents trying to answer the census accurately. The mid-decade censuses for 1925 through 1945 were conducted in January of the year following the reference year, to collect the data on the entire calendar year as soon as possible after its end.

The 1920 and the mid-decade enumerations provided data for reference periods corresponding to those used in the U.S. Department of Agriculture crop and livestock estimates (issued as of December 1 and January 1, respectively), but winter weather made canvassing, particularly in rural areas, very difficult. In addition, there were problems fitting a fairly long interview into the busy workday of the average farmer. The Census Bureau tested a methodology intended to mitigate these problems as part of the 1920 census. Local mail carriers, who were assumed to have sufficient knowledge about the people and farms on their routes to permit them to check the accuracy of responses, as well as avoid at least part of the problem of long interviews, were employed to deliver the questionnaires, pick them up when completed, and carry out a preliminary review of the responses. The plan had mixed results, particularly in the rural test area, and was not adopted as a general enumerative technique.[2] For the first mid-decade agriculture census in 1925, the Census Bureau made a special effort to hire as enumerators people identified with agriculture. The presidents of State agricultural colleges recommended persons to act as supervisors, forest rangers from the Department of Agriculture enumerated farms near national forests, employees of the Bureau of Reclamation canvassed irrigation projects, and Indian agents collected data for farms on Indian reservations. In later canvasses, farmers and farmers' wives frequently were hired to carry out the canvass.

In the 1954 agriculture census, the Census Bureau inaugurated an attempt to collect the required data as near as possible to the end of the crop year of the reference year; canvassing began in November of the reference year. This improved the quality of the data, and the Census Bureau continued to use this procedure for the 1959 and 1964 censuses, but weather still presented a serious problem for canvassing.

The Census Bureau adopted mailout/mailback methodology as the rule for the 1969 agriculture census, permitting a return to a January data collection. The Census Bureau had used this procedure for the 1963 Economic Censuses, and planned to use it in major portions of the 1970 population and housing censuses as well. Employed in the agriculture census, mailout/mailback allowed farmers to complete their report forms at their own convenience, with full access to their own records, and gave them an opportunity to review and correct their own report forms. The Census Bureau compiled an address list of potential agricultural operations from the previous agriculture census records and from administrative records supplied by the Internal Revenue Service, the Social Security Administration, and the U.S. Department of Agriculture. The mailout, at the end of December 1969, requested inventory and production data for that year as of December 31. The Census Bureau asked farmers to complete the forms and mail them back; field enumeration was retained only for Puerto Rico, Guam, the Virgin Islands of the United States, the Trust Territory of the Pacific Islands, and American Samoa, and for certain followup activities.

While far more convenient for farmers and more economic than using a field staff, the mailout/mailback census had problems of its own, particularly the need for a complete address list and for timely response from farmers. The Census Bureau found mail-list compilation particularly difficult with respect to small farms, which were not likely to be included in many of the administrative records the agency used to assemble its list. Adequate response rates required multiple followup mailings—six or seven in a typical census—as well as telephone enumeration of particularly large or important nonrespondent operations, over a period of several months.

Despite these problems the overall coverage obtained by mailout/mailback was only slightly lower than from the old canvassing methodology. The cost savings realized, as well as the convenience (and hence reduced resistance to response for the agricultural operators), were considered to outweigh the drawbacks of the technique.

Sampling. The Census Bureau introduced sampling for specific information in the 1940 agriculture census, when it sampled the collected data for a series of special tabulations. The 1945 agriculture census used sampling as an enumeration method. While the census collected county-level data in a conventional canvassing operation, selected State-level estimates were obtained from an area-segment sample[3] that included approximately 7 percent of all farms in the United States.

[2] It was tried again in the 1950 census, when mail carriers delivered the questionnaires to rural route boxholders, who were asked to complete the forms and hold them until an enumerator arrived to pick them up.

[3] An area-segment sample typically involved identifying particular geographic area segments, usually expected to have a specified average number of agricultural operations, and sampling the total number of segments identified. (For the 1945 census, a 1-in-18 sample of area segments (each expected to contain five agricultural operations) in all counties was selected, and this, together with 50,000 large farms selected for certain inclusion, made up the national sample.) Once a sample was selected, the cooperating agency (USDA's National Agriculture Statistics Service (NASS) and its predecessor, the Statistical Reporting Service (SRS) frequently collaborated with the Census Bureau, making USDA's June Enumerative Survey area sample available for census evaluation, and other purposes) canvassed the famers in the segments to collect the data needed.

Later agriculture censuses sampled to reduce overall respondent burden by collecting selected data only from certain farm operations, and developed estimates for all farms based on the sample data. The technique for the general census used a short form that included the core items requested of all farms, and a standard form (used for a sample of farms) that asked both the core items and additional questions on areas of special interest. The sample generally included all farms expected to meet specified value of sales or acreage limits, plus a random sample of all other farms on the census lists.

The Census Bureau also made extensive use of sampling in its coverage evaluation program to estimate the completeness of the enumeration and to adjust census statistics to compensate for nonrespondent operations.

Agricultural services censuses. Increasing interest in businesses providing services to agricultural operations led the Census Bureau to develop a census of agricultural services for the 1969 agriculture census program. This specialized enumeration aimed at collecting business information (i.e., volume of sales, payroll, number of employees, and so on) at the establishment level on specified types of service operations, such as veterinary services, soil treatment operations, animal and livestock services other than veterinary, soil and crop services, landscapers, farm labor management firms, and the like. The Census Bureau prepared mail lists from administrative records (e.g., Internal Revenue Service (IRS) individual, partnership, and corporation tax records) and enumerated the service establishments by mail, publishing tabulations for the United States and for States, with limited data available for counties. The services' enumeration was repeated for the 1974 and 1978 agriculture censuses, but following the 1978 operation Congress withdrew funding and ended the program.

Follow-on sample surveys. Follow-on surveys enabled the Census Bureau to select the most efficient samples to collect detailed data on subjects of special interest without adding greatly to the overall respondent burden. A follow-on sample survey allowed the Census Bureau to draw a sample from the pool of agriculture census farms, and requested operators to provide more detailed information on their agricultural activities than it was possible to ask in the general census.

The Census Bureau carried out the first agriculture follow-on survey after the 1954 census, with a mail sample survey of farm expenditures. Since then, every agriculture census program except that for 1982 included at least one follow-on survey (the original plans for the 1982 census called for several, but these were canceled because of budget constraints). The 1978 program included sample surveys of farm finances, farm and ranch irrigation practices, farm energy use, and a census of horticultural specialties. The 1987 follow-on program consisted of a horticultural specialties census, a farm and ranch irrigation practices sample survey, and an agriculture economics and land ownership survey. The 1992 Census of Agriculture program included only one follow-on survey, the 1994 Farm and Ranch Irrigation Survey.

