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Part 4

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Chapter 1. Introduction

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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 interviewed was engaged in agriculture (approximately 80 percent were). Another 30 years passed before the census program included information on 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 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. In 1915, Congress authorized the collection of agriculture data quinquennially, but it was not added to the mid-decade census covering the economic areas until 1925.

Through 1940, the Census Bureau carried out the agriculture census with the other economic censuses, but changed their respective schedules. The goal was to use the agency's resources more efficiently and to distribute the workload over periods between decennial censuses. By the 1950's, the agriculture census was providing information for years ending in "4" and "9", while the economic censuses had reference years ending in "2" and "7" as reference periods. In 1976, Public Law 94-229 shortened the intercensal periods after the 1974 to four years each, thus restoring the agriculture census to a concurrent schedule with the 1982 and later economic censuses. In 1997, Public Law 105-113 transferred the responsibility for conducting the 1997 Census of Agriculture and subsequent agriculture censuses, from the U.S. Department of Commerce, Bureau of the Census, to the U.S. Department of Agriculture, National Agricultural Statistics Service.

The agriculture census is the only source of statistics on American agriculture showing comparable figures, by county, and classifying farms by size, tenure, type of organization, principal occupation, age of operator, market value of agricultural products sold, combined government payments, market value of agricultural products sold, and North American Industry Classification System code. The 1997 Census of Agriculture covered agricultural operations meeting the definition of a farm in the 50 States, Puerto Rico, Guam, American Samoa, Commonwealth of Northern Mariana Islands, and the U.S. Virgin Islands.

Legal Authority

The 1997 Census of Agriculture was conducted by the National Agricultural Statistics Service (NASS), with preliminary planning and technical assistance from the U.S. Bureau of the Census. Transfer authority to conduct the census of agriculture was enacted into law on November 21, 1997. Initial planning for and development of tools used during the 1997 Census of Agriculture

were formulated by the Bureau of the Census under authority granted by Title 13 U.S.C. - Census. NASS completed all remaining census activities, including data collection, data analysis, tabulation, and publication of census findings, under new authority granted by Title 7, U.S.C. - Agriculture.

Title 7 U.S.C., Chapter 55 (Department of Agriculture), sections 2204g and 2276, describe the type, frequency, methods, geographic scope, mandatory reporting requirements, and confidentiality requirements for NASS. (See Appendix A for excerpts of Title 7 applicable to the agriculture census.)

Title 13 U.S.C., Chapters 1, 5, and 7 specify for the Bureau of the Census what censuses shall be taken and the intervals between them, certain administrative procedures, and confidentiality requirements, and describe the duties of particular officials. (See Appendix A for excerpts of Title 13 applicable to the agriculture census.)

Uses of Agriculture Census Data

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

The private sector, including businesses, farm cooperatives, commodity and trade associations, and utility companies, rely on agriculture census data to develop plans for locating new plants, service outlets, and sales and distribution facilities. They also use it for allocating research resources, selecting marketing areas, and for other activities that provide better services to the farm community. Major farm organizations use census data to develop promotional materials on various segments of American agriculture.

Agriculture oriented magazines and news media use census results as technical background for stories and feature articles. In addition, census results can be used to estimate market share and identify the types of farms reached. A regional television station, for example, used agriculture census data to learn farm operator characteristics and agricultural production levels in each of its markets, thus, enabling its advertisers to target specific media markets for particular services and products.

Administrative and legislative bodies at all levels of government use census data in planning and analyzing farm and rural 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 forces, and economic planning.

Within the U.S. Department of Agriculture (USDA), NASS employs agriculture census statistics to develop benchmarks and comparisons for its current estimates, and to evaluate particular problems or situations. The Economic Research Service of USDA uses census of agriculture data to evaluate the current economic situation, and to monitor and measure structural changes and adjustments in the farm sector. The Animal and Plant Health Service of USDA prepares disease and pest damage assessments, when needed, using census information.

Other Federal Government agencies use production, sales, and size and type of farm data from the census to calculate economic measures such as farm income estimates, indexes of productivity and price levels. Also, census data are used to calculate Federal disaster compensation, environmental assessments, and for special projects.

Farm Definition

The definition of a farm used in the 1997 Census of Agriculture was any place from which \$1,000 or more of agricultural products were produced and sold, or normally would have been sold, during the census year. This definition was first used in the 1974 census and has been used in all subsequent censuses. The farm definition used for each U.S. territory varies.

Initially, the Census Bureau defined the “farm” for the 1850 agricultural census as any place with annual sales of agricultural products of \$100 or more. Though the definition changed several times since 1850 (see Appendix B) with new sales or acreage criteria, each definition required that 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). The reporting unit for the agriculture census has always been the individual agricultural operation, i.e., the farm or ranch.

For the 1997 Census of Agriculture, an agricultural operation not only included the traditional commodities such as livestock, poultry, or other animal specialties and their products, fruits, vegetables, greenhouse or nursery products, but also included cut Christmas trees, maple sap gathering, and short term woody crops. These new items were added as a result of the implementation of the new North American Industry Classification System. Previously, these items were classified as forestry under the Standard Industrial Classification system.

Census results are based on data obtained from individual “farm” operators about their respective “farms.” Land comprising the farm need not be a single contiguous tract. It can consist of several separate pieces of land, so long as it was treated as a single operation. Since the county is the smallest geographic unit for which the agriculture census data are tabulated, specific rules cover farms with land in more than one county. When land operated as a single farm was located in two or more counties, data were tabulated in the county containing the largest value of agricultural products raised or produced.

The farm definition for Puerto Rico and the other outlying areas, though different, all involved minimum levels of sales. The farm definitions were established in cooperation with the local governments of the respective commonwealth and territories. In Puerto Rico, this included all places from which \$500 or more of agricultural products were produced and sold, or normally would have been sold, during the 12-month period between July 1, 1997, and June 30, 1998. In Guam and the Virgin Islands of the United States, any place with \$500 in annual sales of agricultural products qualified as a farm. In the Commonwealth of Northern Mariana Islands, any place with \$1,000 in annual sales qualified as a farm. In American Samoa, any place that raised or produced any agricultural product for sale qualified as a farm.

Overview of Census Operations

Scope and Reference Dates: The 1997 Census of Agriculture program collected and published statistical data for all agricultural operations meeting the farm definition in the 50 States, Puerto Rico, Guam, American Samoa, Commonwealth of Northern Mariana Islands (CNMI), and the U.S. Virgin Islands. It also included special studies relating to horticulture, farm irrigation, land ownership, and aquaculture.

For the 1997 Census of Agriculture (States), basic data were requested from all farms, while additional information was asked of a sample (i.e., all those with expected annual sales of agricultural products above a specified value, together with a random sample of all other farms) of about 25 percent of all farms. A copy of the general sample report form, which includes the basic questions plus the questions asked of a sample of the respondents, is included in Appendix D of the 1997 Census of Agriculture, United States Summary and State Data, Volume 1, Part 51.

The 1997 Census of Agriculture (States) requested inventory data (e.g., number of livestock) as of December 31, 1997, while production, sales, and other data (except a few crops, such as citrus, for which data were collected for the production year) were collected for the calendar year 1997.

For Puerto Rico and Guam the census form requested land, land use, production, expenditure, farm labor, and sales data for the 12 months between July 1, 1997 and June 30, 1998. For Puerto Rico, data on inventories of livestock, poultry, machinery and equipment, buildings and facilities, and number of sharecropper and agregado families, were requested as of July 1, 1998. In Guam, inventories of livestock, poultry, and machinery and equipment were requested for the number on hand at the time of enumeration. In the CNMI, inventories of livestock, poultry, and machinery and equipment were requested for the number on hand at the time of enumeration and crop production, crop and livestock sales, and expense data were requested for the 1997 calendar year. In American Samoa, inventories of livestock, poultry, and machinery and equipment were requested for the number on hand at the time of enumeration. Crop production, crop and livestock sales, and expense data were for the 12-month period between January 1 and December 31, 1998.

Data Collection: The 1997 census (States), like its predecessors from 1969 onward, was conducted using mailout/mailback enumeration methodology. Initially, a list of about 9.1 million addresses from various sources, including the 1992 census was assembled. This preliminary list was reduced by deleting duplicates and nonagricultural operations to a final census list of about 3.2 million (approximately 250,000 fewer names than the 1992 census). In December 1997, the report forms were mailed to the names and addresses on the final census list frame, with a cover letter asking recipients to complete the report form(s) and mail them back to the National Processing Center (NPC) in Jeffersonville, Indiana. A toll free number was provided on the initial questionnaire and follow-up mailings to assist respondents with questions. Mail and telephone follow-up (the latter making extensive use of computer-assisted telephone interviewing equipment and techniques) to nonrespondents continued over a period of six months after the initial mailing. Once an acceptable overall response level was achieved, NASS edited, reviewed, and tabulated the data. Estimates for nonresponse were factored into the final tabulations for each State.

Data Processing: NPC in Jeffersonville received mail returns for each of the 50 States, entered individual report data into the computer file, and resolved edit failures. Data analysis and resolution of questionable data and data relationships took place in the respective NASS State Offices during the summer of 1998. Report forms from Puerto Rico were processed by the NPC, while those from Guam, the U.S. Virgin Islands, American Samoa, and CNMI were handled by NASS staff at headquarters.

Data Publication: Unlike the Census Bureau, which historically released census statistics on a flow basis (state by state), NASS released all state data, including the U.S. summary, at one time. This was the first time, the U.S. and State publications were released simultaneously. The data were released in February 1999, one year after the due date for filing a census of the agriculture questionnaire, and a full year earlier than previous censuses. This accomplishment was made possible by advanced planning and moving from sequential to simultaneous processing of data. Each State Statistical Office (SSO) played an integral part in this process.

The 1997 Census of Agriculture provided data for more than 3,000 counties or county equivalents in all of its publications. In addition, selected data were tabulated and published at the five-digit ZIP Code level and for congressional districts from the 105th Congress. The United States includes all 50 States, 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 totals are aggregates of the State data.

Special Enumeration and Follow-on Census Activities

Citrus Caretakers

Background: Due to the difficulty of identifying and enumerating absentee citrus grove owners, a special enumeration of citrus caretakers or production managers, including "caretaking" organizations and grove management firms, was conducted. This enumeration took place in Arizona, Florida, and Texas during the summer and fall of 1997. Typically, grove owners who received an agriculture census questionnaire, would send the questionnaire to the caretaker to fill out. This special enumeration simplifies the data collection effort, reduces response burden, and helps to eliminate duplication of reporting.

Enumeration: A citrus caretaker or production manager is essentially an organization or person who cares for, supervises, or manages citrus groves for grove owners, many of whom are absentee owners. The scope and type of each caretaker's operation can vary considerably. Some caretakers completely manage and care for the groves. Other caretakers do only some of the grove work depending on the owner's needs, i.e., many caretakers do not perform harvesting operations. Texas caretakers were enumerated in July 1997, and Florida and Arizona caretakers were enumerated during October 1997.

A special citrus caretaker questionnaire was used to enumerate the caretakers. In addition, the names and addresses of grove owners whose groves were included on the citrus caretaker's questionnaire were obtained, and thus possible duplication of reporting was eliminated. NASS State Statistical Offices in Arizona, Florida, and Texas were responsible for updating their respective list frame of citrus caretakers, training enumerators, enumerating identified caretakers,

reviewing completed questionnaires for consistency and completeness, basic data relationships, and ensuring that the data were forwarded to NPC in Jeffersonville, Indiana for inclusion in the census tabulations.

Florida's enumeration of citrus caretakers coincided with the enumeration phase of NASS's Fruit Chemical Use Survey. To minimize the burden on caretakers who were also included in the the Fruit Chemical Use Survey, the Florida SSO conducted the two surveys simultaneously.

American Indian Farm Operators

In the 1992 and previous censuses of agriculture, each reservation that engaged in agriculture was counted as one farm. Total crop, livestock, and land use information was collected for the reservation. In other words, American Indian farm operations on reservations were enumerated at the reservation level, generally as a single unit. Large reservations that crossed state lines were subdivided as appropriate. The only demographic data collected were for the person responding for the entire reservation, a Tribal Chief, elder, or person who administered any commercial farming.

In preparation for the 1997 Census of Agriculture, NASS made several concerted efforts to add as many American Indian farm operators as possible to the census list frame. Some of the northern Great Plains states were able to identify and add additional operators, but many individuals who farm only on a reservation do not show up on lists of farm operators.

For the 1997 Census of Agriculture, the historic methodology was used in conjunction with an additional procedure to count the number of individual American Indian farm operations within reservation boundaries.

For all reservations having any agricultural activity, the historic approach of summarizing all agriculture on one questionnaire was continued. However, the person responding to the questionnaire was also asked for an estimate of how many individuals on the reservation met the census definition of a farm. That count was then included in a special summary in the Volume 1 publication. Detailed farm level production data and demographic data, however, were not available for those individuals. These American Indian farmers who were not counted individually on a separate report form, but were included with the aggregated reservation report are sometimes referred to as "American Indians Not Individually Reporting."

The term "American Indian" was used on both the report form that collected counts of "on-reservation farm or ranch operators," and on the 1997 Census of Agriculture report form. The term American Indian represents persons who would identify themselves as Native American or Alaskan Native.

1998 Census of Aquaculture

The 1998 Census of Aquaculture was the first national census taken for this industry. It was conducted to expand the aquaculture data collected in the 1997 Census of Agriculture. Selected aquaculture data have also been collected during the 5-year census of agriculture since 1974. For the 1998 Census of Aquaculture, an aquaculture farm was defined as any commercial or noncommercial place from which \$1,000 or more of aquaculture products were sold or normally

would have been sold during the census year. Every respondent in the 1997 Census of Agriculture who provided a positive response to having sold aquaculture products in 1997 were included in the aquaculture census list frame. The 1998 Census of Aquaculture list frame included National and state fish hatcheries. In addition, names and addresses from a recent annual report about fish hatcheries issued by the U.S. Department of the Interior, Fish and Wildlife Service were added to the list frame. No special effort was made to add new aquaculture operations that began operating in 1998.

The aquaculture census collected detailed information relating to on-farm aquaculture practices, size of operation based on water area, production, sales, method of production, sources of water, point of first sale outlets, cooperative agreements and contracts, and aquaculture distributed for restoration or conservation purposes. It was conducted in response to the intense need for an accurate measurement of the aquaculture sector, which grew from a value of \$45 million in products sold in 1974 to more than \$978 million in 1998. Additional information is contained in Chapter 10 and Appendix E in this publication, and in the 1998 Census of Aquaculture publication.

1998 Farm and Ranch Irrigation Survey

Selected irrigation data for on-farm irrigation operations have been collected in the census of agriculture since 1890. A census of farms reporting irrigation in the 1900 Census of Agriculture was authorized by Congress. Surveys of irrigation in humid areas were taken in connection with the 1954 and 1959 censuses. The 1998 Farm and Ranch Irrigation Survey was the fifth survey devoted entirely to the collection of on-farm irrigation operations for the conterminous United States. The 1979, 1984, 1988, 1994, and 1998 Farm and Ranch Irrigation Surveys collected similar data using similar data collection and processing methods and procedures.

The 1998 Farm and Ranch Irrigation Survey was one of four special studies provided for in the 1997 Census of Agriculture program. It supplemented the basic irrigation data collected from all farm operators in the 1997 census. The survey used a sample of operations from the 1997 census that reported using irrigation during the reference year to obtain detailed data about irrigation practices without increasing the response burden on all farmers. Data from the survey were published in November 1999 for all states and for the 20 water resources areas. Additional information about this survey is contained in Chapter 11 and Appendix E of this publication. Additional survey detail and results are included in the 1998 Farm and Ranch Irrigation Survey publication.

1998 Census of Horticultural Specialties

The 1998 Census of Horticultural Specialties was the eighth census of horticultural specialties and is a component of the agriculture census program. Previous horticultural specialties censuses were conducted in conjunction with the census of agriculture and were taken in 1889, 1929, 1949, 1959, 1970, 1979, and 1988. The definition of a horticultural specialty has changed between censuses. For the 1998 census, a horticultural specialty operation was defined as any place that grew and sold \$10,000 or more of horticultural specialty products during 1998. The definition used for the censuses in 1988, 1979, 1970, and 1959 censuses included operations growing and selling \$2,000 or more of horticultural products during the census year. Prior to

1959, the definition used was a \$1,000 minimum sales limit. The census included producers of floriculture, nursery, and other specialty crops, such as sod, mushrooms, food crops produced under glass or other protection, transplants for commercial production, and seeds.

The census of horticulture specialties list frame included all operations identified in the 1997 Census of Agriculture with sales of \$10,000 or more of horticultural specialty crops. Additional operations were added to the list from the continuously updated NASS name and address lists that identified operations with floriculture, horticulture activity (but gave no indication of the sales size of operations).

This census provides a comprehensive and detailed picture of the horticultural sector of the economy and is the only source of detailed production and sales data at the State and National level. Additional information about this census is contained in the respective chapter and Appendix E in this publication and in the 1998 Census of Horticultural Specialties publication.

1999 Agricultural Economics and Land Ownership Survey

The 1999 Agricultural Economics and Land Ownership Survey (AELOS) was an integrated survey of farm finance and land ownership and provided data on the economic status of U.S. farm operations and households. It was the continuation and update of similar studies conducted in 1959, 1964, 1970, 1979, and 1988.

Publication of data on land ownership characteristics began in 1880, with the classification of farm tenure. Varying elements of farm financial data have been collected since the first agriculture census was taken in the United States in 1840. The principal financial characteristics in earlier data collections were value of farmland and sales of agricultural products, but in 1890, census data were also requested on farm mortgage debt. In later censuses, farm taxes were included.

Beginning in 1960, special surveys were conducted in connection with the 1959 and 1964 Censuses of Agriculture on selected aspects of farm finance. In 1971, the 1970 Survey of Agricultural Finance was conducted as part of the 1969 Census of Agriculture. The survey collected data on land in farms, value of land and buildings, rents, capital and operating expenditures, credit used for purchasing specified items for farm use, outstanding debt by kind and source, value of agricultural products sold, and construction of farm buildings and structures, as well as off-farm income. The 1988 AELOS included the majority of the financial measures collected in the 1979 and earlier Farm Finance Surveys and greatly expanded the data on land ownership.

The 1999 Agricultural Economics and Land Ownership Survey contains detailed information on the Nation's farm land ownership, farm finance, farm inputs, and purchases by farm operators. The AELOS was designed to provide statistically reliable estimates of key economic and demographic variables at the U.S. and state level.