The follow-on operations drew samples from the agriculture census itself, so the census data collection operation and the subsequent identification of sample operations for any follow-on survey had to be completed before the latter could get under way. Thus the follow-on surveys (or censuses) usually were carried out for the calendar year following the census reference year; e.g., the 1987 follow-on program data collection activities all took place in 1989, and requested data for calendar year 1988.

Report Form Content and Format

Content. In the 19th century, the agriculture census schedules asked for simple production quantities and total sales values for selected products, with relatively few items on such things as machinery and equipment, or fertilizers used. Changes to these schedules generally were restricted to changes in the kinds of crops and livestock for which data were requested. The 1900 census introduced questions on the race and tenure of farm operators, and from then until today, the agriculture census collected a considerable amount of social and economic information, along with the crop and livestock data. During the period between the World Wars, questions were added on such things as the availability of electricity, telephone service, and paved roads, as well as the degree of mechanization of farm operations, and nonfarm employment and income. The race, sex, and ethnic background of farm operators became important objects of the census questionnaire after World War II, and the 1978 and later agriculture census report forms asked for the respondent's sex, and whether he or she was of Spanish/Hispanic origin.

Business organization, off-farm income, and participation in a variety of Federal Government agricultural programs became increasingly important to data users as well. Some information on organization and income had been requested since the 1920's, and following World War II, items were added on participation in various Federal loan and land conservation programs. For 1974, the census questionnaire introduced an item on farm credit and debt, and for the 1987 census, additional inquiries on production expenses. The 1992 census added questions on hired farm labor by number of days worked, landlords, sales of products to individuals, injuries and deaths occurring on the farm, and additional detailed crop breakdowns (e.g., wheat by type).

Format. The agriculture censuses employed a field canvass of farm operators until the 1969 census. During the 19th century, enumerators used pages in large ledger type binders for collecting the agriculture data, but the Census Bureau began using separate agricultural questionnaires in the 1900 census, and has continued to do so since. (The 1945 enumeration reverted to the binder format as a wartime measure.)

The growing demand for more detailed data, and the opposing demand to reduce respondent burden led to compromises in every census, and to experiments during the 1940 and later censuses in tailoring report forms to reflect the special characteristics of agriculture in various parts of the country. The tailored forms typically had two sets of questions, one asking for basic information of all farm operations, and a second, varying from area to area, covering the crops and livestock produced there. This specialization of report forms reached its peak in the 1964 census, when there was a separate questionnaire for each State, Puerto Rico, Guam, and the Virgin Islands.

The agency eliminated the specialized forms for the 1969 census, when it designed two questionnaires—a short form asking for basic information, and a standard form that included additional items. Tailored report forms[4] were used only for Hawaii, Puerto Rico, and the outlying areas. The census used the standard form for farms in the 50 States expected to have $2,500 or more in agricultural products sold during the census year, while the short form went to smaller farms. A similar format was used for the 1974 census, while the Census Bureau employed a variation of the system in the 1978 census, with a somewhat longer basic questionnaire used for all farms, but with a ''sample'' questionnaire that included all the basic items plus six additional sections of inquiries for a sample of about 20 percent of all farms. Larger page size and other format changes enabled the Census Bureau to collect the data needed while reducing overall response burden by over 30 percent.

Standardization simplified the Census Bureau's job in terms of designing, printing, mailing, and processing the questionnaire, but respondents still were unhappy about questions irrelevant to their own operations. For the 1982 census, the Census Bureau reintroduced regionalized questionnaires for 12 geographic regions of the country, plus separate questionnaires for the outlying areas, and with sample and nonsample forms[5]for each region. The agriculture census ''regions'' did not coincide either with the Census Bureau's census geographic regions or with the USDA's regions, but were simply groupings of States in which the Census Bureau expected to find similar types of crops and livestock operations. The nonsample report form contained all the items requested of all farmers, while the sample version contained both the ''core'' items requested on the nonsample form and additional questions, and was used for a sample of about 20 percent of all farms. The Census Bureau continued to use this system of regionalized/sample and nonsample report forms for the 1987 and 1992 censuses, although the number of regions was raised to 13. (In the 1982 census, the Census Bureau there were 10 multi-State regions, while Florida and Hawaii each made up a region of their own. For 1987 and 1992, Alaska was designated a separate region as well.)

Processing and Publishing the Data

Processing. Processing the census data during most of the 19th century was a fairly straightforward operation; the enumeration staff returned completed schedules to the census office and the clerical staff tabulated and compiled the data by hand. The introduction of mechanical punchcard and electric tabulating equipment (first used in the 1890 population census, and for the 1900 agriculture census) was a major methodological and technological change, so much so that a comparable transformation in processing waited until the advent of the electronic computer and automated data processing systems half a century later. Technical improvements to the equipment continued throughout the intervening decades, (e.g., the 1940 agriculture census introduced automated editing of the census punchcards) however, the basic systems introduced for processing at the turn of the century remained in place until after World War II.

The Census Bureau played a major role in the development of modern computer technology. Its staff drew up the specifications and cooperated in the design of the ''Universal Automatic Computer,'' better known as UNIVAC, the first general purpose electronic computer system, which was installed at the Census Bureau's Philadelphia field office in 1951 for use in processing the 1950 population census. The system was moved to the Suitland headquarters in time for the 1954 agriculture census. Even with the new system, a large clerical staff was required to manually edit the individual report forms before the data were keyed to punchcards for computer processing. The 1964 census introduced ''string'' punching, which saved time in key punching and computer processing. This technology reduced the total number of punchcards needed to transfer the data to magnetic tape, and used computerized programs to perform much of the editing and tabulating work. For the 1969 census, the Census Bureau's Data Preparation Division (DPD) in Jeffersonville, IN, began keying the agriculture data directly to small magnetic tape reels, ''pooling'' (i.e., consolidating) the data on standard computer tape reels, and shipping the tapes to the main computer facility at Suitland, MD, for processing. High-speed printers produced copies of tables for review and correction, and even for photo-offset reproduction for publication. For the 1974 census, computer disks replaced the small tape reels, and the Jeffersonville office transmitted the data to Suitland electronically via telephone datalink. For the 1978 census, individual bar code address labels and laser ''reading'' equipment facilitated automated check-in, while in the 1982 census the data were keyed directly to computer disk once again, but there was no clerical edit before keying, since the edit programs developed by the Census Bureau made manual editing unnecessary. The 1982 census also

[4]The Census Bureau also produced separate report forms for the agricultural services census, and the decennial censuses of irrigation, drainage, and horticultural specialities carried out as part of the 1969 program.

[5]The sample forms were further specialized by the use of ''must'' report forms. ''Must'''' forms were used for very large or special operations, and were identical to the other sample forms in content. The Census Bureau used a different shading color for ''must'''' forms to facilitate identification of these cases during clerical processing.

saw the first use of the interactive data base system, which allowed analysts access to the entire data file to resolve problems. This system was expanded further for 1987, using minicomputer systems to edit the tabulations and to prepare the actual tables, making it possible to dispense with the paper printouts required in the earlier systems.

Publication. The agriculture census data traditionally was published in printed reports, containing tabulations at the national, State, or even county level (as appropriate for each report series), with occasional use of illustrations and graphics. Since the turn of the century, this conventional system was modified successively to include individual reports for each State and county, special reports on selected subjects, greatly increased use of graphics and the development of a graphics report, and the adoption of electronic and other publishing media.

The Census Bureau employed relatively simple geography for publishing census data. Until the 1987 census reports were issued, the standard area reports covered the country as a whole, census geographic regions (and occasionally census divisions), States, and counties. For the 1987 enumeration, the Census Bureau produced selected statistics at the five-digit ZIP-Code level as well; this was the first time agriculture census data were published for a level below the county since the first farm enumeration. In the 1992 census, the Bureau continued to publish ZIP-Code level data, and also produced tabulations of selected data for congressional districts.

The early census reports sometimes included selected maps and an occasional chart, but these were very limited in scope. The Census Bureau produced the first *Graphic Summary*, showing farm tenure and land use, as part of the 1945 agriculture census publication program, and for 1969, introduced computer generated maps as well as additional charts and graphs. Renamed the *Agricultural Atlas of the United States* for 1987, the graphics report became a regular and popular part of the census publication program.

The Census Bureau issued agriculture census data on computer tape—in two standard computer languages—for the first time as part of the 1964 publication program, although only tapes of the preliminary data were offered. For the 1969 and following censuses, the Bureau provided the final census data on computer tape, while preliminary data were available only on tape for the 1978 enumeration. As computer use became more widespread, data users indicated that they needed both the preliminary and final agriculture census data on computer tape, and urged the agency to expand its data publication in machine-readable format to include new media. For the 1982 census, the Census Bureau issued preliminary and final data files on computer tape and the preliminary data on flexible diskettes as well. Conventional computer tape files were those for which the user had to have access to a mainframe computer and the necessary programming and service staffs. Flexible diskettes could be used on the rapidly proliferating mini- and microcomputer systems, although they had limited data capacity (e.g., the 1982 agriculture preliminary data file required over 100 diskettes).

For the 1987 census, the Census Bureau dropped flexible diskettes in favor of developing data files for sale on compact disc-read only memory (CD-ROM). The CD-ROM format employed rigid plastic disks virtually identical to those introduced for audio recordings, and a single CDROM had a data capacity comparable to four high-density computer tapes. Moreover, while special ''readers'' were required to use the new product, the equipment could be added to a standard mini- or even microcomputer system at minimal expense, while giving the user access to an enormous amount of data. The entire 1987 agriculture census data file could be contained on a single CD-ROM disk with room to spare. The Census Bureau, after producing two test disks to evaluate the capabilities of the new medium, adopted it for future censuses and issued the final 1987 agriculture census data file on a single CD-ROM. The basic State and county data for the 1992 agriculture census were released on three CD-ROM's, the first containing selected data for the first 27 States processed, and the second and third, issued as a set, containing data for all States, plus the national summary data, and detailed cross-tabulations.

THE FARM DEFINITION

The first official definition of what constituted a farm for census purposes was used for the 1850 census, when any place that had $100 or more in total value of sales of agricultural products qualified. Since 1850, acreage and dollar value limits were added, altered, or removed, while a requirement evolved that the land on the place be (1) involved in, or connected with, agricultural operations, and (2) under the day-to-day control of a single management (either by an individual, partnership, corporation, or other organization).

The important point was, of course, the involvement with agricultural operations, which—again for census purposes—were the production of livestock, poultry, and animal specialties, and their products, and/or crops, including fruit, and greenhouse and nursery products. The land did not need to be a single contiguous tract to comprise a single farm, but had to be operated as a single economic unit (although exceptions were allowed; see the section on the 1950-1954 definition below).

The changes in the various criteria used in the farm definition, by census, were—

1850-1860	No acreage requirement, but a minimum of $100 in sales of agriculture products.
1870-1890	Any place of 3 or more acres, involved with agricultural production, qualified as a farm. Places with less than 3 acres were considered farms, if they had a minimum annual value of agricultural product sales of $500.

1900	No acreage or minimum sales requirement, and cranberry marshes, greenhouses, and city dairies were included, if they required the full-time services of at least one person.
1910-1920	A minimum of 3 acres, with $250 or more in total value of sales, unless the individual operation required the full-time services of at least one person.
1925-1945	The requirement of the full-time services of at least one person was deleted; otherwise the definition was unchanged.
1950-1954	Places of less than 3 acres qualified as farms if they had, or normally would have had, sales of $150 or more in agricultural products during the census year. Places that began operating for the first time as farms in 1954 also were included. Parcels operated by sharecroppers, and tenant farms, counted as separate farms, even though the landlord handled the entire holding as a single unit. (Land retained and operated by the landlord also was counted as a separate unit.)
1959-1974	The acreage requirement was raised to 10 acres or more, with at least $50 or more in agricultural product sales. A place of less than 10 acres qualified as a farm if it had sales of $250 or more during the census year.
1978-	The acreage requirement was dropped and any place that had, or normally would have had, $1,000 or more in total agricultural product sales during the census year qualified as a farm.

The farm definitions used in Puerto Rico and the outlying areas differed from that employed in the 50 States. In Puerto Rico, the definition generally required 3 or more cuerdas (a cuerda equals approximately .97 acres) and/or specified numbers of livestock, poultry, or fruit or nut trees. The outlying areas' definitions were similar, although in American Samoa a variety of different landholding arrangements had to be taken into consideration in defining individual agricultural operations. The Census Bureau and the Government of Puerto Rico agreed to change the farm definition to give greater emphasis to product sales in the 1982 census, when a farm was any place with $500 or more in annual sales of agricultural products, or any place of 10 cuerdas or more with $100 in sales of agricultural products. The 1987 agriculture census (actually conducted in 1990 for the Commonwealth of the Northern Marianas and American Samoa) in the other outlying areas introduced a similar change, dropping the crop, livestock, and acreage requirements in favor of a minimum of $100 in annual sales of agricultural products.