Unlike the 1988 AELOS list frame universe, the 1999 AELOS did not use, exclusively, the census of agriculture in-scope universe to draw the sample. The 1999 AELOS used NASS's list and area frames which included information about farm operators reporting data in the 1997 Census of Agriculture. New operations that began after June 1, 1999 did not have a chance to be

selected for the survey. Also, horticultural operations were included in the survey in 1999, but were excluded in 1988. Institutional farms, e.g. prison farms and research farms, were excluded from the universe of farms eligible for sample selection. The landlord portion of the survey was comprised of the names and addresses reported as landlords by the farm operators who responded to the operator portion of the survey, with the exception of public landlords. Additional information is contained in Chapter 13 and Appendix E.

Program Cost

The cost of the 1997 Census of Agriculture (States), excluding the 1998 Census of Aquaculture and the 1999 Agricultural Economics and Land Ownership Survey, was approximately \$101 million. Overall, costs increased about 18 percent compared to the 1992 Census of Agriculture. Additional detail is provided in Table 1-1.

Table 1-1. Census of Agriculture Cost Comparisons, Totals for 1992 and 1997.

Activity	1992 Total Cost (\$1,000)	1997 ¹ Total Cost (\$1,000)
Direction	15,389	17,250
Content Determination and Design	7,780	11,067
List Development and Mailout	11,417	15,408
Data Collection and Processing	40,303	46,640
Publication and Dissemination	10,716	10,424
Total	85,605	100,789

¹Data exclude expenditures for the 1998 Census of Aquaculture and the 1999 Agricultural Economics and Land Ownership Survey.

For the 1992 and 1997 censuses, related activities occurred over a period of six years. This six year period is referred to as the census cycle. The kinds of activities undertaken and resources required differ from year to year. Typically, the first three years involve planning and preparation. Years four and five involve data collection, data processing, and preparation of the statistical tables and publications. Activities associated with follow-on censuses and surveys, if scheduled, occur during the fourth, fifth, and sixth year of the census cycle of activities. A comparison of census costs by fiscal year for the 1992 and 1997 censuses is shown in Table 1-2.

Table 1-2. Census Cycle Costs by Fiscal Year for the 1992 and 1997 Censuses of Agriculture

Census of Agriculture	First Year	Second Year	Third Year	Fourth Year	Fifth Year	Sixth Year	Total
	(\$1,000)	(\$1,000)	(\$1,000)	(\$1,000)	(\$1,000)	(\$1,000)	(\$1,000)
1992 Census (FY1990-1995)	2,670	11,238	13,664	30,293	17,271	10,469	85,605
1997 Census ¹ (FY1995-2000)	2,670	11,516	17,335	36,458	23,160	9,650	100,789

¹Data exclude expenditures for the 1998 Census of Aquaculture and the 1999 Agricultural Economics and Land Ownership Survey.

Organization and Structure

Transition: The 1997 Census of Agriculture activities (FY1995-FY2000) were carried out by two agencies. From October 1, 1994 (FY 1995) to February, 1997 (FY 1997) activities were planned and conducted under the U.S. Department of Commerce, Bureau of the Census. From February 1997 (FY1997) on, activities were under the direction of USDA, NASS. The basic organizational structures were simply combined, with the census staff forming a single division in which some vacancies were filled by current NASS staff members. No other formal organizational changes were implemented at that time.

NASS Organizational Structure (FY1997-FY2000): NASS is a key information agency within the Research, Education, and Economics mission area of the U.S. Department of Agriculture and has collected information on U.S. agriculture since it was founded in 1862. Since that time, the responsibilities of NASS have increased, and the statistical program and organizational structure have evolved into a headquarters unit consisting of five divisions and 45 State Statistical Offices serving all 50 states.

Census activities associated with handling follow-up activities of nonrespondents, editing questionnaires, and review and analysis of tabulated data fully utilized NASS's existing field organization and State-level knowledge of farm operations.

On October 1, 1999, the beginning of FY 2000, NASS implemented a new headquarters organization. NASS's field organization remained unchanged. The new organizational structure:

- Preserved the strengths of the existing structure while addressing structural weaknesses and accommodating new responsibilities;
- Eliminated unnecessary duplication of effort by integrating census responsibilities, and by combining training units and editing units that had similar responsibilities;
- Facilitated cross-functional work by emphasizing and strengthening the role of teams; and
- Promoted the effective use of resources.

The impact of this organizational change on the 1997 Census of Agriculture was minimal due to the timing of the implementation of the reorganization - during the last year of the six year census cycle. The effect of the organizational changes will fully impact the 2002 Census of Agriculture.

Chapter 2. Planning and Preliminary Operations

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Considerations

The agriculture census collects and publishes data on agriculture in the United States. Planning the enumeration is an exercise in balancing conflicting requirements. A compromise must be made between the wants and needs of data users and the response burden that can be imposed on data suppliers without increasing the refusal rate.

Cost is also a major consideration. The census has used the mailout/mailback, or self-enumeration procedure with telephone follow-up, since 1969 because it reduces costs. However, mail enumeration faces continually increasing expenses. Indeed, mailing costs comprise a very large portion of the cost of each census, so there is a perpetual interest in saving money by reducing the size of the initial census list. Early responses in the data collection effort also reduces costs by reducing the need for follow-up on nonrespondents.

Once respondents have completed and returned their report forms, the data must be captured in an electronic format, processed, and tabulated. The more detailed the tabulations and cross tabulations, the more useful the data are to users. But tabulation and cross-tabulation consume both time and money, plus increase the number of incidents of data suppressions to protect individual operator information. The census data-release program may not release information that might be used to identify an individual establishment or operator. This confidentiality restriction means that all tabulations and cross-tabulations must be checked to ensure that individually identifiable data are not published. 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 within a reasonable period following the enumeration.

Preliminary Planning

Review of 1992 Census Processing: The 1992 Census of Agriculture was conducted by the Bureau of the Census, U.S. Department of Commerce. The Census Bureau made a major effort to streamline data processing for the 1992 Census of Agriculture and to incorporate improvements in processing techniques. The most significant of these improvements was the extensive use of an interactive editing system. The new edit system allowed the processing of more than a million and a half census questionnaires to be done much more efficiently, requiring less staff and resources.

The changes for the 1992 Census of Agriculture led to significant improvements in overall processing efficiency and data quality and the use of new technology allowed the census costs to remain reasonable. Initial planning for the 1997 Census of Agriculture enumeration included a systematic study of the 1992 processing, tabulation, and disclosure systems. The general processing strategies for the 1997 Census of Agriculture enumeration were developed at a series of weekly meetings. However, budgets and staff resources limited what could actually be developed and implemented.

Planning Teams and Committees: In 1995, during the initial planning stages for the 1997 Census of Agriculture, various planning committees were organized to review program and system changes. A list of new initiatives was developed and prioritized. Resources were assigned to only the items referred to and classified as “must.” The census of agriculture had no

major improvements on the must list. Work began to maintain the 1992 systems and update them to carry out the 1997 Census of Agriculture. As a cost savings measure, plans were approved to incorporate the Puerto Rico census of agriculture into the overall U.S. program.

During 1995 and 1996, the budget for the census of agriculture was under constant scrutiny. Alternative collection methods were being researched and evaluated. A planning team developed several options which included changing the farm definition to include only operations with at least \$10,000 in sales or possibly conducting a sample for selected portions of the universe. In all cases, the small farm and demographic data would be significantly impacted. At this time, NASS was an active member of the Census of Agriculture Advisory Committee. As more and more changes were being proposed to the census program, NASS recognized the importance of the program and took an active role to preserve the existing census farm definition and the program.

During 1996, the Census Bureau learned that funding for the census of agriculture was being moved from the Department of Commerce to the Department of Agriculture. In February 1997, the census program was moved to NASS, along with the staff which supported the census work. Because the census mailout was less than a year away, there was little time to make changes or build new systems. NASS organized a census planning team, which worked closely with the Census Bureau during the transition process. NASS brought an organization structure to the census program that included 45 State Statistical Offices (SSOs) located throughout the country. One central objective of the planning team was to determine how the SSOs could best be utilized and improve census processing. Work which had previously been centralized would now be decentralized and spread across the 45 offices. Areas most impacted included the use of “Tagged Records” (farming operations which were identified during the list frame development process that would best be handled by personal enumeration), toll-free telephone numbers to provide assistance, computer-assisted telephone interviewing, and data analysis. Most remaining data collection work was conducted under contract with the Census Bureau at NPC in Jeffersonville, Indiana.

NASS planned a significant change in the release of census statistics. Unlike the Census Bureau, which historically released census statistics on a flow basis (state by state), NASS established a goal of releasing all State data, including the U.S. summary, at one time. In February 1999, that goal was achieved. For the first time, U.S. and State data were released simultaneously, one year after the due date for filing a census of the agriculture questionnaire. This accomplishment was made possible by advanced planning and moving from sequential to simultaneous processing of data. Each SSO played an integral part in this process.

Use of Tagged Records

During the final phase of the census list frame development process, each state statistical office reviewed the names and addresses of respondents on the census list frame for their respective state, and electronically “tagged” records that they thought would be better handled by personal enumeration rather than by the traditional mailout/mailback approach. Criteria used to select records for tagging included, but were not necessarily limited to:

- Coordination with other on-going NASS surveys,
- A respondent’s desire to be contacted by personal interview,

- Knowledge of other needs for special handling, and/or
- Relative importance of the operation to the state's agriculture.

In addition to the records tagged by the SSOs, headquarters statisticians tagged abnormal operations (i.e. grazing associations, governmental units, churches, university research facilities, etc.) and Multi-unit operations (i.e. large operations which have more than one physical location), and records selected for data collection in NASS's yearly Agricultural Resource Management Study.

Each SSO had the responsibility for ensuring that their tagged records were completed and forwarded to NPC in Jeffersonville, IN for data entry and processing. All tagged operations were considered "must" records and were required to complete the sample questionnaire. Tagged records, except those tagged just for tracking purposes, were excluded from all census mailout and follow-up operations (Large Farm Computer Assisted Telephone Interview (CATI) record, Not-on-the Mail List Survey, Last Call CATI Follow-up, Classification Error Survey, and the Nonresponse Survey). It was imperative that the SSOs manage the enumeration of these records effectively and track their progress. The method of enumeration (personal face-to-face enumeration, telephone enumeration, or mailout/mailback from the SSO) of tagged records was at the discretion of the state office. All total, about 35,000 records were "tagged." See Appendix C, Table C1 for additional detail.

Changes in Computer Hardware

The computers used for the processing of the 1997 Census of Agriculture were primarily owned by the Bureau of the Census. In preparation for the census, and as a result of technological advancements, there were necessary upgrades to the computers' architecture, operating system, relational database software, and the transactional processing software that had been used to process the 1992 Census of Agriculture. These upgrades increased the processing speeds tremendously, allowing more processing to be done in a quicker time frame.

Due to the transfer of the census from one department to another, and the sensitive and confidential data involved, computer access and security issues were critically important. Through cooperative interaction between NASS and the Bureau of the Census, procedures were worked out to allow access only to authorized NASS employees. The Bureau of the Census installed firewalls that validated and authorized only users allowed to access census processing systems. The technology was state of the art and extremely innovative. Each authorized NASS employee was issued a personal "smart card," password, and personal identification number that were validated at the firewall. This insured that only employees officially "sworn in" could gain access to census of agriculture data. This system proved to be very effective in protecting the confidentiality of the data while allowing timely processing of the census to be accomplished.

Computer Assisted Telephone Interviewing

Introduction: Collecting data using a computer assisted telephone interview (CATI) system was the responsibility of NASS's State Offices. Each state office used CATI to interview nonrespondent cases and transmitted their data to the main census data file. The data were processed electronically, eliminating paper reports and manual processing of report forms. Cases

referred for CATI followup included some 1992 census nonrespondent records and records in low response counties. Also included were 1997 census screener nonrespondents and records “tagged” by the state offices. CATI was also used for followup work in 1997 census low response counties (i.e., those counties with response rates below a set rate at a specified date) and the 1997 Nonresponse Survey.

CATI Staff Training: SSO personnel were responsible for training the CATI enumerator staff for the census follow-up work. Training included an introduction to the census, an overview of the paper questionnaires, and all special instructions to the census of agriculture. The enumerator staff was given “walkthrough” training helping the respondents get a feel for exactly how the CATI instrument worked. Enumerators were also given reference materials to use during the interviews to help guide them through various procedures.

Number of Calls: CATI interviewing began in February 1998 with the Advance Follow-up operation, and ended in July of the same year with the Large Farm Follow-up operation. All CATI operations were conducted in the SSOs. Approximately 86,800 interviews were conducted using the CATI instrument.

Consultation on the Census

General Information: The mission of NASS is to provide timely, accurate, and useful statistics to the public. Therefore, NASS must determine which statistical information is most needed. Since the data compiled in the statistical tabulations must be supplied by individuals and/or organizations outside the agency, NASS must know whether the respondents to its census of agriculture and surveys will be able to supply the information requested.

In planning for the census of agriculture, advice was sought from data users on current and future data needs, the ability of respondents to supply the data, general data collection methods, content and format of report forms, and publicity programs to support the census. NASS, as did the Bureau of the Census before the transfer of the agriculture census to NASS in 1997, maintains regular contact with their advisory committee, Governors and departments of agriculture of all 50 States, land-grant (agricultural) universities, Federal departments and agencies, and other data users and suppliers via an extensive outreach program, and welcomes their advice and suggestions. The Census Bureau’s Census Advisory Committee on Agriculture Statistics was one source of this advice.

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. In 1940, 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. The committee provided a continuing body of outside, professional knowledge regarding the data needs of the agricultural community. Committee members represented a broad range of interests including agricultural economists, rural sociologists, farm policy analysts, educators, State representatives, agriculture-related business and marketing experts, and members of major national farm organizations. 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.

Organizations represented on the Census Advisory Committee on Agricultural Statistics for the 1997 Census of Agriculture included:

Agricultural Publishers Association	National Association of State
American Agricultural Economics Assoc.	Departments of Agriculture
American Association of Nurserymen	National Association of State
American Crop Protection Association	Universities and Land-Grant Colleges
American Farm Bureau Federation	National Cattlemen's Beef Association
American Feed Industry Association	National Council of Farmer Cooperatives
American Society of Farm Managers and Rural Appraisers	National Farmers Organization
Association of Research Directors, Inc.	National Farmers Union
Conference of Consumer Organizations	Rural Sociological Society
Equipment Manufacturers Institute	The Irrigation Association
National Agri-Marketing Association	The National Grange
	U. S. Department of Agriculture, NASS

These groups not only provide valuable input into shaping census plans and procedures, but were very influential in generating support needed from farmers who provide the data.

Effective October 1, 1996, responsibility for the census of agriculture program was transferred to the USDA. The authority for the Census Advisory Committee on Agriculture Statistics was transferred to USDA when NASS received funding and responsibility for the census of agriculture in fiscal year 1997. The committee continued informally under NASS until a formal advisory committee was chartered in October 1998 as the Advisory Committee on Agriculture Statistics.

The first meeting of the Advisory Committee on Agriculture Statistics was held November 30 - December 1, 1999. The purpose and scope of the advisory committee was revised. Its new mission was to advise the Secretary of Agriculture on the scope, timing, content, etc. of the periodic censuses and surveys of agriculture, other related surveys, and the types of agriculture information to obtain from respondents. The duties of the Committee are solely advisory and include making recommendations to the Secretary of Agriculture about the agricultural statistics program of NASS, and such other matters as it may deem advisable, or which the Secretary, the Under Secretary for Research, Education, and Economics, or the NASS Administrator may request.

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 States, as well as in Puerto Rico and the outlying areas. NASS, as well as the Census Bureau, routinely ask State governments for assistance in publicizing the census. Both the Governors and the State departments of agriculture have a considerable interest in the content of the census questionnaires, and in the completeness and accuracy of the enumeration. In March 1994, prior to the transfer of the census of agriculture to NASS, 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 1997 census. The responses were considered prior to the design of the 1997 census form.

Federal Departments and Agencies: Numerous Federal departments and agencies use census of agriculture data. Consequently, each Federal department and agency, including all U.S. Department of Agriculture agencies, was contacted during the Spring and Summer of 1994 and asked to define their data needs, provide a justification for why data were needed at the county level, and make suggestions for change.

Content Selection Criteria: As a part of the preparation process for each census of agriculture, each data item on the questionnaire is evaluated. For the 1997 Census of Agriculture, each department, agency, group, and organization was asked to identify and justify relevant data needs and indicate if the data item was:

- Directly mandated by Congress or if the item had strong Congressional support,
- To be used in proposed or pending legislation,
- Needed for evaluation of existing Federal programs,
- Essential, such that if omitted from the census of agriculture, would result in additional respondent burden and cost for a new survey for other agencies or users,
- Required for classification of farms by historical groupings, and/or
- Needed to provide information on current problems.

Content Test

Prior to most agriculture censuses, the census staff engaged in detailed studies and planning aimed at obtaining the most complete and efficient enumeration. Typically, this planning process includes one or more field tests of materials and/or data-collection methodologies, provides 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. For the 1997 Census of Agriculture, the number of changes to the report form were too few to require a field test. The report form was virtually unchanged from the 1992 Census of Agriculture with the exception of three new questions on cut Christmas trees and maple sap. As a result of implementation of the North American Industry Classification System, the additional questions were developed with the assistance of industry associations, university professors, and other government agency representatives. The questions were then evaluated by representatives of the data users community.

Chapter 3. Preparatory Operations

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General Information

Preparatory operations for the 1997 Census of Agriculture began during FY 1995 and consisted of five major activities:

- Determining questionnaire content, format, and supporting instructions
- Preparation of the list of names and addresses
- Sample selection for the sample (long) questionnaire
- Printing and preparations of report forms for mailing, and related enumeration materials
- Formulation of a promotional program to encourage cooperation by agricultural operators

Questionnaire Content and Supporting Instructions

Once questionnaire content was finalized (See Chapter 2, section on “Consultation on the Census” and “Content Test” for details) the various supporting documents were prepared. These documents included instructions for completing the report form, special inserts, a code book, and editing guide.

List Frame Preparation

Introduction: A mailout/mailback data collection method has been used to collect census information since the 1969 Census of Agriculture. The self-enumeration procedure reduces costs compared to a personal-interview methodology, but requires a complete and accurate name and address list for operations meeting the census farm definition. To further reduce costs and respondent burden, it is also essential to eliminate as many duplicate and nonfarm records from the list as possible. This is accomplished during the list building process. Respondent burden is also reduced by asking all respondents a set of core questions and a only a sample of respondents additional questions about the economic characteristics of their operations.

The list compilation operation produced a preliminary census list of approximately 3.3 million names and addresses. To further reduce the size of the preliminary list, statistical modeling techniques were used to identify records that had a high probability of not qualifying as a farm by the census definition. Approximately 478,000 names and addresses were identified (See Appendix C, Table C-6). These records were screened prior to the mailout of the census forms using a postcard consisting of four “yes/no” type questions. Data were collected by mail and telephone. Respondents responding with all “no’s” were removed from the census list. The result was over 125,000 names being dropped, leaving the final census list frame at about 3.2 million.