Appendix C.
Report Forms, Letters, and Envelopes Printed for the 1992 Census of Agriculture

Table 1. **1992 Census of Agriculture Report Forms Printed (by Region and Type)**

Region[1]	A04 Screener Form	A01 (Nonsample)	A02 (Sample)	A03 (Must)
Total	**1,816,000**	**5,288,000**	**2,795,9002**	**466,000**
01	160,300	462,000	213,000	39,000
02	279,900	1,098,000	426,000	70,500
03	93,900	258,000	168,000	28,000
04	429,800	803,000	459,000	75,000
05	59,800	118,000	56,500	17,500
06	208,100	741,000	307,000	51,500
07	79,100	617,000	214,000	38,000
08	73,500	463,000	244,500	52,000
09	82,900	147,500	107,000	27,000
10	97,200	200,500	89,000	26,000
11	151,500	380,000	122,500	41,500
12			33,400	
13			11,000	
14 (General)	100,000		125,000	

[1]The States in each region were as follows: *01*. Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, West Virginia; *02*. Illinois, Indiana, Iowa, Kansas, Nebraska, Ohio; *03*. Michigan, Wisconsin; *04*. Alabama, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, Virginia; *05*. Florida; *06*. Arkansas, Louisiana, Mississippi, Missouri, Oklahoma; *07*. Texas; *08*. Minnesota, Montana, North Dakota, South Dakota; *09*. Colorado, Nevada, New Mexico, Utah, Wyoming; *10*. Idaho, Oregon, Washington; *11*. Arizona, California; *12*. Hawaii; *13*. Alaska.

[2]Sample total includes 220,000 report forms (91,000 -A202 and 129,000 -A202(F)) used in the film optical sensing device for output to computer (FOSDIC) test in Illinois, Iowa, Nebraska, and Ohio, not included in the count for region 02.

Facsimilies of representative screener and report forms are included in appendix F. Other printed materials ordered for the data collection operation mailings are shown in tables 2 and 3.

Table 2. **Information Sheets and Followup Letters**

Form number	Description	Quantity
92-A01(I)	Instruction sheet (screener and non-sample questionnaires)	6,584,000
92-A02(I)	Instruction sheet (sample and must questionnaires)	2,705,000
92-A01(L1)	Transmittal letter (initial mail out)	4,401,000
92-A01(L2)	Reminder card	4,200,000
92-A01(L3)	Followup letter	2,231,000
92-A01(L4)	Followup letter	1,405,000
92-A01(L5)	Followup letter	55,000
92-A01(L6)	Followup letter	965,000
92-A01(L1A)	Transmittal letter (UAA's)	162,000

Facsimiles of the standard instructions sheet, the reminder card, and principal followup letters are included in appendix G.

Table 3. **Outgoing and Return Envelopes**

Form number	Description	Quantity
92-A7.1	Outgoing envelope (initial mailout)	4,535,500
92-A7.2	Outgoing envelope (followup)	2,322,000
92-A7.3	Outgoing envelope (followup)	1,461,000
92-A7.4	Outgoing envelope (followup)	44,000
92-A7.5	Outgoing envelope (followup)	1,005,000
92-A7B	Outgoing envelope (UAA)	212,000
92-A7C	Outgoing envelope (correspondence)	71,000
92-A7	Outgoing envelope (reserve)	200,000
92-A8A(SC)	Return envelope (screener questionnaires)	1,702,000
92-A8A(N)	Return envelope (nonsample questionnaires)	5,100,000
92-A8A(S)	Return envelope (sample questionnaires)	2,375,000
92-A8A(M)	Return envelope (must questionnaires)	423,000
92-A8A	Return envelope (reserve)	200,000

Appendix D.
1992 Census of Agriculture Mailout and Followup Mailings

Table 1. **1992 Census of Agriculture Mailout: December 8-18, 1992**

Form Type	Quantity
Total	**3,551,407**
Nonsample (forms 92-A0101 to -A0111)	2,131,699
Sample (total (excluding multiunits and abnormals))	1,000,442
General Sample (forms 92-A0201 to -A0213)	865,226
Must Cases (forms 92-A0301 to -A0311)	135,216
Multiunit (forms 92-A0301 to -A0311, forms 92-A0201 and -A0212)	5,727
Abnormal (forms 92-A0301 to -A0311, 92-A0201, and 92-A0213)	1,899
Screener (forms 92-A0401 to -A0411)	411,640

Table 2. **First Followup: Reminder/Thank You Card (Form 92-A01(L2)): January 6-8, 1993**

Date	Quantity
January 6-8, 1993	3,543,781[1]

[1]The Form 92-A01(L2), Reminder Card was mailed to all addresses in the mail file except multiunits and abnormals.

Table 3. **Geographic Segments Used in the 1992 Census of Agriculture Mail-Followup Operations**

Segment	States
1	Must cases for all States
2	Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming
3	Texas
4	Michigan, Minnesota, Montana, North Dakota, South Dakota, Wisconsin
5	Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, Virginia, West Virginia
6	Alabama, Georgia, Kentucky, South Carolina, Tennessee
7	Arkansas, Louisiana, Mississippi, Missouri, Oklahoma
8[1]	Florida, Kansas, Indiana, Iowa
9	Alaska, Hawaii, Illinois, Nebraska, Ohio

[1]FOSDIC test cases for Iowa were mailed as part of the segment 9 mailout.