General Procedures: The list of names and addresses for the 1997 Census of Agriculture was compiled from the records of the previous Census and from administrative records obtained from

a variety of Federal agencies and private associations. Names and addresses frequently appeared on more than one of the source lists, so the various lists had to be matched to one another for duplication removal. Not only were duplicate records identified and deleted, but useful information about the name and address sources and the size of the operation was retained, coded, and linked so it could be used as needed in future data collection and processing operations.

The 1997 Census of Agriculture list compilation was conducted in two phases. Phase I was done over the period April, 1996 through May, 1997, and Phase II from June, 1997 through October, 1997. The agency used essentially identical procedures in both phases of the compilation process. The principal difference between Phase I and Phase II was the addition of updated source records to the final census list. The list construction process involved six major operations:

- Standardization of source list format.
- Linking employer identification and social security numbers.
- Coding of geographic information.
- Coding and linkage of name and addresses information.
- Resolution of possible duplicates.
- Assigning identification numbers and other processing codes.

Sources: The Phase I list development and linkage operation involved approximately 9.1 million records. These records were obtained from the NASS list frame, special lists, the 1992 Census of Agriculture, selected Internal Revenue Service records, and Puerto Rico records. The special lists were compiled by contacting various Federal and State agencies, as well as business associations and corporations to request lists of addresses of individuals and companies involved with specific types of agricultural operations.

The first phase of the census list frame compilation and linkage operation was completed in May 1997, resulting in a preliminary list of 4,817,300 records. In June 1997, the second phase of list development was begun, supplementing the Phase I list file with new source records from the United States Internal Revenue Service (IRS) 1996 tax-year, additional NASS list frame records, and updated multi-unit and abnormal lists from the 1992 Census of Agriculture. Approximately 7.1 million records were processed during Phase II.

Table 3-1. Number of Records Processed During List Development by Source

Source	Records
Phase I - Preliminary Unprocessed List	
NASS List Frame	2,790,600
Special Lists	131,300
1992 Census of Agriculture	3,344,200
Internal Revenue Service (1995 & 1996)	2,762,200
Puerto Rico Records	63,100
Sub-total	9,091,400
Phase II - Final Unprocessed List	
Phase I Processed List	4,817,300
Special Lists	19,200
Internal Revenue Service (1996)	2,275,500
Multi-unit and Abnormal	5,100
Total	7,117,100

There were 3,314,796 records on the census list of names and addresses at the conclusion of Phase II list development. Following Phase II, the list file was reduced even further to approximately 3.2 million by mailing a postcard screening form to farm operators who were thought to have a high probability of not being a farm.

Source Priority and Size Codes: Source priority codes were used to identify the specific source from which a name and address was obtained. When two or more records were identified as duplicates, the record with the higher source priority was retained for inclusion on the census list, and the other records with lower source priority were deleted.

Table 3-2. Priority Selection Order of Addresses by Source

Order of Name and Address Selection	List Source
1	Multi-unit and Abnormal Lists
2	IRS 1040F
3	IRS 941/943
4	IRS 1065
5	IRS 1120
6	NASS Farms
7	1992 Census In-scope
8	Special List

Size codes (1 - 16) were also assigned to each of the final census list records. The size code was a categorical variable indicating the approximate value of an operation's production, i.e. total value of product (TVP). This code was then used in sampling for the Nonresponse Survey, for establishing "certainty" cases (i.e., size level at which data must be estimated if not collected), and for determining records to be screened. Where duplicate records existed, the priority scheme shown in Table 3-3 was used in selecting a size code. The actual value of sales of an operation was not always available, so other data were used to generate an approximate value. If two or more sources of equal priority existed, then the highest priority code was retained on the final record. Multi-units were automatically assigned size code 15, and abnormals, size code 16.

Table 3-3. Priority Scheme Used to Assign Size Codes

List Source	Priority	Source of Size
IRS 1040F	1	Gross Income
1992 Census in-scope	1	1992 Reported TVP
NASS farms	2	List Frame Control Data
IRS 943	3	Annual Payroll
IRS 1120	3	Gross Receipts
Special Lists	3	Variable Depending Upon List
IRS 941	4	Annual Payroll
IRS 1065	5	Gross Receipts
1992 Census Nonrespondents	6	1992 Size Code

Record Unduplication, Geographic Coding, and Linkage: To ensure that all records entering the automated record linkage system contained appropriate geographic codes, all input records were processed through a system designed to verify and standardize geographic information. Zip

codes, towns, counties, and states were checked for consistency. Some records were fixed by the system while others required manual updating. During Phase I processing, there were 963 records whose addresses were rejected as unsalvageable and thus the records purged; there were 191 unsalvageable addresses during Phase II.

Based on the name form, a possible partnership or corporation (PPC) flag was set on records thought to be either a partnership or a corporation. The format program identified these cases during the building of the census list. Records with a PPC flag were prevented from being automatically deleted during matching and were reviewed clerically for duplication. Similarly, records on the NASS list frame, which had an indication of possible multiple operations with the same operator name, were reviewed clerically for possible duplication.

Employer Identification Numbers (EINs) and Social Security Numbers (SSNs) provided the easiest method of linking duplicate records from the various source lists. About 90 percent of the records from the different sources used in compiling the list included either an EIN, an SSN, or both. The record linkage program first made EIN comparisons across records and then performed SSN matching. This was followed by exact name matching, and subsequently a matching of records with similar names and addresses. All matching was done within zip code blocks.

Matching parameters were set conservatively with the intent of avoiding false matches. The matching was done for Phase I and then Phase II. There were three possible outcomes for the Phase I records:

- Those deemed to be matches by the system were purged, with a single record kept to represent the match group;
- Possible matches were reviewed and resolved as either matches or nonmatches and subsequently purged or kept; and
- All nonmatches were automatically passed on to Phase II.

Generally, possible duplicates (PDs) were reviewed and marked for deletion electronically. When more than 12 possible duplicates existed, a paper listing of possible duplicates was generated, reviewed, and duplicates marked. This process was referred to as PD Review. As with all record linkage systems, there were false matches made as well as undetected duplication passed on.

For the Phase I, PD Review, there were 645,800 link groups containing 1,759,700 records deemed to be possible matches; for Phase II, there were 237,900 link groups containing 604,100 records. Nearly all of the PD review work was performed in the NASS field offices. When there were more than twelve records in a linkage group, a print was generated with the review done by the NPC staff in Jeffersonville, Indiana. As the final step of census list frame development, all nonfarm records that failed to match farm records were removed from the list; this included partner records from the NASS list frame. Afterwards, NASS SSOs were provided a data base file containing their respective census list records so that they could perform a final review of their census list and tagged records for field enumeration.

Many states felt that the possible duplicate review system did not always allow them the flexibility to delete and match records as needed. They further felt that there were some agricultural business type records present on their list frame which did not belong. There were also some cross state operations which had not been brought together by record linkage due to the blocking that was used. The final review allowed the SSOs to address some of the record linkage shortcomings and to subsequently delete records as well as match them to other records. The following table summarizes unduplication process results.

Table 3-4. Summary of Unduplication Results by Initial Source List, 1997

Process	Number of Records	Cumulative File Size
Phase I - Initial source lists	9,091,400	9,091,400
EIN deletes	386,000	8,705,400
SSN deletes	2,465,100	6,240,300
Exact name match deletes	342,700	5,897,600
Geo-coding rejects	1,000	5,896,600
Name and address match deletes	633,600	5,263,000
PD Review deletes	432,500	4,830,500
Corrections for omissions / inclusions	13,200	4,817,300
Phase II - Initial source lists	2,299,800	7,117,100
EIN deletes	346,700	6,770,400
SSN deletes	1,439,500	5,330,900
Exact name match deletes	284,200	5,046,700
Geo-coding rejects	200	5,046,500
Name and address match deletes	108,300	4,938,200
PD Review deletes	83,000	4,855,200
Deletion of partner and nonfarm	1,489,700	3,365,500
Deletion of Puerto Rico records	40,300	3,325,200
Corrections for omissions/inclusions	6	3,325,194
Final SSO review: duplicates deleted	1,900	3,323,294
Final SSO review: nonfarms deleted	8,500	3,314,794
Preliminary List Frame		3,314,794

Statistical Modeling and the Screener Questionnaire

Selecting Operations to be Screened: The various matching operations used to compile the 1997 Census list frame produced a final list of approximately 3.2 million records. Statistical modeling was performed to identify those records remaining in the file that were least likely to represent farms; these were selected for prescreening. Three different methodologies were studied prior to choosing which course of action to take: 1) the 1992 Census of Agriculture Classification and Regression Tree (CART) model, 2) an improved CART, and 3) a non-CART approach. The latter was adopted. Results from the 1992 Census of Agriculture were used to project the scope status for the 1997 Census of Agriculture records. Two variables were used to make the projection:

- Source combination code, i.e., the list source(s) of a record, and
- Census list size code (i.e., total value of product (TVP) sold based on historic and administrative data.

Relationships were developed within each state. Some records were deemed to be “automatic keeps” and were to remain on the census list no matter what the model showed. Automatic keeps included:

- All records from minority special lists.
- All previous census records where the respondents indicated that they were a minority.
- All records showing that they were found on IRS files, on the NASS list frame, and on the 1992 Census of Agriculture in-scope file
- “Certainty” and “Tagged” records and Multi-units and abnormal farms
- All records with historic or administrative data indicating TVP > \$99,999
- 1992 census records where TVP equals zero, government payments were greater than \$999, and points (a scoring process to estimate TVP less than \$1,000) and acres are positive
- All records in New England states, Delaware, Nevada, and Alaska
- All NASS extreme operator list records for cattle on feed, milk cows, total cattle, hogs, sheep, and layers. Extreme operators were identified based on inventory levels surpassing a set threshold with the value varying by commodity and state.
- All records reporting Conservation Reserve Program payments only in the 1992 census.
- Records targeted to receive either Christmas tree or maple sap special instructions insert.

Records found only on a special list file, excluding those specified above, were automatically flagged to be screened. The initial goal was to screen approximately 300,000 records. Ultimately, 478,299 records were contacted via mail or telephone during the screening process. Model-based probability of being a farm was approximately 25 percent for the 1997 screener records. Approximately 125,570 records were dropped from the census list based on the screener results. Records were selected for screening following completion of Phase II Potential Duplication Review in September 1997. A screener flag was initialized to indicate records selected for screening. These records were assigned a telephone or mail data collection mode, depending in part on the presence of a valid telephone number. Approximately 240,000 screener records were assigned a mail follow-up code. The remaining 238,000 records were assigned a telephone follow-up code.

Data Collection: The postcard data collection instrument for the screener was called the Agricultural Activity Report. It consisted of four "yes/no" questions that asked about the presence or absence of several types of agricultural activities, along with name and address verification. No quantitative data were collected unless the respondent insisted on completing a complete census form during the telephone screener data collection or through the Incoming Telephone Call System. When this occurred, a sample report form was completed. Respondents completing a census report form during the screener interview were removed from subsequent census mailings. The Agricultural Activity Report effectively identified nonfarms that were "out-of-scope" for the census of agriculture. However, insufficient data were collected to determine whether a case was "in-scope," or a farm.

There were two screener form mailout phases; October 20, 1997 and November 17, 1997. Data collection began on October 20. The preliminary closeout for transmission of the check-in file and name and address updates to headquarters was November 24. The final closeout date for transmission of the check-in file and name and address updates was December 22. Respondents who answered "yes" to any of the screener questions were mailed a complete report form packet during a supplemental mailing January 2 through January 5, 1998.

The self-administered mail questionnaire version of the Agricultural Activity Report was printed on a yellow business reply postcard. It was printed by the North Carolina SSO, along with cover letters for both the initial and follow-up mailings of the screener. The outer envelope, also printed by the North Carolina SSO, displayed the notice "YOUR RESPONSE IS REQUIRED BY LAW."

Courtesy copies of the screener postcard and both cover letters were provided to all SSO's prior to mailout. A Computer Assisted Telephone Interview (CATI) instrument was used for data collection of screener records designated for telephone mode. Although mailed screener records were identified in the file in each SSO, individual SSO's did not initiate contact with cases designated for mail data collection to avoid duplicate contacts.

In addition to CATI data collection, Blaise software was used to support screener data collection and customer service activities, such as:

- Incoming telephone calls: Collection of screener information during incoming calls was captured using the CATI instrument.
- Paper questionnaires: Data obtained during telephone interviews were completed with paper questionnaires and captured using the CATI instrument.
- Name and address corrections: All name and address corrections obtained by mail for cases reporting agricultural activity were forwarded by the North Carolina SSO to the originating state to be corrected using the Blaise instrument.

Training for Screener Enumeration and Incoming Calls: A document entitled "What Do You Say When the Caller Says. . ." was developed and distributed electronically to all state offices by e-mail. This form was used during training of customer service representatives handling incoming telephone calls on the toll-free number.

Many respondents did not consider activities in which they participated to be agricultural or farm-related. Enumerators and customer service representatives were instructed "If in doubt, include the activity." Questionable cases were then included in census enumeration so farm status could be determined. If questionable records were excluded and they were in fact farms, then the number of farms would have been undercounted by the census.

Since the screener phase was the first data collection activity associated with the 1997 Census of Agriculture, all data collection staff, including supervisors, office staff, and customer service representatives were trained on the purpose of the census and how the screener phase supports census objectives. A census toll-free number was distributed to the media, data users, and the general public. Customer service representatives were instructed how to deal with incoming calls from individuals and organizations other than screener recipients. In addition, they also received training covering the following topics:

- Introduction to the 1997 Census of Agriculture.
- Familiarity with non-traditional agriculture.
- Principles of providing quality customer service.
- Differences between screening for the census and other NASS screening activities with which enumerators may be familiar, such as the Agricultural Resource Management Study Phase I or list-building criteria work.
- Confidentiality and mandatory authority.
- Characteristics of the screener target population.
- Non-traditional agriculture in their state.
- Inclusiveness policy and possible duplicates.
- Content of paper questionnaire and Blaise instrument.
- Overview of the census report form.
- Interviewing skills, including probing skills.
- Enumerator procedures and special problems.
- Administrative instructions.

Up to 2 hours of home study time was authorized for enumerators to become familiar with the Agricultural Activity Report, i.e. the screener questionnaire, Interviewer's Manual, and other materials prior to classroom instruction.

The toll-free census customer service telephone number (1-888-4AG-STAT or 1-888-424-7828) was included on the cover letter for the mailed screener. Prior to mid-December, the North Carolina SSO received all incoming calls generated by the screener operation. Subsequently, incoming calls were routed to the state offices according to the originating area code.

Customer service representatives responded to incoming calls. After addressing callers' requests or concerns, customer service representatives encouraged callers to complete the screener interview during the call. Screener interviews with callers may have been completed either on a paper screener questionnaire to be later input in to the Blaise instrument or input directly into the Blaise instrument.

Name and address corrections from mail returns were made in Blaise for those operations indicating agricultural activity, from the updated addresses on the "undeliverable as addressed" forms returned from Post Office, or updated from field or office enumerator action. The SSOs completed updates before the December 22, 1997 screener final closeout. UAAs that were not updated were included in the 1997 Census of Agriculture mailout.

List Frame Sampling

Background: Large-scale sampling was introduced for agriculture data collection in the 1945 Census of Agriculture. Post-Census sample surveys were used to supplement the basic data collected in the 1959 and 1964 Agriculture Censuses. In the 1978 and following censuses, the census list was sampled to collect specified additional data from selected agricultural operations. All farms were asked for basic data, while a sample of approximately 25 percent of the addresses on the census 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 of Agriculture, the agriculture census introduced a "short" form (one sheet, front and back) with abbreviated versions of the standard items. Addresses on the census list that were 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. The screener section enabled recipients who were out-of-scope to skip the rest of the reporting sections of the form. In 1997, there were no such screening questions.

"Certainty" and "Noncertainty" Records: The sampling method used for the 1997 Census of Agriculture was essentially the same as that used for the 1982, 1987, and 1992 censuses. During list frame development records were identified as "certainty" (including large farms, multi-units, abnormal farms, "tagged" records, etc.) or as "noncertainty" cases. The final census list was then sorted by Census File Number (CFN) for sample selection.

Records selected for the sample or long form included all "certainty" records, selected "tagged" records, and records in counties with less than 100 farms. Additionally, a systematic sample of 1 in 2 of all "noncertainty" records in counties reporting 100 to 199 farms in the 1992 census was selected; 1 in 4, if 200 to 299 farms; and 1 in 6, if 300 or more farms. This differential sampling scheme provided reliable data for the sample items at the county level. When a nonsample large farm was identified during processing, it was removed from the sampled population and data were imputed for the additional items that were not asked. In all, there were 849,200 records that received a long sample form.

"Must", "Certainty", and "Tagged" Records: "Must" records were mostly composed of those agriculture operations that were so large that failure to include their data might distort the census statistics. A response was needed for every "must" case; secondary sourcing was required for any nonresponse. These operations all received a long census form and underwent extra

enumeration effort prior to being estimated for. For the most part, records were included based on previous and administrative TVP and acreage data. Also, all records in Rhode Island and Alaska were deemed to be “must” cases as were multi-units (i.e., operations with multiple reporting units) and abnormal farms (e.g., a university or prison farm).

“Certainty” records were agricultural operations large enough to justify receiving long census forms and extra enumeration effort but not secondary sourcing. All records in counties expected to have fewer than 100 farms also received the “certainty” designation as did all late census adds to the census list. Additionally, operations that were to receive the maple sap or Christmas tree insert were classed as “certainty” records.

“Tagged” records were agricultural operations that individual state offices felt were important to agriculture in their state. These operations did not necessarily need to be large; in many cases, the “tagged” records were farms which made a significant contribution to the production of a specific commodity but were small in size relative to other types of operations. Additionally, all records known to be in NASS’s Agricultural Resource Management Study (ARMS) were also tagged by headquarters. Many of the questions on the ARMS survey overlapped census questions, so data collection was coordinated to minimize respondent burden. A one digit code (i.e., NASS flag) was assigned to various tagged groups within a state. SSOs were able to monitor response to these based on the “tag” code. Again, these records received a long form and data had to be estimated for the nonrespondents.

There were approximately:

- 2,900 multi-units,
- 1,500 abnormal, including Indian Reservations,
- 332,100 “certainty” cases (which could include some “tagged” records),
- 14,600 headquarters “tagged” records, and
- 25,700 SSO “tagged records” (including 10,900 with a value of “9”).