Table 4. **Second Followup (Report Form): February 11-24, 1993**

Segment	Check-in closeout	Total	Nonsample	General sample	Must	Screener
Total		**1,521,702**	**858,117**	**398,505**	**66,957**	**198,123**
1	Feb. 8	66,957			66,957	
2	Feb. 9	198,493	98,596	53,935		45,962
3	Feb. 10	136,677	98,668	31,917		6,092
4	Feb. 11	203,721	123,297	61,000		19,424
5	Feb. 15	170,131	98,326	55,302		16,503
6	Feb. 16	224,585	104,440	56,040		64,105
7	Feb. 17	213,524	130,953	56,996		25,575
8	Feb. 18	163,983	115,502	38,397		10,084
9	Feb. 21	143,631	88,335	44,918		10,378

Table 5. **Third Followup (Report Form): March 18-29, 1993**

Segment	Check-in/ closeout	Total	Nonsample	General sample	Must	Screener
Total		**1,102,924**	**610,123**	**295,772**	**48,782**	**148,247**
1,3	Mar. 15	148,550	71,398	23,526	48,782	4,844
2	Mar. 16	136,771	66,535	38,075		32,161
4	Mar. 17	146,540	87,479	45,319		13,742
5	Mar. 18	123,443	69,886	41,119		12,458
6	Mar. 19	166,585	74,515	42,717		49,353
7	Mar. 22	157,798	94,691	43,286		19,821
8	Mar. 23	117,510	81,736	27,890		7,884
9	Mar. 24	105,727	63,903	33,840		7,984

Table 6. **Fourth Followup (Letter): April 23- May 7, 1993**

Geographic Segment	Check-in closeout	Quantity
Total		**856,191**
1,3	Apr. 21	113,479
2	Apr. 20	105,573
4	Apr. 22	116,036
5	Apr. 26	94,388
6	Apr. 27	132,438
7	Apr. 28	123,748
8	Apr. 29	88,839
9	May. 4	81,690

Table 7. **Fifth Followup (Report Form): May 27-June 3, 1993**

Segment	Check-in/ closeout	Total	Nonsample	General sample	Must	Screener
Total		**722,874**	**401,852**	**191,766**	**25,841**	**103,415**
1,2	May 24	113,017	41,553	24,234	25,841	21,389
3,4	May 25	168,177	108,037	47,146		12,994
5,6	May 26	188,469	92,799	52,148		43,522
7,8	May 27	182,757	116,217	46,712		19,828
9	May 28	70,454	43,246	21,526		5,682

Table 8. **Mailing Undeliverable As Addressed (UAA)**

Mailing	Check-in/closeout	Mailout Date	Quantity
Total			33,393
First	Feb. 4	Feb. 9-16	[3]2,735
Second	Mar. 1	Mar. 5	658

Appendix E.
Publications in Selected Series

The major publications series for the 1992 Census of Agriculture were the Volume 1, *Geographic Area Series*, AC92-A, the Volume 2, *Subject Series* (in 5 parts), AC92-S, and the Volume 3, *1994 Farm and Ranch Irrigation Survey*, AC92-FRIS.

The Volume 1, *Geographic Area Series*, consisted of a report for the United States, and individual reports for each State, Puerto Rico, Guam, and the U.S. Virgin Islands. Each report included an introductory text and two chapters of detailed statistical tables, the first for the State/area, and the second covering the county or country equivalents (e.g., parishes, municipios, election districts). The Census Bureau issued the Volume 1 reports in printed volumes, online (selected highlights only), computer tape, and on three compact disc-read only memory (CD-ROM) discs. (Data for Puerto Rico, Guam, and the U.S. Virgin Islands were not released on CD-ROM. Reports for these areas were available in printed reports and online highlights, and a computer tape file for Puerto Rico also was available.)

The Volume 2, *Subject Series*, consisted of five reports—Part 1, *Agricultural Atlas of the United States*; Part 2, *Coverage Evaluation*; Part 3, *Ranking of States and Counties*; Part 4, *History*; and Part 5, *ZIP Code Tabulations of Selected Items*. Parts 1-4 all were available as printed reports, while Part 5 was released on CD-ROM and the Census Bureau plans to issue Parts 1 and 2 together with congressional district data and a 1992 Public Use Microdata File on CD-ROM as well. Highlights of Parts 3 and 5 also were available online.

Volume 3, *1994 Farm and Ranch Irrigation Survey*, showed statistics about on-farm irrigation practices collected from a sample of 1992 agricultural operations (excluding Alaska, Hawaii, abnormal farms, and horticultural specialty operations) who reported using irrigation during the census year. The publication reported data for 18 water resources regions of the 48 conterminous States, and for the 27 leading irrigation States. The report was released as a printed volume, on CD-ROM, and highlights were made available online.

PRINTED REPORTS

Volume 1, *Geographic Area Series,* Series AC92-A

Geographic Area	Report No. (AC92-A-)	Pages	Price	Published
Alabama	1	520	28.00	Nov. 16, 1994
Alaska	2	242	8.50	Dec. 1, 1994
Arizona	3	300	16.00	Oct. 27, 1994
Arkansas	4	536	28.00	Nov. 9, 1994
California	5	526	28.00	Oct. 25, 1994
Colorado	6	484	26.00	July 19, 1994
Connecticut	7	284	16.00	June 16, 1994
Delaware	8	272	15.00	Jan. 13, 1994
Florida	9	500	28.00	June 6, 1994
Georgia	10	830	37.00	Dec. 12, 1994
Hawaii	11	260	15.00	Dec. 12, 1994
Idaho	12	424	23.00	July 7, 1994
Illinois	13	628	24.00	June 2, 1994
Indiana	14	620	33.00	Mar. 4, 1994
Iowa	15	620	32.00	Apr. 5, 1994
Kansas	16	644	34.00	June 1, 1994
Kentucky	17	712	35.00	Aug. 23, 1994
Louisiana	18	484	27.00	Sept. 6, 1994
Maine	19	316	18.00	June 16, 1994
Maryland	20	344	19.00	May 11, 1994
Massachusetts	21	296	17.00	June 16, 1994
Michigan	22	596	31.00	June 6, 1994

PRINTED REPORTS

Volume 1, *Geographic Area Series,* Series AC92-A—Con.