Printing and Addressing Report Forms

General Information: NASS contracted through the U.S. Census Bureau with commercial printers to print report forms, letters, information sheets, mailout and return envelopes, and other enumeration materials. Contractors printed the various forms, and assembled specified numbers of mailout packets for the initial and follow-up mailings, using written specifications provided by the NASS, and under quality control supervision of NASS and Census Bureau personnel. The contractors shipped completed packets to the NPC warehouse in Jeffersonville, IN for final preparation (essentially ink-jetting mailing labels and postal order sort) and mailout.

Printing and Quality Control of Address Labels: The 1997 Census of Agriculture mail list comprised about 3.2 million names and addresses. NASS created a computerized mailing list, then transmitted the list to NPC in Jeffersonville, IN by telephone datalink. The NPC staff used the address list files to ink-jet the labels directly onto the report forms using high-speed printers.

A check-in operation for returned questionnaires updated the response list daily, and the Census Bureau created an updated address file of nonrespondents following the cutoff date for each of the follow-up mailings. The cut-off dates were chosen based on the expected time when mail returns would begin to decline. Mail labels for all follow-ups, including the Thank You/Reminder postcard, were computer generated and ink-jeted onto the mail pieces.

As labels were printed (for the initial mailout and after each mail closeout), NPC quality control (QC) clerks monitored the printing to ensure that the address and bar codes were properly formatted, legible, and that the bar codes were visible through the envelope window. Quality control clerks checked the entire first file for each form type from each printer, for each printing. They also spot checked labels at specified intervals in each printing run. Quality control problems with any file resulted in partial or complete reprinting, as needed.

Table 3-5. Quantities of Materials Printed, 1997

Form Number	Description	Quantity
Information Sheets and Form Letters:		
97-A01(I), A02(I), and A03(I)	Instruction sheets	8,770,998
97-A01(L1) and (L1A)	Transmittal letters - initial mailout (L1) and UAA's (L1A)	4,440,224
97-A01(L2)	Reminder card	3,800,000
97-A01(L3) through (L5)	Follow-up letters	4,287,800
Envelopes:		
97-A7.1 (N), (S), (M), and (MU) through A7.4 (N), (S), and (M); A7A, A7B, and A7C	Outgoing envelopes	9,313,324
97-A8A, (N), (S), (M) and (MU)	Return envelopes - blanks, Nonsample (N), sample (S), must (M) and multi-unit (MU)	9,274,324
Report Forms:		
97-A0101 through A0111, and A0114	Nonsample report forms	6,216,000
97-A0201 through A0214	Sample report forms	2,447,724
97-A0301 through A0311	Must report forms	511,800

Mailing Packets: Mailing packet contents for the initial mailout in December 1997 are shown in Table 3-6.

Table 3-6. Summary of Mailing Packages for the Initial Mailout, 1997

Type	Report form	Information sheet	Return envelope	Cover letter
Nonsample	97-A0101 through 97-A0111	97-A01(I)	97-A8A(N)	97-A01(L1)
Sample	97-A0201 through 97-A0213*	97-A02(I) *	97-A8A(S)	97-A01(L1)
Must	97-A0301 through 97-A0311	97-A02(I)	97-A8A(M)	97-A01(L1)

* The Hawaii mail packet included a unique instruction sheet - 97-A03(I).

Quality Control: Private contractors printed and assembled the 1997 Census of Agriculture mailing packets to specifications supplied by NASS. NASS and Census Bureau headquarters personnel along with teams of two or three NPC quality control (QC) personnel, made on-site inspections at each contractor's printing facility when the forms and packets were being printed and assembled. 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. Random samples of individual package types were opened and examined to ensure that correct materials had been used.

Each contractor boxed and shipped a sample of each day's production of assembled packets for QC review at NPC. The Census Bureau's QC staff specified that a day's QC sample size was determined by the total number of boxes of packets produced by that days' printing run. The QC staff then pulled three packets at random from each box for inspection. When an error was identified, the rest of the packets in the box involved were checked as well. If similar or other errors were found, the surrounding packets also were inspected. All detected errors had to be corrected before the packets were accepted and stored in the NPC warehouse for labeling and mailing.

Labeling: Mail labels for all mailings, with the exception of the thank you/reminder card, were printed by form number in ZIP Code sequence. Labeling equipment at the NPC facility ink-jeted the labels through the open windows of the outgoing envelopes. The equipment labeled mailing packets 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 printed on the correct forms. Packets that were incorrectly or illegibly labeled were removed and replaced with valid packets.

The bulk of the labeling for the initial mailout began the first week of October 1997 and was completed by the end of November 1997. NASS released the mailing packets for abnormal and multi-unit operations to the U.S. Postal Service for mailing on December 8, 1997. The remainder of the approximately 3.2 million mailing packets were mailed during the following two weeks.

Public Awareness Program

In addition to the usual preparatory operations - questionnaire design, list frame development, printing and addressing report forms, etc. - a public awareness program was implemented to promote the census of agriculture and encourage farmers and ranchers to respond to NASS's request for the information. The public awareness program had two major components: data collection and data dissemination. Chapter 4 provides a description of the 1997 Census of Agriculture Public Awareness Program.

Chapter 4. Public Awareness Program

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Introduction

Prior to the 1997 census, the public awareness program was a centralized effort controlled and implemented by the Agriculture and Financial Statistics Division at the Census Bureau who conducted and managed the previous censuses of agriculture. With the shifting of responsibility for the census of agriculture from the Census Bureau to NASS in February 1997, the public awareness program also shifted into more of a decentralized effort planned, managed, and implemented at the national level by NASS headquarters in Washington, D.C. but implemented at the local level through NASS's 45 State Statistical Offices (SSOs).

General Information

Objectives: The public awareness program for the 1997 Census of Agriculture had two major parts--data collection and data dissemination. The data collection outreach phase was primarily designed 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 2, 1998.
- 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 toward 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.

Publicity Team: The Census Division of NASS established a Publicity Team comprised of three members of the Special Projects and Information Section at headquarters, one staff member from Field Operations at headquarters, and five State Statisticians (representing NV, MI, DE, OK, and OR). The team developed public awareness plans and materials and implemented them prior to their implementation. State office representation was invaluable to the success of the public awareness program due to their unique experience and knowledge of both the target audiences (i.e., farmers and ranchers) and state office operations.

Headquarters and SSO staffs informed various other USDA agencies of the census plans prior to mailout and requested their assistance in promoting the importance of the census through their channels.

Strategies and Activities: Unlike previous censuses where all of the promotion and marketing activities were directed by a centralized headquarters unit, public awareness activities for the 1997 Census were primarily decentralized. Program activities were coordinated through national

contacts by headquarters staff and handled locally through the SSOs. Headquarters provided templates and materials to SSO staffs who then heavily promoted the census to their state and local farm associations, media, legislatures, etc. in a very *grass roots* effort. At the headquarters level, contacts were made to national media (e.g., farm broadcasters, agricultural editors and publishers), national farm organizations, and other national-level partners.

Headquarters staff hosted exhibits at over 30 national agricultural and agribusiness expositions and conventions including the American Farm Bureau Federation, National Cattlemen's Beef Association, National Agri-Marketing Association, National Association of Farm Broadcasters, American Agricultural Editor's Association, and other commodity, media, and trade association meetings. SSO staff attended hundreds of state and local meetings of these same types of organizations. At these meetings, NASS staff formed new and built upon existing working relationships to promote the census and its benefits. Many SSO staff gave presentations at these meetings to promote the reasons to respond to the census and, after census results were compiled, to announce the results of the census.

Before the census mailout in December 1997, 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.

Slogan and Logo: The slogan for the 1997 Census of Agriculture showed a consistent message from the previous two censuses in 1992 and 1987 admonishing readers to "Make It Known—America Counts on Agriculture." To reinforce that consistency across censuses, the logo used for the 1997 Census was the same used in 1992 and 1987 depicting a farm and silo with the words "AG CENSUS USA" below it. This image was used on posters, information kits, press releases and other communication materials, video tapes, "drop-in" ads provided to magazines and newspapers, and other marketing materials.

Census Publicity Campaign

Marketing strategies for the 1997 Census of Agriculture largely mirrored those conducted in 1992 changing only the method of distribution which was carried out primarily through the SSOs at the local level.

Broadcast Materials: NASS headquarters staff, in cooperation with USDA's Office of Communication, developed statements of work and hired an outside contractor to produce one 60-second and two 30-second audio public service spots promoting census response. The 60-second and one of the 30-second spots contained a conversation between a husband and wife about why they were mailing back their completed report. The other 30-second spot contained a rancher telling the listener why he knew the census was important. For these public service spots, NASS hired professional broadcast people as the voices for the husband, wife, and rancher.

NASS headquarters staff also prepared seven actualities with the Acting Director of the Census Division, providing responses to questions about the census. Farm broadcasters were able to use their own voices as the interviewer for their local audiences.

A separate contractor was hired to duplicate and distribute these public service announcements to approximately 1,500 rural radio stations and networks across the country. Response cards were mailed with the public service announcements to gauge how effective they were and how well they were used. NASS received approximately 200 response cards back from recipients. Additional copies of the public service announcements were used by several SSOs to distribute personally to their local radio networks/stations. The USDA radio and television reporters distributed audio and video news releases about the census over their satellite networks.

There were no video public service announcements produced because NASS determined that radio would have a greater reach to farmers and ranchers and so resources were concentrated to produce quality audio materials.

Printed Materials: While broadcast and other electronic media are increasingly influential in reaching the public, printed materials – newspapers, magazines, posters, informational brochures, etc. – remain an important channel for census promotion. The 1997 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 and distribution; providing articles, press releases, and drop-in advertisements to magazines and newspapers; and writing and distributing standardized speeches, agriculture census guides, and lesson plans.

Headquarters staff prepared a “1997 Publicity Notebook” with templates for the 1997 Census outreach core materials and their target implementation dates, including a:

- Pre-census speech with focus on why the census is important
- Letter of support for administrators of USDA agencies (e.g. NRCS, APHIS, and FSA) for their field offices to support and promote the census
- Frequently Asked Questions
- Poster
- Promotional Recipient Cover Letter (for those receiving an information kit to help promote the census)
- Report Form Guide
- Magazine Editorial and Feature Stories (both with and without graphs)
- Editor/Publisher Letter to Encourage Use of the Drop-In Ads
- Guide and Fact Sheet for Drop-In Ads
- Drop-In Ads of various sizes for newspapers and magazines proclaiming:
 - The Census of Ag is Coming
 - The Census is in the Mail
 - Make it Known—America Counts on Agriculture
 - The Census is Counting on You

- Telephone Contacts List
- Data Release Dates
- Proclamation, Cover Letter, and Sample Press Release (for proclamations by the highest elected officials in each state)
- Press Release Series:
 - Nation's 25th Census Begins This Week
 - 1997 Census Ready to Count Nation's Farms
 - Why the Census is Important to You
 - Census Report Forms Due February 2
 - Farmers/Ranchers Reminded to Participate in Nation's 25th Census of Agriculture
 - Are You in Agriculture? Make Sure Your Farm is Counted
- Slide Show and Outline
- Specialized lists (ethnic radio stations, farm broadcasters, weekly papers, etc.)

The **posters** highlighted the motto with the statement, "Farmers and Ranchers! Please return your census form by February 2, 1998" and the words "1997 Census of Agriculture" prominently displayed under a large graphic of the logo. These posters were primarily distributed by the SSOs in their information kits.

A **Report Form Guide** was prepared and distributed as a reference manual for county extension agents, vocational agriculture teachers, USDA agencies, vocational agriculture teachers, colleges and universities, and others to use in helping farmers and ranchers, or other respondents, complete their report forms. The guide included 44 pages of explanations and detailed instructions for completing each item on the sample and nonsample questionnaires, plus appendixes and an index.

SSOs were requested to send in a written copy of their census promotion plan and an example of the Information Kits they assembled and distributed to their state and local partners. There were a variety of unique strategies implemented among the states in addition to what headquarters planned and prepared for SSOs to use. These strategies were uniquely targeted to each SSO's local audience to be more customized and effective in their areas. Some states prepared unique letters targeted toward each type of potential agriculture partner such as grain elevators, feed and supply stores, livestock marketing associations, farm associations, local USDA agencies (e.g., Farm Services Agency, Natural Resources and Conservation Service, etc.), and extension offices.

Special Promotional Materials: In addition to the usual press releases, drop-in advertisements, public service announcements, and other conventional publicity materials, NASS used several special promotional items to try to increase public awareness about the agriculture enumeration. These included baseball-style caps, plastic bags, yard sticks, magnets, lid openers, potato chip bag clips, frisbees, and pencils. All of these items, except for the caps, bore both the census logo and slogan.

Data Release Publicity

Census Release Ceremony: On February 3, 1999, NASS hosted a ceremony to celebrate the release of the 1997 Census of Agriculture results that were officially released on February 1, 1999. The ceremony occurred two days after official release of the data due to scheduling conflicts. The Director of the Census Division, served as master of ceremonies and the celebration included comments from the Deputy Secretary of Agriculture; Under Secretary for Research, Education, and Economics; Assistant Secretary for the Maryland Department of Agriculture; and the NASS Administrator. Over 1,000 invitations were sent to members of Congress, Advisory Committee on Agriculture Statistics members, and other local census supporters and partners.

Many SSOs hosted similar celebrations in their respective states as well as press conferences on the day that the census results were released.

News Releases: Following the completion of data collection for the census, NASS 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. Again, the activities were conducted at the national level by headquarters staff but spearheaded at the local level by the SSOs. Headquarters staff prepared two versions of a state-level story that the SSOs could choose from to prepare their press releases. There was also a national-level press release highlighting results of the census. On census release day, a product announcement was distributed to inform the public of the availability of the 1997 Census of Agriculture data.

In addition, as subsequent census products became available (i.e. “Ranking of States and Counties,” “Ranking of Congressional Districts,” “Commodity Ranking by Market Value of Agricultural Sales,” “1998 Census of Aquaculture”), NASS headquarters staff released product announcements describing the new release, its content, and available formats to the media and posted it on the NASS homepage.

Producer and Trade/Professional Meetings: NASS headquarters and SSO staffs hosted booths, delivered presentations, and participated in a variety of farm and trade shows, professional conferences, agricultural news media conferences, and commodity producers association meetings to help publicize the census.

Chapter 5. Data Collection

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General Information

NASS employed mail self-enumeration as the principal data collection methodology for the 1997 Census of Agriculture in the 50 states. Enumeration for the agriculture censuses in Puerto Rico, Guam, American Samoa, and the Virgin Islands of the United States were conducted separately. See chapters 7 and 8 for details. The Department of Commerce, Bureau of the Census, National Processing Center (NPC) in Jeffersonville, IN, under contract with NASS, carried out the majority of the mailout operations. The NPC mailed some 3.2 million agriculture census report forms in December 1997, and carried out three follow-up mailings to nonrespondents. The first follow-up was a Thank-You Reminder postcard requesting early response that was mailed during the first week of January to all addresses on the census list. The next two follow-ups were mailed to nonrespondents and included a report form, a letter, an instruction sheet, and a return envelope. Following the third follow-up mailing, a telephone follow-up operation was conducted, focusing on nonrespondents of significant size or impact on the industry.

The vast majority of agricultural operations were enumerated by mail, but NASS also utilized telephone enumeration. The principal technique employed in the telephone operations was computer-assisted telephone interviewing (CATI). The CATI operation was coordinated with the mail enumeration.

In addition, SSOs in Florida, Texas, and Arizona conducted separate enumerations of citrus caretaker operations in the Summer and Fall of 1997, to obtain data on citrus production at the close of the growing season. Citrus producers whose groves were covered in the caretaker enumeration also received census report forms in December so that they could report any other agricultural activities.

Census Mailout and Follow-up Operations

General Information: NASS contracted with the Census Bureau's NPC in Jeffersonville, Indiana, to handle the mailout and check-in processes for the census. The NPC received assembled mail packets from private print contractors, addressed the report forms using name and address files provided by NASS, and conducted the mailings of the initial and three follow-up mailings.

Each 1997 Census of Agriculture mailout packet included a cover letter, report form, instruction sheet, any special instructions required for known feedlots, nurseries, certain animal specialties, and a return envelope.

The initial mailout cover letter asked the addressees to respond by February 2, 1998. The first follow-up mailing, conducted the first week of January 1998, consisted of a reminder/thank you postcard that was sent to all names and addresses on the initial census list. A second follow-up census packet was mailed the second week in February, and the third follow-up was mailed during the third week in March. A fourth and final follow-up of nonrespondents was conducted via telephone (CATI). This "Last Call Follow-Up" encompassed the usual mail follow-up for Low Response Counties and what would have been a fourth mail follow-up.

Table 5-1. Summary of 1997 Census of Agriculture Mailout and Follow-ups

Mailout/ Follow-up	Material Sent	Mailing Dates	Questionnaires Mailed
Initial and Follow-up Mailouts	Letter and report form	December 10-24, 1997	3,182,749
Follow-ups (mail):			
First	Reminder/Thank-you card	January 7-9, 1998	2,933,170
Second	Letter and report form	February 13-26, 1998	1,275,322
Third	Letter and report form	March 20-April 1, 1998	780,823
Last Call (Telephone)	NA	April 15-30, 1998	NA

NA - Information not applicable.

Regionalized Report Forms: The three basic report form types - Nonsample, Sample, and Must - were regionalized by preprinting on the report form the predominant crops grown in each of thirteen regions. Preprinting the predominant crops grown in each region reduced not only respondent burden, but also increased the efficiency and accuracy of the data processing and tabulating activities. A single report form was developed for Hawaii as was a single report form for Alaska. In addition, a general (nonregionalized) sample and nonsample report form was developed for training purposes. This form was used by NASS for internal purposes, for mailout if a region was short of forms, or more generally, for informational and training purposes. The states included in each regional grouping for 1997 are shown in Table 5-2.

Table 5-2. Summary of States Included in Each Region by Region Number, 1997

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	North Dakota, Minnesota, Montana, South Dakota
9	Colorado, Nevada, New Mexico, Utah, Wyoming
10	Idaho, Oregon, Washington
11	Arizona, California
12	Hawaii
13	Alaska
14	General report form for training or data collection on a temporary basis.

Initial Mailout: The initial mailout occurred from December 10-24, 1997 and totaled about 3.2 million addresses. Bulk rate postage was used for most of the mailing packets. First-class postage, however, was used for packets addressed to multi-units, abnormals, and late/new mail list additions, and going to Alaska and Hawaii addresses. First-class postage was also used for undeliverable as addressed (UAA) records. Quantities mailed by form type during the initial mailing are detailed in Appendix C, Table C1.

Private contractors printed the report forms and other census mailout materials and assembled the mailing packets. The initial and follow-up mailings were subject to quality control inspection by Census Bureau personnel at the contractors' locations. Contractors then delivered the mailout packets to the NPC in Jeffersonville, Indiana. Staff at the NPC labeled and mailed the mailout packets on a flow basis. The NPC staff used similar procedures for each mailout.

Follow-up Mailings: The first follow-up was a Reminder/Thank You card mailed from the NPC to all addresses on the mailing list, except Abnormals and those that were in the early-January supplemental mailing of report forms. The cards were mailed on a flow basis from January 7 through January 9, 1998 as they were labeled. First-class postage was used on all

Reminder/Thank You cards. A total of 2,933,170 cards were addressed and mailed.

Second follow-up cut-off dates for respondent response for each geographic workload group were established, ranging from February 9 to February 20. A total of 1,275,322 preassembled packets were labeled and mailed on a flow basis, by geographic workload group, between February 11 and February 24, 1998.

The third mail follow-up, like the second follow-up, used a complete census packet, with the original cover letter replaced with a new cover letter that requested a 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 geographic segment from March 16 through March 26. The preassembled report form packets were addressed and mailed on a flow basis from March 20 through April 1, 1998. The third follow-up mailings totaled 780,823 packets. Quantities mailed by segment for both the second and third mailings are detailed in Appendix C, Table C4.

A fourth follow-up mailout was originally planned for April 15 - April 30. However, due to budgetary and timing constraints, plus the better than expected response rate for most states, the fourth follow-up mailout was not implemented. A Last Call (a final telephone follow-up operation) was conducted by the state offices from April 15 through early June, depending upon the state. This operation concluded on June 8, 1998.

Not all mail packets were deliverable as originally addressed. Mail packets that were Undeliverable As Addressed (UAA) were returned to the NPC. UAA packets that were returned to NPC with an indication that the addressee was deceased were remailed "to the estate of" the deceased. Those UAAs received from the post office with address corrections were checked-in, the addresses were updated, and they were included in the UAA re-mail operation. If no corrected address was available, electronic files of these UAAs were transferred to the SSOs where state resources were used to determine if a better address was available.

Two UAA files were transmitted to the SSOs. One file was transmitted on January 13 and one on March 10. If a better address was found, the address was corrected by staff in NASS's field offices. Those that were corrected by February 4, 1998, were sent a report form from the NPC facility in Indiana. Since this was the first time these respondents received the census report form, the mail packets included a special cover letter. Corrected and remailed UAA cases that did not respond received a second follow-up at the end of March. UAAs that were updated after February 4 were mailed a report form packet from the state offices. Name and address corrections were updated nightly. The NPC transferred 148,330 UAA cases to the SSOs between January and March, 1998. About 65,000 cases had addresses corrected and were remailed by Jeffersonville or the SSOs.

Telephone Operations

Incoming Telephone Call System: Telephone operations for the 1997 Census of Agriculture included an Incoming Telephone Call (ITC) System to assist respondents with completing the census form, for data collection and follow-up operations, and to answer questions throughout the census data collection period. This was the first time a toll free telephone number was

included on the initial mailout instrument. A toll free number was made available to supply information to other sources, e.g. individuals from other government agencies or the media.

The North Carolina office received all calls through the ITC system from the census screener phase through November 30, 1997. The ITC system was routed to the individual SSO on December 1, 1997, during the screener phase but before the initial census mailout. With the ITC system, each SSO, including the North Carolina SSO, had the capability to:

- Grant respondents a time extension to complete the form,
- Process a “claims filed” or “needs a new form” comment from respondents,
- Take appropriate action on operations that were “out-of-scope,” refused to complete a questionnaire, received multiple forms, or needed help completing the form, and
- Respond to questions on confidentiality or penalties for nonresponse, as well as other concerns.

Incoming calls were routed to the SSOs based on the caller’s area code. Occasionally the caller had questions on agricultural production in another state that could not be answered by the staff receiving the call. When this occurred, the ITC system had the option of routing calls to other SSOs. If the enumerator could not answer the caller’s question, a call back form was completed by the enumerator for the state office census coordinator. The coordinator either called the respondent back, forwarded the call sheet to another statistician in the office, or e-mailed the coordinator in another office, if necessary. Enumerators could use the ITC to inform the NPC in Jeffersonville, IN to remail forms until the correspondence closeout date. The closeout date varied by state from April 21 through July 10, 1998.

Computer Assisted Telephone Interview Instrument: A Computer Assisted Telephone Interview (CATI) instrument was used by state offices throughout the data collection phase of the census. CATI collected data were electronically transmitted by the state offices to the main census data file. The data then were processed electronically, eliminating a paper report and processing (key entry) of these forms. CATI was used during the screener, advanced follow-up, large farms, not on mail list, classification error, nonresponse survey, and the last call survey phases. The last call survey phase was a combination of follow-up work in low response counties (i.e., those counties with response rates below 75 percent) and for nonresponse follow-up work that replaced the fourth mailing of the report form package.

State field office personnel were responsible for training CATI enumerator staff for the agriculture census and follow-on special studies. The training included an introduction to the census, overview of the paper questionnaire versions, and all special instructions to the census of agriculture and special studies. The CATI enumerator staff was given “walk-through” training during each different phase of data collection with practice training modules helping them get a feel for exactly how the CATI instrument worked. Enumerators were also given reference materials to use during the interviews to help guide them through various procedures. For the 1997 Census of Agriculture, CATI interviewing began in January 1998 and continued through July of the same year. All CATI operations were conducted in the NASS State Offices. Approximately 86,800 interviews were collected using the CATI instrument.

Screener Phase

Records were selected for screening following completion of Phase II Potential Duplication (PD) Review in September 1997. A screener flag was initialized to indicate records selected for screening, and whether the data collection method would be via telephone or mail. Choice of the data collection mode depended in part on the presence of a valid telephone number.

Approximately 238,000 records were assigned to telephone follow-up and the remaining 240,000 screener records to mail follow-up.

Screener forms, called Agricultural Activity reports, were mailed to respondents beginning October 20, 1997 and close-out for receipts was November 24, 1997. No quantitative data were collected unless the respondent insisted on completing a census form during CATI screener data collection or through the Incoming Telephone Call (ITC) System. The Agricultural Activity report consists of "yes/no" questions that ask about the presence or absence of several types of agricultural activities, along with name and address verification. Respondents completing a census report form during the screener interview were removed from subsequent census mailings. The Agricultural Activity Report effectively identified nonfarms that were "out-of-scope" (O/S) for the census. However, the data collected were insufficient to determine whether a case was "in-scope," or a farm.

Table 5-3. Summary of 1997 Census of Agriculture Screener Results

Item	Number of Forms
Total Screener Forms Mailed Out	478,299
Returned and Classified as a Farm (I/S)	198,300
Not Returned (Nonresponse) ¹	154,429
Returned and Classified as a Non-farm (O/S)	125,570

¹ Forms not returned during the screener operation were mailed a census form.

Not-On-The-Mail List (NML)

The main purpose of the Not-on-the-Mail List (NML) data collection activity was to obtain census data for area frame operations that were not accounted for in the census. The NML data were used to estimate the number of farms missed by the census enumeration, as well as the land, total production, and associated characteristics of these farms. NML interviews were conducted using the nonsample census questionnaire.

NML records were from area frame segments used for the NASS 1997 June and 1997 Fall Area Surveys that did not match to the census list. Essentially, these records are the same as the census version of nonoverlap (NOL) approach used in prior agriculture censuses. The census relied on a single frame, the census list (which includes the NASS list frame), for its data collection activities, and the NASS area frames to make NML estimates. NML data collection for the 1997 Census of Agriculture was from March 6 through April 22, 1998. NML data were collected and summarized separately from the census questionnaires.

In February 1998, all records from both the June and Fall Area Surveys were matched to the census list to determine if they were or were not on the census list. The census list included all records added to the list by January 12, 1998. Records that were found to be out-of-scope (O/S) in the screener operation were not included. These O/S records were later dropped from the census list. June area records included those with agricultural activity (i.e., those completing a questionnaire) as well as those that screened out but indicated agricultural potential or unknown agricultural potential. Fall area records included only those with agricultural activity. The number of area frame records totaled 38,869 from the June survey and 23,433 from the Fall survey.

All area frame records remaining as nonmatches at the end of the resolution process were identified as NML records. If there was any uncertainty in whether the record was on the list, the record was left as a nonmatch. There were cases in which the automated unduplication system failed to link matching records, allowing some operations into the NML sample although they really were on the census list. These NML records were identified and coded appropriately during data collection in the state offices.

The SSOs conducted NML interviews in person, whenever possible, to ensure that data were collected for the correct operation(s). Interviews not completed in person were conducted using the CATI instrument. The CATI instrument was basically the same as the one used in the "Advance Follow-Up". Introductions varied slightly, since the NML cases were being contacted for the first time and the Advance Follow-up cases had received census form(s) in the mail. Respondents refusing to complete the interview by phone were either interviewed in the field by an enumerator, or mailed a census questionnaire with the return envelope having the SSO's address.

The CATI system was used to manage the data collection process for all NML cases. All cases were processed using temporary and final codes similar to those used in main census CATI activities. All data collected on paper were entered into the CATI system. None of these cases needed to be keyed-in at the NPC in Indiana.

By the closeout date for each SSO, every case in the sample was resolved. If an enumerator was unable to obtain an interview because of a refusal, non-contact, etc., the case was completed using secondary sources information from the previous June or Fall Area Survey. Partial interviews also used secondary sources to complete the form. The replication code K037 was set to "7" to indicate that the NML records that contained data obtained from a secondary source were coded appropriately so that it could be identified in future operations.

Advance Follow-up

The advance follow-up phase of data collection focused on 1992 nonrespondents and records "tagged" by the SSOs. The tag was a marker for records, at the SSO's discretion, that the SSO wanted to track during the data collection process. But, because of problems identified with nonresponse weighting and the SSO's differences in the data collection plans for tagged records, these records were untagged on March 23, 1998. Tagged records were eligible for nonresponse weighting, but identifying these records for special handling had the potential to introduce response bias. Most records tagged by the SSO's met the definition of a large farm so the data for these reports were collected during that process. CATI was used for data collection during

the advance follow-up. Data collection for these records took place between February 6 and April 29, 1998.

Large Farm Follow-up

A “large farm” was defined as an operation which, if not counted, was determined to be “large” enough to affect the accuracy of census data at the county level. Those large farms not responding by mail to the 1997 Census of Agriculture had a follow-up contact by telephone or field enumeration to complete the report. If necessary, reports for large farms were completed using secondary sources. All report forms completed on paper were returned to the SSOs. Data from the completed paper forms were entered into CATI, electronically transferred to NPC, and incorporated into the census data file. All large farm forms completed on paper were retained at the state offices for reference during the 2002 Census of Agriculture, and not sent to Federal storage facilities. The large farm follow-up operation was conducted from March 6 to July 21, 1998.

Classification Error Survey

The objective of the Classification Error Survey (CES) data collection process was to re-interview a sample of census respondents to determine their true farm status and identify duplication. The CATI system managed the data collection processing for all CES cases. All data collected on paper were entered into the CATI system. The data collection instrument used for CES was substantially shorter than the census questionnaire.

A sample of approximately 37,000 records was systematically selected from the 1997 census list frame. Operations with Total Value of Product (TVP) greater than \$500,000, abnormals, multi-units, and operations in Alaska and Hawaii were excluded from the CES. Tagged records were also excluded. Because of census nonresponse and CES nonresponse, the effective sample size was further reduced to approximately 26,000 records. The SSOs handled all processing of these forms, except initial duplication searches and the final edit of undercounted data. Data collection for the CES was undertaken during 1998 from mid-April to mid-August.

Additional details on the Classification Error Survey are in Chapter 7, Coverage Evaluation and Research.

Nonresponse Survey

General: The Nonresponse Survey (NRS) collected data from a sample of nonrespondents to the 1997 Census of Agriculture. The proportion and number of farms among census nonrespondents were estimated based on the NRS results. These estimates were used to adjust the weights applied to the responding farms in order to represent the nonresponding farms. All states, except Alaska and Rhode Island, were included in the NRS.

The census used weighting adjustments to account for whole-farm (unit) nonresponse. During estimation, weights were applied to the responding farm records to compensate for the data that

were lost due to nonresponse. The NRS collected data that were used in this adjustment procedure.

It was not assumed that data were missing at random within the state; historically, the proportion of farms in the nonresponse universe differed by several percentage points from the proportion in the response universe. The sole purpose of the NRS was to collect data to estimate this proportion, rather than to assume that it was the same as in the response universe. The NRS sample was selected independently within each state near the end of the census follow-up operations for that state. The size of the nonresponse universe across all states was approximately 428,000 records. The nonresponse survey sample size was approximately 37,000 records. The questionnaire was a relatively short questionnaire designed strictly to obtain enough information to determine farm status. The data were collected using either computer assisted telephone interview or personal enumeration.

Data collected in the NRS were used to determine the farm status of the unit which were then used to estimate the proportion of farms in the nonresponding universe. Number of nonresponding farms in the state was estimated as the product of this proportion and the number of nonresponding records in the state. Weights of the responding farms were then increased to compensate for the number of farms estimated to be in the nonresponse universe. (See Volume 1, Geographic Area Series, Appendix C, for details of the statistical estimation methodology.)

The re-weighting process did not apply to the large farm universe where secondary sourcing was used to account for whole-farm nonresponse. The estimation scheme stratified on variables that produced strata homogeneous to farm proportion. The re-weighting was accomplished through a procedure of systematically selecting response records to receive weights of two so that they represented a single nonresponse farm; this was not a requirement of the nonresponse methodology - it was implemented so that the publication components would sum to the totals. The nonresponse adjustment process resulted in approximately 12.2 percent of total farm count being contributed by whole-farm nonresponse estimation; this represented approximately 224,000 farms.

Advance Follow-up data collection was completed before the NRS sample was selected. After the NRS sample was selected, NRS cases contained in the Last Call Follow-Up survey were removed from Last Call Follow-Up before NRS data collection was initiated. No further attempts were made to collect census data from these cases using Last Call. Instead, they were moved to the NRS for data collection. Removing these NRS sample cases from Last Call Follow-Up ensured that the same cases were not subject to enumeration attempts in two surveys. It also ensured that the statistical precision of the NRS results was maintained.

Sample Selection: Independent samples were selected within each of five strata defined for nonresponse universe cases. These strata are defined in Table 5.5

Table 5-5. Strata Definitions

Strata	Definition
1	Screener records (SCRELIG > 0).
2	Expected 1997 TVP < \$2,500 or unknown (FSZ97 = 13, 14, or 17)
3	Expected TVP > \$2,500 Expected 1997 TVP < \$9,999 (FSZ97 = 11 or 12).
4	Expected 1997 TVP \$10,000 and at least two strong sources on the mail list (FSZ97 < 11 and SC97 = XX6, XX7, XX8, or XX9).
5	Expected 1997 TVP \$10,000 and fewer than two strong sources (FSZ97 < 11 and SC97 XX6, XX7, XX8, or XX9).

Sample sizes for the Nonresponse Survey depended on the:

- Number of NRS-eligible nonrespondents in each stratum;
- Estimated In-Scope Rate within each stratum, based on 1992 NRS results;
- Desired level of reliability in stratum-level estimates of the 1997 In-Scope Rate;
- Expected response rate in each stratum, based on historical NRS response rates; and
- Expected alert rate in each stratum, based on historical NRS alert rates.

The last two factors resulted in increases to the NRS sample size to maintain desired levels of reliability in the presence of nonresponse to the NRS, and allowed for cases dropping out of the NRS sample because they responded to the census after the NRS sample was selected.

Since samples were selected independently within each stratum, the total sample size in each state was the sum of the sample sizes for each stratum. Nationally, there were 36,545 samples in the NRS.

Data Collection: The 1997 NRS was conducted using the CATI and field enumeration. CATI enumeration was begun first on those records that had telephone numbers. When the SSO received the sample, they were instructed to research the records without telephone numbers. Records for which telephone numbers were not found using directory assistance or Internet searches, were sent to the field for collection. During data collection, respondents whose telephones had been disconnected or those with incorrect phone numbers were researched and sent to the field if the phone number could not be resolved in the office. The CATI call scheduler could be set so the maximum number of calls would be “1” when the day batch was created. This forced the call scheduler to deliver almost all cases once before beginning to attempt cases a second time. This allowed the disconnected and bad phone numbers to be discovered early in the data collection period. This allowed more time for research in the office and/or field enumeration. When the size of the day batch started to get too small, the maximum number of times a call was made for each telephone number could be reset to 2 before recreating the day of batch. Data collection began in the third week in April and continued until the first

week in July 1998.

Last Call Follow-up

Last Call Follow-Up replaced both the Low Response County Follow-Up and a fourth follow-up questionnaire mailout that had been conducted in the 1992 census. The Last Call Follow-Up was the last census data collection effort and, therefore, the last opportunity to achieve as high a response rate as possible. Data collection for the Last Call was similar to the Advance Follow-Up, as both sample and non-sample interviews were conducted using the CATI system. The workload for Last Call excluded Large Farms, Tagged records, and Advance Follow-Up cases. Though these record types were excluded from Last Call, data collection for each of these operations continued until their respective closeout date in each state.

The estimated workload for Last Call was approximately 400,000 records. Calls were first targeted to records in low response counties, because it was imperative that each county attain a 75 percent response rate at the very minimum. Input files were delivered to the SSOs using the census data distribution system, and the CATI system processed and managed the data collection process. Data collection started April 15 with the last states closing on May 22, 1998.

Analytical Review

During the review of the tabulated data, there were telephone call backs to respondents to resolve or confirm questionable and/or inconsistent data. Call backs were made only when the data significantly impacted summarized totals. All of the criticisms - questionable data items - were identified on the label of the paper form during Analytical Review, so if there were more than one problem with the report form's data, all questions could be resolved with one phone call.

Citrus Caretaker Enumeration

Background: A citrus caretaker is an organization or individual caring for, supervising, or managing citrus groves for 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. Many caretakers did not perform harvesting activities. Unlike the mailout/mailback enumeration procedures of the main census and many of its data collection components, face-to-face field enumeration was used to obtain grove information from the citrus caretakers. On site field interviews eliminate the difficulty of identifying and enumerating absentee owners who frequently employed caretakers to manage their groves and may 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 Census of Agriculture in Florida, when 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. They also obtained from each caretaker a list of names, addresses, and acres owned by each grove owner employing the caretaker. Census of agriculture 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 followed, and expanded to cover caretakers in Texas in the 1974 and later enumerations, and in Arizona from 1978. Citrus caretakers in Florida, Texas, and Arizona were enumerated in this manner after the 1996-97 citrus crop year.