Geographic Area	Report No. (AC92-A-)	Pages	Price	Published
Minnesota	23	588	30.00	Nov. 16, 1994
Mississippi	24	540	30.00	Nov. 21, 1994
Missouri	25	652	35.00	Apr. 14, 1994
Montana	26	472	25.00	Sept. 26, 1994
Nebraska	27	618	32.00	Sept. 28, 1994
Nevada	28	310	18.00	Sept. 19, 1994
New Hampshire	29	288	16.00	June 16, 1994
New Jersey	30	332	19.00	July 26, 1994
New Mexico	31	392	21.00	Nov. 18, 1994
New York	32	498	27.00	July 27, 1994
North Carolina	33	604	34.00	Nov. 29, 1994
North Dakota	34	480	26.00	Oct. 26, 1994
Ohio	35	606	32.00	Apr. 29, 1994
Oklahoma	36	578	30.00	Nov. 28, 1994
Oregon	37	412	22.00	Feb. 9, 1994
Pennsylvania	38	532	28.00	Aug. 24, 1994
Rhode Island	39	244	14.00	June 16, 1994
South Carolina	40	430	23.00	Dec. 12, 1994
South Dakota	41	506	27.00	Oct. 25, 1994
Tennessee	42	608	31.00	Aug. 22, 1994
Texas	43	1,088	40.00	Dec. 2, 1994
Utah	44	362	19.00	Sept. 1, 1994
Vermont	45	292	16.00	June 16, 1994
Virginia	46	630	33.00	May 11, 1994
Washington	47	396	22.00	Mar. 25, 1994
West Virginia	48	448	24.00	May 13, 1994
Wisconsin	49	546	29.00	Mar. 16, 1994
Wyoming	50	316	18.00	July 19, 1994
United States	51	516	29.00	Dec. 14, 1994
Puerto Rico	52	273	18.00	Jan. 31, 1995
Guam	53	68	5.00	June 5, 1995
Virgin Islands of the United States	54	44	3.75	Mar. 28, 1995

Volume 2, *Subject Series*, Series AC92-S

Part	Title	Report No. (AC92-S-)	Price	Published
1	Agricultural Atlas of the United States	AC92-S-1	20.00	Jan. 1996
2	Coverage Evaluation	AC92-S-2	(X)	May 1996
3	Ranking of States and Counties	AC92-S-3	11.00	Feb. 1995
4	History	AC92-S-4	.	/

Volume 3, *1994 Farm and Ranch Irrigation Survey*, Series AC92-FRIS

Title	Report Series No.	Price	Published
1994 Farm and Ranch Irrigation Survey	AC92-FRIS	12.00	Feb. 1996

Appendix F.
Chronology of Major Activities

Census	Began	Completed
1992 CENSUS OF AGRICULTURE OF THE UNITED STATES		
1990 Census Pretest		
Initial mailout	Nov. 1990	Nov. 1990
Field interviews	Dec. 1990	Feb. 1991
Telephone interviews	Dec. 1990	Feb. 1991
Mail List Development		
Procure source lists	June 1990	July 1992
Mail list model development	Jan. 1991	Oct. 1992
List production	Apr. 1991	Sept. 1992
Sample selection	Oct. 1992	Oct. 1992
Final list processing	Oct. 1992	Oct. 1992
Census Mail Preparation and Mailout		
Print report forms and envelopes	Feb. 1992	Aug. 1992
Preparation for postal delivery	Mar. 1992	Dec. 1992
Initial mailout	Dec. 1992	Dec. 1992
First (reminder card) followup	Jan. 1993	Jan. 1993
Second followup	Feb. 1993	Feb. 1993
Third followup	Mar. 1993	Mar. 1993
Fourth followup	Apr. 1993	May 1993
Fifth followup	May 1993	June 1993
Citrus caretaker enumeration	Oct. 1991	Dec. 1992
Precomputer Processing		
Receipt and check-in	Jan. 1993	Sept. 1993
Correspondence	Jan. 1993	June 1993
Data keying	Feb. 1993	Dec. 1993
Edit review	Mar. 1993	Jan. 1994
Clerical review	June 1993	Jan. 1994
Computer Processing		
Census edit/item imputation	Feb. 1992	Aug. 1993
Disclosure analysis	Aug. 1993	Mar. 1994
Analytical review	May 1993	Mar. 1994
Data tabulation production	July 1993	May 1994
Publication		
Volume 1, *Geographic Area Series*	Nov. 1993	Oct. 1994
Volume 2, *Subject Series*		
Part 1, *Agricultural Atlas*	(X)	Jan. 1995
Part 2, *Coverage Evaluation*	(X)	May 1996
Part 3, *Ranking States and Counties*	(X)	Mar. 1995
Part 4, *History*	(X)	—
Part 5, *ZIP Code Tabulation of Selected Items From the 1992 Census of Agriculture*	(X)	[1]Dec. 1995
1992 Coverage Evaluation		
Develop estimation methodology	Apr. 1990	Mar. 1992
Receive and process USDA June Agriculture Survey (JAS) data	July 1992	Jan. 1995

See footnotes at end of table.

Census	Began	Completed
Classification Error Survey (CES)		
Design report form	Aug. 1991	June 1992
Select CES sample	Oct. 1992	Oct. 1992
Mailout and mail followup	Feb. 1993	July 1993
Telephone followup to nonrespondents	June 1993	Sept. 1993
Produce combined JAS/CES estimates	Oct. 1994	Sept. 1995
Publish 1992 Coverage Evaluation report	(X)	May 1996
1992 CENSUS OF AGRICULTURE IN PUERTO RICO		
Negotiate special agreement with the Commonwealth of Puerto Rico	May 1990	June 1991
Design and print report form	May 1991	Nov. 1992
Sample design and selection	Jan. 1991	Sept. 1992
Prepare mail list	Mar. 1991	Mar. 1993
Data collection	July 1993	Oct. 1993
Data keying	Aug. 1993	Oct. 1993
Data processing	Sept. 1993	Mar. 1994
Publication	(X)	May 1994
1992 CENSUS OF AGRICULTURE IN THE U.S. VIRGIN ISLANDS		
Negotiate special agreement with the Virgin Islands Government	Apr. 1990	Apr. 1990
Design and print report forms	June 1991	Nov. 1992
Data collection	June 1993	Aug. 1993
Data keying	Oct. 1993	Dec. 1993
Tabulation and editing	Dec. 1993	Feb. 1994
Publication	(X)	Apr. 1994
1992 CENSUS OF AGRICULTURE IN GUAM		
Negotiate special agreement with the Government of Guam	Apr. 1990	June 1991
Design and print report forms	Oct. 1991	Nov. 1992
Data collection	July 1993	Sept. 1993
Data keying	Oct. 1993	Dec. 1993
Tabulation and editing	Dec. 1993	June 1994
Publication	(X)	July 1994
1994 FARM AND RANCH IRRIGATION SURVEY		
Design report forms	Sept. 1993	Dec. 1993
Sample design	June 1993	Aug. 1994
Sample selection	Sept. 1994	Nov. 1994
Data collection	Jan. 1995	June 1995
Data tabulation and editing	Apr. 1994	Dec. 1995
Publication	(X)	June 1996
Electronic data release	(X)	Nov. 1995
Printed publication release	(X)	Feb. 1996

(X) Not applicable.

[1]The ZIP Code Tabulation of Selected Items From the 1992 Census of Agriculture was issued on CD-ROM only.