Enumeration and Data Collection: A special citrus caretaker questionnaire was used to enumerate every caretaker in Florida, Texas, and Arizona, who managed citrus operations during the 1996-97 citrus season. Texas caretakers were enumerated in July, 1997 and Florida and Arizona enumerated in October. The staggered schedule enumerations were intended to contact the caretakers when their workloads were lightest and information from the 1996-97 harvest season would be available.

A list of citrus caretakers was compiled from various administrative records and respondents included in the 1992 Census of Agriculture. Before interviewing began, each caretaker was mailed a citrus caretaker census report form, together with a cover letter, and an instruction sheet. The caretakers were asked to look over the report form and complete it if possible, and then to hold it until an enumerator visited.

Each state office was responsible for training their field interviewers, coordinating the caretaker training, and coordinating enumeration with ongoing surveys. Florida's Citrus Caretaker training was coordinated with the Fruit and Chemical Use training. Texas' field interviewing training took place during the Texas June Area Frame Survey training. Arizona coordinated their caretaker training with the ARMS training.

The citrus caretaker questionnaire was essentially a shortened version of the sample questionnaire used in the 1997 census. It contained only those questions from the questionnaire that pertained to grove management operations and some detailed citrus production questions. There was also an extra section in which other agricultural operations of the caretaker were to be listed.

A citrus caretaker report form was completed for every caretaker who had any citrus operations in 1996-97, 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, a report form was completed for each county with 500 acres or more of citrus.

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. This information was used to ensure that duplicate reports from the grove owners were not incorporated into the census data file. Caretakers were asked to inform their grove owners that they had provided citrus production data to NASS, and supply the owners with their caretaker's numbers. Census of agriculture staff matched the names and addresses of grove owners provided by the caretaker to the census lists during data processing.

When the caretaker enumeration was complete, data were manually transcribed by state office staff to a keyable "must" census form. The census report forms were then sent to the NPC in Jeffersonville, Indiana for data entry and processing. The transcription process was necessary so that existing census of agriculture data keying procedures and software could be used, thus avoiding the cost and time of developing new procedures and software just for the caretaker enumeration.

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 1997, 1992, and 1987, are summarized in the following table.

Table 5-6. Summary of Citrus Caretaker Counts for 1997, 1992, and 1987

State	Caretakers			Grove Owners			Citrus Acreage		
	1997	1992	1987	1997	1992	1987	1997	1992	1987
Total	101	61	92	2,400	2,465	3,975	174,100	171,300	196,500
Arizona	16	5	7	120	65	175	19,100	7,300	12,000
Florida	75	44	65	1,950	2,300	3,000	142,000	150,000	170,000
Texas	10	12	20	330	100	800	13,000	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 1997.

Census Results

The 1997 Census of Agriculture achieved an overall response rate of 86.2 percent, about 1.7 percent above the final response rate for the 1992 census. Table 5.7 shows the check-in results for the 1997 census. There were 23,362 records that had their data estimated using secondary sources due to two possible reasons; respondent non-response or coordination with ongoing surveys to minimize respondent burden. These records were included as responding farms. Late adds were made after the final stages of census list development so the total is slightly higher than the total shown for the final census list adjusted for results for the screener survey.

Table 5-7. Summary of Check-in Results, 1997

Disposition	Records
Responding farms	1,678,805
Responding nonfarms	993,261
Receipts not processed	3,146
Nonresponse	427,679
Undeliverable as addressed	120,787
Total	3,223,678

Table 5-8. Summary Census Counts, 1997 and Earlier Censuses

Item	1997	1992	1987	1982
Total Number of Farms	1,911,859	1,925,300	2,087,759	2,240,976
Land in Farms (acres)	931,795,255	945,531,506	964,470,625	986,796,579
Estimated Value of Land and Buildings per Farm	\$449,748	\$357,056	\$289,387	\$345,869
Total Value of Sales of Agricultural Products (\$1,000)	\$196,864,649	\$162,608,334	\$136,048,516	\$131,900,223

Chapter 6. Data Processing

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Introduction

Transition: The transition of the census of agriculture from the Bureau of the Census to NASS affected nearly all aspects of the 1997 Census of Agriculture. Form and data processing, i.e. form mailout and follow-up, form receipt and check-in, data entry, and data editing, were no exception. The late date in the census cycle, February 2, 1997, at which time the census program was acquired by NASS, made it imperative that many of the plans and procedures for data processing already in place be kept in tact with a minimum of change.

The 1997 census data processing system was a system that handled a large volume of paper report forms. Unlike 1992, where nearly all processing was performed in the Census Bureau's NPC (formerly known as Data Processing Division), processing the 1997 census was split between three locations. The majority of the data entry and computer edit review processing was still performed at NPC in Jeffersonville, Indiana. A significant portion of the data analysis and review was completed in the SSOs. Also, a portion of the data review and analysis effort was completed at NASS headquarters in Washington, D.C., and by Census Division staff in Marlow Heights, Maryland.

Major Activities: The 1997 preliminary census list of names and addresses - excluding screener results - was about 3.3 million records. Of this number, 29,350 were tagged records. Tagged records were pre-identified agricultural operations which NASS SSOs identified as requiring personal enumeration, rather than the traditional mailout/mail back enumeration method. Hence, tagged records were removed from the NPC mailout. Also, an additional 5,865 records were handled by the state offices, and were excluded from the NPC mailout. See Appendix C, table C-1 for additional detail.

The approximately 3.2 million record 1997 final mail list was slightly smaller than the 3.6 million record mailout for the 1992 Census of Agriculture. Much of this reduction was accomplished by adoption of the screener questionnaire to filter out possible non-farms. The screener was mailed and processed prior to finalizing the final 1997 census mail list. Additional information about the screener operation is discussed in the previous chapter. The remaining portion of the mail list size reduction was achieved by a state level review of the census list in each SSO which eliminated duplicates.

NPC began addressing the mailout packets for the initial mailout in November of 1997. After the initial mailout, follow-up activities via mail continued until May, 1998 and telephone follow-up of non-respondent records via CATI continued until December, 1998. All mailed report forms were returned to the NPC in Jeffersonville, Indiana. Tagged records were returned to their respective state office for review and then forwarded to the NPC for processing.

When enumeration efforts stopped, the overall response rate was 86.2 percent, about 1.7 percent above the final response rate for the 1992 census. A small number of late adds were received after this date.

Activities conducted at the NPC included:

- Form mailouts for the initial and follow-up mailings.
- Receiving and checking in the report forms.
- Sorting the returned report forms and removing the contents from the envelopes.
- Evaluating and responding to census-related correspondence.
- Reviewing nonagricultural reports and “2+” reports.
- 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 files containing all the report forms received by NPC during the data collection operation. Out-of-scope forms were referred to the files immediately upon being identified; in-scope report forms as well as computer identified out-of-scope forms were generally files after edit review. All in-scope records were then forwarded to their respective SSO for Analytical Review.

Receipt and Check-in

Post Office Box Numbers and the 56 Pocket Mechanical Sorter: Since paper report forms are physical products and since they accompanied much of the captured data through the processing system, a fast and practical way to sort report forms into groups had to be developed. This was accomplished in two ways.

First, different types of report forms (sample, non-sample) were mailed out with return envelopes having different post office box numbers on their postage paid return envelopes. This effectively allowed all census reports to be sorted by type by the post office (PO) based on the PO box number and its corresponding location. All census reports (excluding the screener, nonresponse survey, and classification error survey reports) were sent to different PO boxes. These PO boxes facilitated the sorted receipt of must, sample, multi-units, abnormal, and Indian Reservations. Second, to further sort records by state while report forms were still in their return envelopes, the 56 pocket mechanical sorter located in the NPC facility read the bar code on the report form label to sort each of these types of report forms into state groups.

Immediately after receipt, trays of forms sorted by type were sent to check-in clerks, who fanned through the receipts in each tray, checked to make certain that each tray contained one type of report form, and then further reviewed them to be sure that they contained one of the following types of receipts:

- Materials addressed to a specific analyst.
- Undeliverable as addressed (UAA).

- Agriculture receipts (except Alaska and Hawaii).
- Agriculture receipts for Alaska and Hawaii.
- Multi-units, abnormals, and Indian Reservations.
- No barcode visible.
- Other receipts.

This list of receipts does not include screener forms or forms from the nonresponse or classification error surveys.

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 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 workunits - a batch consisted of 95 report forms (smaller batches could be used to clear the unit). The unit control clerk used the unit’s interactive work station to update the report form tracking system. Each batch was registered into the Data Entry Control System. This required the clerk to key the necessary code, user name, and password, then indicate the specific operation involved (in this case, check-in batch registration), 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.

Single-unit receipts without correspondence 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 check-in 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) 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 and types of reports that follow).
- Multi-units and abnormals.

- Other returns.
- Undeliverable as addressed (UAA)
- Machine failures (machine failures were not resubmitted for each batch, but were held and batched 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 multi-units, abnormals, and Alaska and Hawaii were sorted separately. After a batch had been sorted, the operator keyed the relevant identification data in 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, multi-unit report forms and UAA’s, respondent originated correspondence, out-of-scope cases that did not enter the computer edit, and secondary source referrals from the telephone unit. Wand/key operators also used the interactive system to keep track of their work, keying batch number and other identification information as work batches arrived for check-in. The operators used a hand-held laser wand to check-in 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 content and sort unit. All of these procedures were completed with the report form still in its return envelope.

Remove Contents and Sort: During the processing of the 1997 Census of Agriculture, the Remove Contents and Sort Unit received census returns in envelopes sorted by state and form type. The census returns were processed by the clerical staff using the state processing priority. The contents of each envelope were removed and examined by the staff in the unit. Receipts were sorted into the categories shown in Table 6-1.

Table 6-1. Receipts Sort Categories, 1997

Category	Description
“2+” Cases	2 or more reports received in the same envelope or reports received with additional I/S written in the “2+” boxes on the front of the report form.
Special Cases	Returns with attached correspondence, remarks on the front or back, blank reports, and reports with “acres in the place”, but no crops or livestock.
Good Receipts	All cases not qualifying as a “2+” or special case.

Sorted work was also maintained by state and was transmitted to the proper unit for further processing. The “2+” Cases were sent to the “2+” Unit, and the special cases to the Special Case

Processing Unit. Good receipts were sent to Batch for Data where they were wanded into data keying work units and then sent to the Data Systems Branch of NPC for data entry.

All sorted work was subjected to quality control review that was performed by the lead clerk. The quality control checks were made by selecting one case from each destination tray twice each day. 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 clerks 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.

Census Automated Tracking System

About 2.8 million report forms were processed by NPC during the 1997 Census of Agriculture. NPC had to maintain control of how these documents were handled during processing, so a system was developed to track each CFN throughout each step of processing. Hence, a tracking system was called the Census Automated Tracking System (CATS) was developed.

The CATS universe was made up of all census file numbers mailed in the census. As reports were received at NPC, CATS tracked the processing status of each case by integrating available information from the various automated data capture systems used in census processing. These steps were:

1. 56 pocket check-in laser sorter,
2. Wand/key check-in,
3. Batching for data entry,
4. Special case processing,
5. "2+" case processing,
6. Correspondence,
7. Large farm coverage processing,
8. Data transmissions, and
9. Computer editing.

The system produced five basic data capture resolutions:

1. Undeliverable as addressed (UAA) - The census form was returned to NPC by the U.S. Postal Service as undeliverable.

2. Out-of-scope (O/S) - The case was identified at some point in processing as not meeting the farm definition.
3. Keyed and transmitted - Data were keyed from the report form and transmitted to Census Bureau's computers in Bowie, Maryland for editing, and the record was not determined to be O/S.
4. Computer Assisted Telephone Interview (CATI) Resolution - The data for this case was captured by CATI.
5. Not satisfied - This case had not yet been resolved, i.e. it did not fit any of the four categories above. However, each case was eventually resolved.

As report forms were returned to the NPC, they were checked-in by the 56 pocket check-in laser sorter and proceeded through the various stages of processing. The CATS required that CFNs be wanded as cases were physically moved between the units. This allowed the tracking system to generate daily reports showing cumulative receipts, backlogs of forms to be processed, and number of forms processed each day for each of the processing units. These reports were available for the U.S. and for each state.

Utilizing the CATS, it was possible to determine the processing status of each CFN on the census list. This proved to be a very beneficial processing tool.

Correspondence

The 1997 Census of Agriculture was the first census in which a toll-free number was provided to the respondent in the initial census mail package. The toll-free number was widely used by the respondents who had questions or problems in completing their census reports. The widespread use of the toll-free number appears to have resulted in a drastic reduction in the amount of respondent originated correspondence received at the processing center. Prior to the census, the projected workload for the Correspondence Unit was 25,000 pieces of correspondence. This estimate was based on workload estimates from the 1992 census which did not use a toll-free telephone number. In reality, the unit only processed 5,200 pieces of correspondence.

The Correspondence Unit also was responsible for processing reports requiring correspondence referred to the unit from other areas of processing such as the Special Case, the "2+", and the Large Farm Coverage Processing Units. The unit also made interactive name and address corrections to cases returned to NPC by the post office with address corrections.

In addition to approximately 5,200 pieces of correspondence handled by the unit, approximately 40,000 name and address corrections for undeliverable as addressed receipts were processed. The unit was staffed by an average of three clerks and one supervisor. Incoming correspondence was read and processed on a first in/first out basis. The clerical staff read the correspondence and interactively keyed a correspondence category code that resulted in assigning and mailing the appropriate form letter to the respondent.

Completed work was subjected to quality control procedures requiring 100 percent verification of all work. All census of agriculture correspondence that required a response from a respondent

was held in a suspense file. Cases remained in the suspense file for a maximum of 35 days. If no response had been received at the end of that period, the cases involved were referred to an analyst who determined what further action, if any, should be undertaken.

Special Cases and "2+" Case Processing

Special Cases: Special cases were non-must report forms received from the open and remove contents operation that had attached correspondence, remarks entered on the front or back, a blank front page with no positive data, or 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.

These condition/action tables addressed the following kinds of situations:

- 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 record met a condition in a table that resulted in the assignment of an O/S or a referral code.

If the case did not meet the conditions in the tables, it was considered in-scope, 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 out-of-scope cases) on the front of the report form in the upper right hand corner. Selected referral codes (S for successor, P for partnership, and CF for claims filed) were entered on the front of the report form in the middle of the top margin, 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 on the front of the form in the lower right corner. And, after completing an entire work unit (up to 95 cases), the clerk wrote the date on a yellow post-it note and applied it to the top 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 alternatives were as follows:

Table 6-2. Special Cases Disposition, 1997

Priority Groups	Disposition
In-Scope (I/S)	Batched for keying
“2+” Cases	“2+” processing unit
REM, R-AG, or R-LL	Large farm coverage unit
Form letter assigned	Correspondence reading
Correspondence analyst	NASS Agriculture Analyst
Successor, partnership, or claims filed	Research clerk, special case unit
Out-of-Scopes (O/S)	O/S wandering within unit/ forward checked forms to central files
Conservation Reserve Program (CRP)	Batch and hold in unit

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.

NPC at Jeffersonville, Indiana had a staff of 15 to 25 people working from December 28, 1997 to June 28, 1998 (six months) to process approximately 868,000 special cases

"2+" Cases: A "2+" case resulted when two or more:

- Report forms were mailed to the same individual (who might, or might not, operate more than one farm or ranch);
- Report forms were mailed to different individuals involved in the same operation (e.g., a husband and wife, two or more partners, several heirs to an estate, etc) for which only one report was required; or
- 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 were 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, 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 CFNs present for a specific case had to be linked to prevent duplication of data. The CFNs 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; or
- 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;
- A folder containing only blank reports with no attached correspondence which clarifies the farming status; or
- The case included one or more pre-identified abnormal or multi-unit farms, 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).

Clerks assigned linkage codes to each CFN that required linking. A primary-linkage code was assigned in each case; for cases involving a single report form with multiple CFNs, 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 CFNs 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 a 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 report, and a secondary code of "9" to the others.

Clerks assigned out-of-scope reports secondary linkage codes of "5." When all the CFNs for a case were out-of-scope, the reviewing clerk assigned a primary code of "2" to one form and a

secondary code of "6" to the remaining report(s). These codes were written in the upper right corner of the address label and the circled. 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, CFNs 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 CFNs 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 shown in Table 6-3.

Table 6-3. "2+ Case Disposition, 1997

Priority Groups	Disposition
Abnormals, multi-units, Alaska, and Hawaii	Large farm coverage unit
Referrals	NASS 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 (I/S) reports	Batch for data entry

NPC in Jeffersonville, Indiana had a staff of 4 to 8 people working from December 28, 1997 to June 28, 1998 (six months) to process approximately 175,500 "2+" cases for the 1997 Census of Agriculture.

Quality Control: The work of both the special case and "2+" case processing units were subject to quality-control procedures before being released from the units.

For clerks in the Special Case Unit, the first 100 cases processed were verified 100 percent. Special case clerks qualified for sample verification, if they had achieved an error rate of 5.0 percent or less. When qualified for sample verification, the work of special cases processing clerks was checked at a 1-in-10 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. Records could be rejected for the following errors:

- Error in scope classification of report forms.

- Error in coding report for research claims filed, successor, or partnership.
- Referral error.
- Error in transfer of data from remarks to report form.
- Error in form letter designation.

For clerks in the “2+” unit, 100-percent verification continued until 25 consecutive error-free cases had been verified. Once the processing clerks began sample verification, cases were reviewed at a 1-in-8 sample verification rate. For “2+” case clerks, any error identified during sample verification meant returning to 100-percent verification status until re-qualifying. 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 the following errors:

- Failure to refer Congressional case to NASS Analyst
- No linkage made as required (failure to assign linkage codes or enter related CFN's).
- Linkage made when not required.
- Incorrect linkage codes assigned.
- Other error in coding/annotation of report form.
- Error in performing interactive linkage.

In both the Special Case and “2+” Units, 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 total for all clerks and submitted a weekly summary verification report to the NASS, Census Division, Frame Development Section.

Large Farm Coverage Unit

General Information: The large farm coverage unit (LFCU) performed prekey review on the agriculture multi-units and abnormal farms. The LFCU also resolved any special case must report forms and conducted all telephone follow-ups with respondents required to resolve the edit referrals. The LFCU staff also performed extensive name and address research on the Not-On-the-Mail List Survey.

Multi-units and Abnormal Farms: The LFCU was responsible for preparing outgoing mail packages for both the multi-units and abnormal farms, and mailing them. Upon receipt, the multi-units and abnormal farms were checked-in and sent to the LFCU. Here, they were reviewed for completeness. This review ensured that all agricultural operations of each multi-unit had been accurately enumerated, satisfied and corrected. It also ensured that each report form that was appropriately scoped and ready for data entry. The LFCU staff telephoned respondents to resolve any reporting inconsistencies discovered during the review. Upon

completion of this review, multi-unit and abnormals that reported agricultural data were batched into workunits and sent to the Data Systems Branch for keying. Multi-unit and abnormal report forms that were determined not to be farms, were assigned the proper out-of-scope code and checked-in appropriately.

Special Case Must Reports: Must reports that were returned with remarks written on the front or back, reports with attached correspondence, reports that were blank, or reports that reported acres in the place, but not crops or livestock were identified in the remove contents and sort operation as special cases musts. These reports were sent to the LFCU for processing. LFCU staff reviewed the reports determined if they were within the scope of the census. In many instances, respondents were recontacted via telephone to determine operating status or to locate the name of a new operator.

Edit Review Referrals: The LFCU staff conducted numerous telephone reinterviews with respondents in order to resolve data inconsistencies identified by the edit review processing unit. Once these calls were completed, the report forms and the documentation from the phone call were returned to the Edit Review Unit and the necessary data corrections were made interactively.

Not-On-the-Mail List Survey Processing: Not-on-the-Mail List (NML) cases that remained unmatched to the census list at the conclusion of state office processing were sent by headquarters to the LFCU for additional research. The LFCU staff performed interactive name and address research using the census list and made numerous telephone calls to unmatched NML respondents to match the NML cases to the census list. This process identified a significant number of matches which resulted in improving census list coverage.

Data Entry

Batch for Data Keying: After check-in and/or other prekey processing, report forms with data were referred to the Batching Control Unit where the clerical staff batched the report forms into data keying workunits (DKWUs). The forms were batched by state and form type (must, sample, nonsample). Each report form barcode was wanted to physically create each batch and create an electronic record of the report forms contained in each batch. Each DKWU contained approximately 95 report forms. Upon creation of each DKWU, a cover sheet was placed on top of the report forms, the forms were placed in a plastic envelope, and the DKWU was transferred to NPC, Data Systems Branch (DSB) for data entry. The cover sheet identified the type or report form, the number of forms, the date created, and other tracking information.

Data Keying Operations: Data keying involved transcribing data from the census report forms to a machine readable data file for edit and tabulation. The DSB staff used a key to disc interactive system that combined the clerical review or screening of census questionnaires with the data entry operation. Each key station consisted of a keyboard and a monitor that allowed the keyer to display and edit keyed data, as well as receive messages or questions from the input program. Data keyers clerically screened the data as it was keyed. They 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. All completed work was subjected to formal quality control procedures to ensure that the information on the report form was accurately recorded in the data file for editing and tabulation. 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 staff transferred the data electronically to the Census Bureau's Computer facility in Bowie, MD, for further processing.

Computer Processing

General Information: After being keyed to a computer file, the data from each report form were formatted and edited using minicomputer systems at the Census Bureau's Bowie, MD, 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.

Format: Computer processing began with the format program. This program converted the data records into a series of fixed and variable portions. Historical data for individual items were added at this time and were compared to the reported data for completeness and reasonableness. The format 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.

Computer Edit: Computer editing is the mechanical process of checking and reviewing reported data and comparing it to established parameters. The complex edit and imputation programs were designed to carry out several hundred individual editing operations in all. However, only some of the programs were required most records.

Prior to submission for the complex edit, the formatted data files were sorted by state and by county and census file number within each state. The data from each farm record were subjected to a detailed, item-by-item, computer edit. This 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 Standard Industrial Classification and North American Industry Classification System code;
- Identified nonsample farms representing farms that met the "certainty" criteria for each state, and converted these 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 combination of commodities; and
- Checked that geographic, legal, and physical constraints were met.

The computer 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 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.

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 the data had been keyed correctly and/or that the changes were justified.

Failed Edit Review: Data records from individual report forms that were rejected by the computer edit, i.e., “failed edit review” cases, were referred to the edit review staff in Jeffersonville, which carried out the edit review processing. Edit review determined whether the information was keyed correctly from the reports to the data file and that any changes made to the individual records in the computer edits were correct and acceptable. Edit review staff also reviewed cases identified as format rejects as well as reports determined to be out-of-scope by the computer. For general failed edit cases, flags set by the computer edit identified specific problems, and/or data items that were changed by the computer edit programs.

Failed edit cases were referred to the edit review unit in their original data keying work units. This enabled the staff to work through batches of work organized by state and form type. The clerical staff used an interactive correction system to review and enter changes to the keyed and edited data. Any cases for which the computer edit results were found to be unacceptable were corrected as required and the data were immediately re-edited. If a record referred for re-edit failed the edit a second time, it was immediately redisplayed with the new flagged keycodes. The edit review clerk reworked the case and resubmitted it for editing. This process for an individual record continued until it passed the edit. The next failed record in the data keying work unit would appear on the screen and the process was repeated.

Post-edit Correction Processing

General Information: After the computer edit and edit correction processing were completed, NASS conducted a final review of data files to identify errors, review suspect data, and remove duplicate records that had not been identified before aggregating individual records for analytical review. The individual records were tabulated by computer into a matrix called the analytical table. Records were given an initial weight prior to aggregation in these tables. Accessory matrices – “call tables” – also were built. NASS staff used the matrices to extract data for analysis and correction of both the county-level and state-level tabulations. Following the analytical review process, a “Final Data Review” process was conducted to ensure that the actions taken during analytical review were resolved.

After analytical review, the data underwent final weighting. A small, state-level, table of selected basic data then was created for each state and reviewed to ensure that the final weighting had not caused significant shifts in the data. Once the table was approved, the data were aggregated into a single file – the master matrix – for each state and for the United States.

The master matrix also underwent disclosure processing, and was then used to build the Volume 1, except the cross tabulations, publication tables. Volume 1 cross tabulation tables were generated separately from the master matrix and underwent independent disclosure analysis. All Volume 1 tables were then downloaded electronically to a local area computer network for table review using the Census Bureau's Tabulation and Disclosure System.

Duplication Review: After the computer edit and failed edit review were complete, a computer

program was run to identify sets of possible duplicate report forms that were present in the edited data file. This program matched records in each county in a state by telephone number, North American Industry Classification System code, and then by selected keycodes within matching records. It ran in three phases and hunted possible duplicates based on calculated point scores that resulted from comparing similarities derived from comparing the previously mentioned variables. If several keycode items matched or if there were other similarities, the records involved were displayed at an interactive workstation for the clerical staff to review. During the duplicate process, the paper questionnaires for the sets of possible duplicates were utilized to help determine the existence of duplication. This duplicate edit was run on all 50 states and was concluded before any states were tabulated into their analytical tables.

Analytical Review: Analytical review is the review of all census of agriculture data items, data values, and a variety of data relationships for all states and counties. It was designed to allow statisticians, using an interactive computer system, to detect and correct incomplete or erroneous data before they are tabulated for publication. The analytical review process for previous agricultural censuses was conducted by a centralized staff of headquarters statisticians, supplemented by senior NASS statisticians temporarily assigned to the Census Bureau to review the tabulated data. However, for the 1997 Census of Agriculture, analytical review was a decentralized process involving NASS's 45 State Statistical Offices and selected and specially trained headquarters statisticians.

During analytical review, staff used an unpublished analytical table displaying all census data items with positive data values in either the current or previous census. Each analytical table included ratios, frequencies, measures of data imputation, and other calculations designed for data problem detection. There was a single analytical table for each state and county. Analytical tables were the first tabulations of census data and were created after data keying, computer edit, edit review, edit unduplication, and nonresponse weighting were completed.

The review system included problem identification and description tools (called criticisms) together with a variety of research routines addressing several data bases. Criticisms were created from the analytical table and provided a standard way to describe data problems. Each criticism that was written had to correspond to a specific keycode. The research routines were accessible from the criticism "shell" and were used to identify and list the farms that were involved in the specific criticisms. Analytical review was undertaken in two steps, County Analytical Review and State Criticism Review. Criticism resolution involved reviewing and resolving data problems identified during analytical table review. Report forms were reviewed, and if necessary, corrections to their corresponding electronic records. Missing operations were called and enumerated, and late receipts were keyed and added to the tabulated data.

County Analytical Review involved a systematic review of county data by designated commodity statisticians using the county analytical table. Prior criticisms, created from computer specifications (standard computer criticisms) were checked for validity and deleted if not valid. Then a review comparing the 1997 data to the previous (1992) census data was done with special attention to the appearance of new, disappearance of 1992, and duplicate data, and questionable changes within the county. Other criticisms were frequently created requesting verification of coding and keying of dubious crop or livestock commodities. Sales values versus production costs (net gains and losses) and other measures of economic reasonableness were checked.

Irrigation, crop yields, land values, machinery inventories, broiler sales, milk cow inventories, and other data for a county were examined in the same way before the review was completed.

Once County Analytical Review was completed for all counties within a state, a State Criticism Review was undertaken. The State Criticism Review was a final check on the results of the County Analytical Review, and was performed by the state statistician, deputy state statistician, delegated state office commodity statistician, and designated headquarters staff. It was a means of developing criticism standards by evaluating and providing feedback to the commodity statisticians and included an automated outlier check to ensure that no large differences between current and previous census data for specified items went uncriticized. Commodity statisticians, both state and headquarters, reviewed state-level commodity data and the existing county criticisms for completeness. Where necessary, they created county criticisms to resolve any remaining problems that were not already addressed.

Final Data Review during the 1997 Census of Agriculture contained the same functionality of the initial criticism process, combined with a new change derived from the actions taken in the first review and resolution process. It was the last opportunity to make changes at the record level. This three stage process consisted of a Final County Review, Final State Review, and Final Criticism Resolution.

Tabulation for Counties, States, and the United States: As data were keyed, edited, and reviewed, they were incorporated into the master data matrix for the census. A master matrix was created 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, 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. United States summary tables were compiled by summing state data. Selected tables included historical data from previous censuses.

Production table review and disclosure analysis for the 1997 Census of Agriculture Volume 1 series, was conducted using a computerized Tabulation and Disclosure System (TADS). TADS operated on computer workstations utilizing various in house software. It had tools for status tracking, interactive table review, and data flow. NASS state office statisticians reviewed the county-level data in the "to be published" tables, and marked-up the tables as needed. These changes were forwarded to headquarters statisticians that had the capability to display information about each datum value and adjust values as appropriate. Adjustments made to any datum value was captured automatically and combined at the state level based on the marked-up tables were made and the changes captured automatically. County tables were combined into the state level tables.

Disclosure Analysis: The law which authorized the census of agriculture also prohibits publishing information that could be used to identify individual respondents. To ensure that confidentiality was maintained, all summarized data were checked prior to publication in a procedure called disclosure analysis. Disclosure analysis involved a review of each data table 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.

NASS used their automated equipment and programs to perform the bulk of the analysis and suppressions. However, NASS staff carried out interactive table review using the Tabulation and Disclosure System.

Chapter 7. Coverage Evaluation

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Introduction

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 accuracy and completeness of the farm count and coverage of selected data items (e.g., land in farms, total value of agricultural products sold, and others). 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.

Historic Highlights

Sometimes it is best to know where you have been before deciding where to go. This was certainly true with the 1997 coverage evaluation program. A significant portion of the evaluation program was based on experience, and lessons learned from prior census evaluations. The following offers a very brief census by census synopsis of how the issue of coverage error were addressed over the years.

1950: Coverage estimates for the 1950 Census of Agriculture were based on check data (e.g., cotton ginnings) and a reinterview of 6,000 farms selected from 1,000 area segments. The intent of the reinterviews was to measure not only coverage error, but also reporting error.

1954: Overall coverage for the 1954 census was evaluated by a reinterview process. There were 772 rural segments used (contained 2,800 farms), and 700 list farms selected from areas near the segments. Contacts were made in an effort to find duplication and to verify farm status. Additionally, there were 3,000 urban segments used; farm operations found in those were reinterviewed with some data verification taking place along with classification measurements. A third contact was made in cases when census data and coverage data varied appreciably.

1959: Coverage for the 1959 Census of Agriculture was evaluated by making comparisons with check data (e.g., processors' data) and several sample surveys. There were 1) 772 rural area segments, 2) a sample of "some" urban areas, and 3) sample of census respondents. The first two surveys provided a "Not-on-the-Mail List" (NML) measure. To determine classification error, a sample of 2,500 farms (less than 5,000 acres in size) was selected from census respondents in the 772 segments. This sample was supplemented by 525 farms (more than 5000 acres in size) selected from 200 separate segments located largely in the western states. Data were collected a few weeks prior to the census for the half of the 772 segments and after census enumeration for the others; names collected were then matched to census list to determine the NML status. If the name was on the census list and data varied appreciably from the area and list frame data, a recontact was conducted to ascertain truth. On correctly identified farms, an attempt was made to rectify any disparate data.

1964: The coverage evaluation program for the 1964 Census of Agriculture involved 200 counties. Within these counties, 800 segments were constructed, each containing 3 to 4 resident farm operators (RFOs). Selection of the segments was made so as to include ag-urban areas. This was supplemented by a pseudo-list sample. List records were selected, and then operations within the segment in which the sampled records were located were then reinterviewed. There was no attempt to measure reporting errors. A weighted estimator was used.

1969: As a part of the 1969 census evaluation program, the area frame used by the National Agricultural Statistics Service for its June survey was utilized. This was the first time the June area frame was used for coverage purposes. The Resident Farm Operators or open estimator was used for NML and Classification Error Survey (CES) estimate. A sample of 1,500 nonfarms was used along with 23,000 RFOs located within the segments. Matching was done with census of agriculture forms mailed afterwards to the nonmatches, approximately 4,200, and possible matches totaling about 3,000. Once the data were collected, another attempt to match was undertaken. Problems associated with this evaluation included:

- Approximately 7,200 of the mailed forms were ultimately classified as nonrespondents;
- Specifications for the matching process called for matching to stop as soon as the first match was found, even though multiple duplicates existed;
- The sample design for the June Area Survey did not adequately reflect farm numbers because of under representation of urban segments; and
- A problem with variation between enumeration dates for area sample data and census data.

1974: The evaluation program for the 1974 Census of Agriculture, again used NASS's June Survey area frame. The Resident Farm Operator (RFO) estimator was used for both NML and CES estimates. A sample of 3,000 nonfarms was used along with 22,000 RFOs. Matching was done with census forms mailed after the process to the nonmatches and possible matches. Once data were collected, a second attempt to match respondents was undertaken. Tests were conducted on using weighted estimator in 5 states - value was determined to have an upward bias due to understatement of total farm acres - further testing recommended.

Problems associated with this evaluation approach included:

- Level of nonresponse;
- Records found solely on the Agricultural Stabilization and Conservation Service (ASCS) lists were sampled, so not all were added to final census list - in turn area records were matched to the non mail list ASCS records - when matches were found, adjustments had to be made in estimator to reflect the fact that the ASCS list source was sampled;
- Difficulties in searching for matches (thought was that 5% of nonmatches were actually on list somewhere);
- Thorough searches for matches stopped as soon as first match was found although multiple duplicates may have existed (in some cases, multiple duplicates were identified just by chance);
- Sample design of June Survey didn't adequately reflect farm numbers (thought to be due to under representation of urban segments);
- Problem with variation between enumeration dates for area frame data vs. census data; and
- Classification was not made on four percent of matched cases due to missing forms.

1978: The 1978 evaluation program did not use NASS's June area frame. Rather, the census list was supplemented with 6,400 area segments representing rural areas called Census of Agriculture Area Sample (CAAS). Data for nonmatches in these areas were expanded to adjust state level numbers for Not-on-the-Mail List (NML). Two additional surveys were conducted to further evaluate coverage. The first survey used was based on a sample from the Census Bureau's Annual Housing Survey (AHS) which mainly targeted locating farmers living in urban areas not covered by CAAS with a smaller sample targeting rural areas (sample size 72,000 units). Again, this provided an NML number. The second survey was the Post Enumeration Survey (PES). This was basically a reinterview of a sample of households found in the Census of Agriculture Area Sample. Data collected on the PES reinterviews were then used to further adjust the area numbers that would be used to adjust the census number. State level values were not adjusted to reflect results from the PES and AHS (only regional and national levels). In essence, the PES and AHS samples attempted to measure census list frame misclassification and undercount/overcounts in CAAS. Problems associated with this approach were:

- Too many farm operators missed in Census of Agriculture Area Sample (CAAS);
- Often CAAS data were based on observations or data provided by someone other than operator of the land;
- Misspelled CAAS names or census names resulted in CAAS overcounts based on PES; similar problems due to alternate addresses and alternate names for same operation;
- Nonresponse; and
- Unclassified cases (i.e., some nonmatched AHS units could not be determined to be a farm/nonfarm).

1982: For the 1982 Census of Agriculture evaluation program, the Census of Agriculture Area Sample (CAAS) was again conducted, but due to budget constraints it was not supplemented by the Annual Housing Survey (AHS). Also, the CAAS was reduced to 344 segments. A list sample of 4,700 census names was selected to further measure coverage error. This was the birth of the Classification Error Survey (CES). The nonfarms, Undeliverable As Addressed (UAAs), and one-half of the farms were matched back to the list in an effort to detect duplicate records. A sample of nonduplicates and all potential duplicates were reinterviewed (300 cases) to determine classification error. Problems associated with this evaluation included:

- Small sample sizes (about 3,440 farm operators in the CAAS and only 300 CES interviews);
- Respondent nonresponse. It is important to note that the dual system estimator was introduced to account for the fact that the area frame and the list were both incomplete although they both were attempting to measure the same thing (i.e., number of farms).

1987: The June survey area frame was reinstated as a tool to measure the NML only with the Classification Error Survey (CES) again used to measure classification error and duplication. The area frame sample size was increased 20 percent with ag-urban areas being the principal target. Also, more intensive screening was dictated with additional questions added to the area questionnaire itself. Only Resident Farm Operators (RFO's) with indicated agricultural activity were used. Names from the June area frame were matched to the census list frame with all nonmatches mailed a census form. Rematches were done once the census form was returned as

was a final scope determination. The CES sample was 18,500 records selected from the initial census list. Only census respondents were recontacted (15,300). There were 100 nonrespondents and about 900 cases where a “truth scope” could not be determined, so the effective sample size was further reduced. The dual system estimator was again used since it was believed that the area frame and the list frame both fail in their attempts to measure the total farm universe. Census farm number used in the calculation took into account the Classification Error Survey results. Significant problems with this evaluation included:

- CES sample sizes were too small to provide state level estimates;
- A “truth scope” could not be determined on 619 area cases;
- Variation in enumeration periods for the June area survey and the census enumeration; and
- Duplication determination was often difficult when data were only partially duplicated across questionnaires.