Appendix G.
Report Forms

CHANGES IN THE STANDARD REPORT FORMS

Background Information

The Secretary of Commerce is responsible for the design and content of all census data collection forms and usually delegates this task to the Director of the Bureau of the Census. The Census Bureau regularly consults interested organizations and agencies, including the U.S. Department of Agriculture, the Bureau of Economic Analysis, and others, for comments and suggestions regarding the report forms. The Census Bureau's own advisory committee on agricultural statistics reviews the suggestions, comments, and data requests and makes its own recommendations on the priorities to be assigned to the various items for inclusion in the final report forms. (See chapter 2 for more information on consultation on the census.)

1992 Census of Agriculture Report Forms

General design. The 1992 general report forms reintroduced the booklet format last used in the 1974 census. The census retained the regionalized census report forms, identifying 9 multi-State regions, plus Alaska, Florida, Hawaii, and Texas as separate regions for a total of 13. Four report forms were used for each region—two nonsample versions (one with a screener question and one without) and two sample versions (one for ''must'' cases and one for ''certainty'' and general sample cases—see chapter 2 for details and definitions of ''must'' and ''certainty'' cases). All of the report forms used identical formats, but employed tailored items to list crops and livestock common within each region.

The census used sample and nonsample versions of each regionalized form except for Alaska and Hawaii, where only sample forms were employed. The nonsample questionnaires contained the items asked of all respondents, while the sample versions included additional questions asked only of a sample of farmers. Both sample and nonsample versions used the booklet format; the booklet measured 8-1/2″ x 11″, consisting of white stock with black printing and shading in a different color for each region. The sample and nonsample forms were 12 and 10 pages long respectively, including the information sheet. The sample questionnaire contained all the sections on the nonsample form, plus additional sections on—

- Use of fertilizers and chemicals.
- Total production expenses, including interest expense for secured and unsecured loans.
- Machinery and equipment (inventory and value).
- Market value of land and buildings.
- Income from farm-related sources.

The Census Bureau also employed a ''screener'' form, which was, essentially, the nonsample form with the first section split into two subsections—the first asked recipients whether they had any agricultural activities during 1992, while the second covered the acreage items that composed the full section in the other report forms.

The Census Bureau assigned form numbers to the questionnaires by type of form (i.e., nonsample-screener, nonsample, sample-nonmust, sample-must) and by geographic region as follows:

Nonsample	Forms 92-A0101 through 92-A0111[1]
Nonsample (screener) (the -A0414 was a generalized form)	Forms 92-A0401 through 92-A0411 and 92-A0414
Sample (nonmust)	Forms 92-A0201 through 92-A0213
Sample (must)	Forms 92-A0301 through 92-A0311

[1]No nonsample questionnaires were used in Alaska or Hawaii, each of which constituted a separate ''region.''

In addition, in Illinois, Iowa, Indiana, and Ohio, the Census Bureau tested form 92-A0202(F) for use with film optical sensing device or input to computer (FOSDIC) equipment. The FOSDIC form was identical in content to the standard sample form except for the addition of optical recognition and alignment marks printed on the pages.

Major changes in data requested. The overall data content of the 1992 census report forms was similar to that of 1987—the bulk of the data collected on agricultural operations obviously concerned the basic information on number of farms, acreage in farmland and various crops,

inventories of livestock, value of sales of agricultural products, and so on. Specific data requirements and priorities change over time, and the content of the report forms has to be adjusted to reflect these changes. The major changes to the ''all farms'' sections of the report forms for the 1992 agriculture census were as follows:

Section	Change
Section 1. ACREAGE IN 1992	Item asking for landlords' and renters names, addresses, and acres rented from or to each was deleted; item added asking for ''Number of landlords'' was added to the section.
Section 2. Were any of the following CROPS harvested from ''THIS PLACE'' in 1992	''Winter wheat for grain'' and ''Spring wheat for grain'' were added to the crop list in the section.
Section 7. Were any CROPS harvested from ''THIS PLACE'' in 1992	''Ginseng'' was separately listed in this section, and ''Canola (pounds)'' included on the write-in list included ''other (industrial) rapeseed.''
Section 17. Did you or anyone else have any HORSES, BEES, FISH, GOATS, OTHER LIVESTOCK, or ANIMAL SPECIALTIES on this place in 1992?	''Hybrid striped bass'' and ''crawfish'' were added to the write-in list.
Section 20. (NEW) During 1992 did you grow or raise any crops, livestock, or livestock products that were sold DIRECTLY to individual consumers for HUMAN consumption—roadside stands, farmers markets, pick your own, door to door, etc.?	New section requesting products sold and gross value of sales.
Section 27. (NEW) HIRED FARM or RANCH LABOR—Did you have any paid workers doing agricultural labor on this place in 1992?	New section (data on labor was collected in the section on production expenses for 1987) requesting number of hired laborers working 150 days or more, and less than 150 days.
Section 28. (NEW) Were there any INJURIES or DEATHS connected with farm or ranch work on or for this place in 1992?	New section asked for number or injuries or work-related deaths for family members and hired workers

Puerto Rico and the Outlying Areas

Form 92-A1(PR), Puerto Rico. The Census Bureau consulted with data users in Puerto Rico, including the Department of Agriculture, the College of Agriculture of the University of Puerto Rico, the Agriculture Extension Service, and the Planning Board, to consider changes to the agriculture census report form for the 1992 enumeration. Based on the advice and recommendations received, the Census Bureau made the following changes to the report form content:

- Dropped the 1987 Section 21 (PRODUCTS FOR HOME CONSUMPTION).
- Dropped the item on tobacco from, and added plantains and bananas (and requested individual sales data for all major crops) to Section 3 (Was any COFFEE, PINEAPPLES, PLANTAINS, or BANANAS harvested FOR SALE from this place during the last 12 months?).
- Added item on number of cuerdas planted for individual fruit trees to Section 5 (Were there a combined total of 10 or more FRUIT TREES or COCONUT PALMS on this place for commercial production in the last 12 months?).
- Dropped value of sales of individual vegetable crops from Section 6 (Were any VEGETABLES or MELONS harvested FOR SALE from this place in the last 12 months?).
- Dropped items on molasses grass, milo, and elephant grass from Section 8 (Were any GRASSES grazed or cut, or were any SEEDLINGS or OTHER CROPS harvested FOR SALE on this place in the last 12 months?).
- Added Section 15, Did you or anyone else raise any FISH or AQUACULTURE PRODUCTS FOR SALE on this place during the last 12 months?

Form 92-A1(G), Guam. The report form used in the 1992 agriculture census for Guam was similar to that used in the 1987 enumeration, with modifications based on recommendations and suggestions from data users on Guam. The 1992 report form incorporated the following major changes:

- Deleted items on (1) land held under land permits and government-furnished land, (2) value of sales for individual crops (sales were collected by type of crop only, e.g., total value of sales in 1992 of fruits, nuts, or nursery crops), and (3) value of sales of each type of animal (sales were requested for cattle and calves (including carabaos), hogs and pigs, poultry, and other livestock).
- Dropped the 1987 distinction between ''crops harvested'' and ''crops sold,'' and asked for crops harvested for sale (usually acres and pounds) in all crops sections.
- Added Section 6, Was any LAND in this place IRRIGATED or was any water used for other agricultural purposes at any time during 1992?
- Added item on race of operator (senior partner or person in charge) to Section 13 (CHARACTERISTICS of the FARM OPERATOR).

Form 92-A1(VI), Virgin Islands of the United States. The changes made to the report form for the 1992 agriculture census in the Virgin Islands were similar in some instances to those made for Guam. The items on value of sales for individual crops and types of animals were dropped from the respective sections, and sales value was requested only for types of crops (e.g., field and forage crops, vegetables, etc.) and for specified kinds of animals (e.g.,

cattle and calves, hogs and pigs, and other livestock). The items on ''crops harvested'' also were replaced by ''crops harvested for sale.'' In addition, the following significant changes were made—

- Dropped 1987 Section 1 (OPERATOR).
- Dropped the item on production for home consumption from section on land in agriculture (Section 1 (LAND IN AGRICULTURE) for 1992).
- Split the 1987 section on crops harvested into three sections for 1992—Section 2 (Did you harvest any FIELD OR FORAGE CROPS FOR SALE in the last 12 months?), Section 3 (Did you harvest any VEGETABLES FOR SALE in the last 12 months?), and Section 4 (Were any FRUITS, NUTS, or NURSERY CROPS grown or harvested FOR SALE in the last 12 months?).
- Dropped the questions on whether the place had electricity and/or running water from the section on equipment and facilities (Section 7 in 1987, Section 11 in 1992).
- Dropped question on place of birth of the operator from section on operator characteristics (Section 8 in 1987, Section 12 in 1992).
- Added Section 8, Did you or anyone else raise any FISH or other AQUACULTURE PRODUCTS (shrimp, etc.) in the last 12 months?

Selected Facsimiles

[redacted]

Publication Program

1992 CENSUS OF AGRICULTURE

Results of the 1992 Census of Agriculture are published in a series of reports that provide data at the national, State, and county (or equivalent) levels for the United States. Data also are available for Puerto Rico, Guam, and the Virgin Islands of the United States.

VOLUME 1. GEOGRAPHIC AREA SERIES (AC92-A-1 TO -54)

National, State, and County Data are published in detailed national and State tables for the United States, and in State and county tables for each State. These reports include data on number and size of farm; crop production; livestock, poultry, and their products; tenure, age, and principal occupation of operator; type of organization; value of products sold; government payments plus market value of agricultural products sold; production expenses; direct marketing; number of hired employees; land use; irrigation; and the standard industrial classification of farms.

U.S. Summary and State Data Report (AC92-A-51)
Chapter 1. National-level data
Chapter 2. State-level data

State and County Data Reports (AC92-A-1 to -50)
Chapter 1. State-level data
Chapter 2. County-level data

Outlying Areas Data (AC92-A-52 to -54) are published for the regions and municipios of Puerto Rico, the election districts on Guam, and the islands of the Virgin Islands of the United States.

VOLUME 2. SUBJECT SERIES (AC92-S-1 TO -5)

Agricultural Atlas of the United States (AC92-S-1) graphically illustrates a profile of the Nation's agriculture at the county level in a series of dot and multicolor pattern maps. The maps provide displays on sizes and types of farms, land use, farm tenure, market value of agricultural products sold, crops harvested, livestock inventories, and other characteristics of farms.

Coverage Evaluation (AC92-S-2) provides national- and regional-level estimates on the completeness of the census, in terms of both the number of farms missed and selected characteristics of those farms.

Ranking of States and Counties (AC92-S-3) ranks the leading States and counties for selected items from the 1992 census. Tables show cumulative percent of U.S. totals and most include comparative data from the 1987 census.

History (AC92-S-4) provides a detailed description of the planning and conduct of the 1992 Census of Agriculture. It explains the history of the agriculture census, farm definition, data collection and processing, data dissemination, coverage evaluation and research, and the census of agriculture in outlying areas. Also included are facsimiles of the report forms, information sheets, and letters sent to the public.

ZIP Code Tabulations of Selected Items from the 1992 and 1987 Censuses of Agriculture (AC92-S-5) provides tabulations by five-digit ZIP Code for selected items from the 1992 and 1987 censuses. Data items include number of farms, land in farms, farms by size, market value of agricultural products sold by size of sales, livestock inventory, cropland harvested, selected crops, and other data.

VOLUME 3. 1994 FARM AND RANCH IRRIGATION SURVEY (AC92-RS-1)

This report provides data collected from a sample of irrigated farm operations identified in the 1992 Census of Agriculture. Data items include acres irrigated, land use, yields of specified crops, methods of water distribution, quantity of water used by source, expenses, and other irrigation practices. Data are available for each of the 17 Western States, 10 other leading irrigation States, and the 18 water resources regions of the conterminous United States.

PRINTED REPORTS

All of the reports listed above are available as printed reports, except Volume 2, Part 5, ZIP Code Tabulations. To obtain order forms or further information concerning any agriculture census printed reports, write the Bureau of the Census, Agriculture and Financial Statistics Division, Editorial and Information Staff, Washington, DC 20233-8300 or call 1-800-523-3215.

ELECTRONIC PRODUCTS

- **Computer Tapes**—Public-use computer tapes contain the same summary statistics published in the Volume 1 reports.
- **Compact Disc-Read Only Memory (CD-ROM)**—Data from Volume 1, Volume 2 parts 1 and 5, and Volume 3 are available on CD-ROM.
- **Online Access**—Highlights from Volume 1, Volume 2 parts 3 and 5, and Volume 3 are available on the ARI Network® and on CENDATA™ through DIALOG® and CompuServe®.

For information regarding electronic data products, write to Customer Services, Bureau of the Census, Washington, DC 20233-8300 or call 301-763-4100. Internet users may contact the Census Bureau's home page at http://www.census.gov/.