1992: The 1992 census evaluation process mimicked 1987 program. One major difference was the adoption of the weighted estimator as opposed to the use of Resident Farm Operators (RFOs) only. This greatly increased the number of area frame names that the census received from NASS. An updated file reflecting any farm status changes discovered during the December Area Survey was incorporated. Area frame names were matched to the census list, with nonmatches being mailed a census form. Nonresponses were imputed. The initial CES sample consisted of 21,300 records, but only census respondents were in the final sample (16,800). Search routines were performed to locate duplicates. Possible misclassifications were determined by statisticians with cases in question being recontacted for verification of “truth scope.” The dual system estimator was again used since it was believed that the area frame and the list frame both fail in their attempts to measure the total farm universe. The census farm number used in the calculation of the dual system estimator took into account CES results. Problems associated with the evaluation included:

- Variations in enumeration period for June area and census;
- Duplication determination was often difficult when data were only partially duplicated across questionnaires;
- Classification Error Survey sample sizes were too small to provide state level estimates; and
- A “truth scope” could not be determined on 205 area cases.

It is important to note that for the weighted area estimator, census farm acres were used as opposed to those collected during the June survey. Information about the computation of the adjustment estimate and other details are included in the 1992 Census of Agriculture publication.

Over the years, in most cases: 1) no effort was made to rectify data on duplicated operations; i.e., data were adjusted downward on a sampled record to reflect the fact that it was duplicated; 2) no discussion was given in the historic publications on how “true farm status” was determined in the misclassification studies; 3) list duplication was hard to quantify when data seemed to be only partially duplicated across a set of possible matches; and 4) area to list matching was not as

difficult as detecting list duplication when the question asked was “is the area name on the census list frame?” Additional information and more detail about earlier evaluation programs can be found in the respective Volume 1, Census of Agriculture publication.

1997 Census of Agriculture Coverage Evaluation

Overview: The primary objectives of the census of agriculture were to accurately count U.S. farms, measure commodity production and sales, and measure demographic characteristics of farm operators. According to coverage evaluation results, the past five censuses of agriculture included an average of 92 percent of U.S. farms and 98 percent of agriculture production. Complete enumeration of agricultural operations satisfying the farm definition of \$1,000 or more in agricultural sales was complicated by the variety of arrangements under which farms are operated, the multiplicity of names used for an operation, the number of operations in which an operator participates, and the difficulty in classifying those operations just around the \$1,000 sales range. In the 1997 Census of Agriculture, extensive efforts were made to compile as complete and accurate a list frame as possible, while reducing the duplication and number of non farm operations on the list.

The foundation of the 1997 Census of Agriculture coverage program was two separate surveys, a Not-on-the-Mail List survey. The Not-on-the-Mail List (NML) survey was based on an area frame sample and the Classification Error Survey (CES) was based on samples drawn from the 1997 final census list.

Based on these two surveys, the 1997 coverage evaluation program was designed to measure four components of error in the census farm counts. These components include:

- Undercount due to farms Not-on-the-Mail List (NML);
- Overcount due to farms Duplicated or enumerated more than once (DUP);
- Undercount due to farms Incorrectly Classified as nonfarms (ICU); and
- Overcount due to nonfarms Incorrectly Classified as farms (ICO).

The first component, census list undercount, was by far the largest component of coverage error. Duplication, though occurring far less frequently, can involve larger farms and have a larger impact on acreage and sales estimates. The last two components involve the misclassification of either farms or nonfarms. Misclassification can arise from errors in either reporting or processing the data. Table G - Coverage Estimates, in Volume 1 of the census publication, illustrates the effect of coverage adjustments on census farm counts by demographic characteristics, land in farms, and total value of sales.

The coverage total was defined as the net difference between undercounted and overcounted farms. The adjusted census total was the sum of the census total and the net coverage total. The relative standard error is shown for the final census coverage adjusted number. This number will be similar to the relative standard error for the census number, except when the coverage total was negative or close to zero. The coverage adjustment percentage shows the coverage total as a percentage of total census adjusted farms for that characteristic.

The 1997 Census of Agriculture was the first agriculture census to include all four components of coverage error in Table G. Previous publications only included the coverage error component due to farms not on the census list (NML). Caution, therefore, should be taken when comparing coverage estimates from Table G with previous years. In addition, the coverage total was a negative number for some characteristics. This means that the number of farms overcounted for this characteristic was greater than the number of farms undercounted.

Area Frame Surveys to Measure List Frame Undercoverage: Names and addresses collected in the 1997 June Agricultural Survey and 1997 Fall Area Survey were used to estimate the undercount due to farms not on the census list (NML). These names were matched to the census list frame, and those that did not match were contacted by telephone or person. The enumerator verified whether the operation had reported in the census, and if not, a census of agriculture report form was completed. The percentage of farms missed in the census varies considerably by state. In general, farms not on the census list tended to be small in acreage, production, and sales of agricultural products. Farm operations could be missed for various reasons, including the possibility that the operation started after the census list was developed, the operation may be so small as not to appear in any agriculture-related source lists, or the operation may have been falsely classified as a nonfarm prior to mailout.

Classification Error Survey to Measure Three Types of Coverage Error: The remaining three types of coverage error were measured by the Classification Error Survey. This survey was used to estimate the number of farms counted more than once (DUP), the number of farms misclassified as nonfarms (ICU), and the number of nonfarms misclassified as farms (ICO). A sample of census of agriculture respondents was selected for reinterview to determine their farm/nonfarm status and collect information to identify potential duplication. The farm classification from this inter-view was compared with the classification on the census of agriculture report form. Any differences between these two classifications were reconciled to determine the true farm status. Each operation was reviewed for duplication by matching the additional information received from the re-interview (landlords, tenants, other names, etc.) to the list of census respondents. Potential duplication was reviewed and discrepancies reconciled. In general, the classification error rate was higher for small farms close to the \$1,000 agricultural sales requirement. This rate was also higher for farms with small acreage (less than 49 acres), higher for tenant farms than for full- or part-owner farms, and higher for farms where farming was not the operator's principal occupation.

Coverage Estimation: The adjusted census total, T, was estimated as the census farm count, C, plus undercount and minus overcount adjustments. Undercount includes 1) farms not on the census list (NML) and 2) farms incorrectly classified as nonfarms (ICU). Overcount includes 3) nonfarms incorrectly classified as farms (ICO) and 4) farms duplicated in the census (DUP). Altogether, the adjusted census total is: $T = C + (NML + ICU) - (ICO + DUP)$. In some states, estimates of misclassification of farms owned by operators having rare demographic characteristics were based on particularly small sample sizes. Where such small sample sizes occurred, a form of small area estimation was used in which data from similar states contributed to that state's estimates. In these cases, the coverage totals are weighted totals of the direct state estimate and the direct estimate from the region. Direct estimates were used to the largest extent possible, based on the amount of survey cases available for the particular item being estimated.

Estimated net coverage error, defined as the difference between undercounted and overcounted farms, was included in the Highlights Table of the 1997 Census of Agriculture publication.

Not-on-the-Mail List (NML)

Overview: The Not-on-the-Mail List (NML) survey data were used to estimate coverage error resulting from an incomplete census list. In 1997 Census of Agriculture, NASS's June and Fall area frames were both used to generate the coverage measure. Agricultural (Ag) tracts from the 1997 June Area Frame Survey, as well as those tracts that screened out but indicated Ag potential or unknown Ag potential, were all used. Additionally, Ag-tracts from the 1997 Fall Area Frame Survey were included. Total number of tracts was 62,302 with 38,869 from June and 23,433 from Fall area frame survey. During January, 1998, headquarters personnel used Automatch record linkage to match area frame records to the census list. This was undertaken prior to census data collection. All possible matches were reviewed by headquarters personnel. The NML "pool" after record linkage was 11,630 tracts. These records were to be contacted for the census to see if they were missed farms. In the end, there were 3,777 NML tracts.

Information about coverage adjustments were included in the Volume 1 census publication. Commodity coverage error was not published. In most cases, farm acres from the area survey itself were used in weighing as opposed to census collected acres. Outliers were the only significant problem noted with this approach to estimating census coverage.

The Process: The Not-on-the-Mail List (NML) sample for the 1997 census included agricultural (Ag) tracts from the 1997 June Area Survey (JAS), and tracts that indicated Ag potential or unknown Ag potential. Henceforth, the combination of these two latter groups will be referred to as "potential" tracts). Additionally, Ag tracts from the 1997 Fall Area Survey (FAS) were included. An exception was made for five States, Colorado, Kansas, Oklahoma, Oregon, and Washington, since these five States use the same segments in both the June and Fall surveys. In these States, only the Fall Ag tracts were used; no "potential" tracts were included.

Total number of tracts was 62,302 with 38,869 from June and 23,433 from Fall. Of these, 2,869 were "potential" records, and another 3,253 were records that indicated farm activity but failed to have \$1,000 in sales or points. There were 56,180 true Ag tracts included in the sample.

Additional items asking for whole farm data (e.g., total corn acres were asked on the June form) were added to the area frame questionnaires to aid in determining whether records were on the list. This extra information was extremely useful when secondary sourcing was required. Identification (ID) information on the area frame data files were used to determine which records to extract from ELMO. ELMO, for the purposes of this document, refers to the NASS List Sampling Frame. The files contained 26 records for which did not include name and address information. Hence, these records were given dummy names and addresses and the states involved were asked to "clean" them up during or prior to NML data collection by going back to the area questionnaires to get the names. Additionally, there were approximately 840 records with "inadequate" names sent back to the state offices prior to the matching operation. These consisted of both Ag and "potential" tracts. Examples are operator names such as "House", "Mr. Jones", and "Unknown Operator." The SSOs responded differently. Some names were updated, some were made nonag (i.e., out-of scope), and some went untouched (i.e., they went into the matching operation as "junk").

Automatch software was used to match the area frame records to census list records prior to data collection. The matching process involved five passes through the records; ELMO area to list linkage codes were used in the first pass, SSNs in the second, EINs in the third, names and

addresses in the fourth, and phone numbers in the fifth. As a result, records fell into three groups: matches, possible matches, and nonmatches. Originally, only the possible matches were reviewed (a total of 18,464 area records). A flowchart was designed to aid the process. As with most flowcharts, strict adherence could produce erroneous decisions so the matching process was not perfect and required some subjectivity. Around twenty people reviewed the resolution output with the most difficult determinations being referred to the most experienced people.

Great care had to be taken when looking at records with multiple operations and partnerships. Also, cases where two or more area tracts matched each other required additional coding to insure whatever action was taken on one was taken on the whole group. All partner records associated with a tract were kept in the same link group as the tract operator; thus, all the records associated with a tract and census records matching any of them fell in the same linkage group.

Automatch was performed within each state individually. Census records were selected based on address state with area records selected based on location of their associated segment. All tracts that had operator or partner addresses, that differed from the state in which the tract was located, required that manual matching be done in addition to having them go through Automatch. About 900 tracts that fell into this group.

Census research screens were used for cross state matching. Also, at the end of the process, all area nonmatches which had a NASS list frame identification on them, were checked manually against the census list to see if a match indeed existed. Results from these three operations produced the file of nonmatches, that was to be fed into the Computer Assisted Telephone Interview (CATI) system for data collection. Unique census file numbers were assigned to all 62,302 tracts.

Data Collection and Editing: A total of 11,630 tracts constituted the original NML pool. Thirty-four previously identified multi-tract operators were held out to avoid redundant contacts. There were 11,596 NML records fed into the survey management system for the purpose of collecting Not-on-the-Mail List (NML) data. Personal interviews were encouraged, but a CATI instrument was designed for states to use if desired.

An additional supplemental form was designed for enumerators to use when the respondent claimed to have already completed the census. Furthermore, data collection was coordinated with the Agricultural Resource Management Study since many of the questions on that survey were similar to those on the census. All refusals and inaccessible were secondary sourced from the June or Fall area form.

Data collection for the NML survey was conducted from March 6 to April 30, 1998. The state offices made 1,452 matches prior to or during CATI data collection. Some of these matches were deemed to be invalid and required later review and resolution. Of the remainder, there were 7,226 records deemed to be in-scope with 2,952 out-of-scope.

Collected data were run through the census complex edit which allowed imputation on items which couldn't be secondary sourced. NML records were retained in a separate database from the regular census records. The edit review was performed in headquarters and was completed by the end of May, 1998.

There were 2,457 computer out-of-scope records as a result of the initial edit. After the initial

edit was completed, SSOs may have detected further errors as they reviewed their summaries and data listings. Therefore, they were given access to the NML edited database so that any necessary corrections could be made. Total of 4,774 in-scope NML records in the preliminary summary were sent to the state offices on June 3, 1998. The original indication showed 412,000 NML farms. The summary was rerun several times. Each time, data listings were produced so that states could concentrate on high impact records as well as check for erroneous data. After each summary, additional matching and un-matching was done. Tools used for matching included:

- A FoxPro file containing all the census list frame records,
- Census research screens,
- The Enhanced List Management Operations software, and
- The data warehouse.

Each tool provided a different capability. In addition, within a county, the unduplication module of the complex edit was used to match remaining area records to census records with similar data; this was also done in headquarters. The final summary was run around the first of December, 1998, with the final indication of 294,573 NML farms based on 3,777 area sample NML records. Secondary sourcing was used on 751 of the records (20 percent).

Match Review: The un-matching process (i.e., “match review”) alluded to above was based on two operations: 1) the un-linking of matches to Undeliverable As Addressed (UAA) records and to tag/large farm nonrespondents, and 2) the un-linking of records which failed match verification and subsequent review. There were 321 preliminary matches made to UAA records and 20 to tag/large farm nonrespondents. UAAs are not considered to be on the census list and are not used in nonresponse adjustments. Likewise, all tagged records and large farms were to be secondary sourced if they did not respond and subsequently were also excluded from nonresponse adjustment calculations. Unfortunately, not all were secondary sourced, so there was nonresponse. Neither group of records was being covered by the census nor by the Nonresponse Survey so, by necessity, they had to be covered by the NML Survey. Henceforth, for simplicity, the 341 records will be referred to as just UAAs). Further attempts to match these “new” NML records or to out-of-scope them were made by headquarters statisticians. The residual records were sent to the SSOs who were to match the records, out-of-scope them, or enter data into the NML database for them. Since this operation was taking place in September, 1998, SSOs were encouraged to secondary source the records. In the end, 104 of the 341 records were matched to other records, 50 were out-of-scope, and 187 were classified as NML farms. The impact of the UAAs on the final NML summary was 9,345 farms.

A second group of records was unlinked via match verification process. This step was performed on records which were matched during the record linkage. Basically, it was a computer check that looked at total land, cropland, cattle, hogs, type of organization, and total value of sales. Variations between JAS/FAS data and census data were scored; records with scores indicating large variations were then flagged for additional verification. Approximately 55 percent of the records matched by the Automatch software passed the machine check with 25 percent failing.

The remaining 20 percent were matched to census nonrespondents, so they went through no verification. In the final summary, only 47 tracts were reinstated as NML records due to match verification failure. Nine more records were deemed non-matches but were out-of-scope. The impact on the final NML summary due to reinstated records was minor with only 2,243 farms being added on.

The match verification process was very time consuming. As part of the operation, a FoxPro database was developed to hold both census data and NML data, so that all the data for the records in a match group could be viewed simultaneously. A match group included all records brought together by Automatch, as well as any manually matched records. The database was continuously updated as changes were made in the NML data or Census data.

Dual Estimation: In the beginning of the survey, the dual system estimator was going to be used to summarize the NML (see the 1992 Census of Agriculture Coverage Evaluation publication for details). This estimator required that the final scope of the census list record that was matched to each area farm record be known:

$$\text{NML} = (\text{Area farms not matched}) \times (\text{Census farms adjusted for Classification Error Survey} / \text{Area farms matched to census farms}).$$

Around mid-July of 1998, it was decided to use the NASS non-overlap estimator instead. The advantage of the change was that the non-overlap estimator was consistent with that used in other NASS programs. It was also much less complicated to calculate and could be produced in a more timely manner. It also reduced the amount of tracking needed for matched records since the dual system estimator required that the final scope of any matching list record be known. This process would require tracing any linkages that might exist among the census matched records and other census list records. Additionally, the indication from the dual system estimator could only be calculated after adjustments from the Classification Error Survey (CES) had been made and once all scoping of census records had ceased. Its main benefit was that it adjusted for the fact that the area frame farm expansion never quite equals the census farm count, particularly for small farms.

For NML estimation, farm acres used in computing the tract acres to farm acres weight was not necessarily that used in the area survey. The area frame data were used, if the respondent was the operator, spouse, or bookkeeper. Otherwise, farm acres from the census were used. If this resulted in a weight greater than 1, then the area frame farm acres were used regardless of respondent. For the “potential” tracts, census farm acres were used since area farm acres weren’t available. If a “potential” record’s weight exceeded 1, then it was set to 1.

Conclusions and Observations: There were 62,302 records going into the Not-on-the Mail List (NML) Survey with 3,777 left in the final NML count. The original total included 2,869 “potential” tracts based on the screening questions and 3,253 Ag places with less than \$1,000 in sales and points. In the end, 78 of the 2,869 “potential” tracts were NML as were 363 of the 3,253 Ag places.

The NML expansion coming from these two groups was 5,780 for “potentials” and 34,915 for Ag places. Together they accounted for almost 13.8 percent of total NML. Overall, the not-on-the-mail list expansion for farms with less than \$1,000 in sales was 136,921 (46.5 percent of total NML farm count).

A total of 234 NML tracts reported more than \$100,000 in sales on the area surveys (NML expansion of 5,011 farms). The largest group of NML tracts (1,345) came from area tracts in the \$1,000 to \$2,499 sales group. About half of these area tracts were in the group via points that were assigned during the area survey as opposed to reported sales.

During the NML Survey, there were 59 area tracts that reported the operator as deceased with no referral. These were made out-of-scope with no data collected. There should have been additional follow up by SSOs to get the “new” operator’s name 1) for matching purposes or 2) for collecting 1997 data even if for only a partial year. These farms were operating in 1997, so there should have been associated data, possibly being reported by a different individual on the census list.

An effort was made to track the matching process. When records were deemed to be out-of-scope, it was not necessary to match them to the census list. The table below provides matching details. Some out-of-scope records may have actually been matches to census records, but since whether or not they were matches was irrelevant, they were not pursued.

Table 7-1. Count of Matched Records by Source, 1997

Source of Match	Count of Records
Automatch	50,019
SSO match prior to/during CATI data collection	1,299
SSO match after CATI data collection	1,137
Matches by Frame Development Section	212
Matches by National Processing Center	349
Out-of-scope records not matched	5,509
Matches to UAAs which were counted as NML (i.e., non-matches)	187

During census list development some active records from NASS’s name and address lists were lost during duplication removal. These records were subsequently identified and sent back to the state offices, to see if any should be added back. The effort put forth on resolving these cases varied by state. In the final NML summary, 21 of the NML cases were on these files but were left unmatched since their matching ELMO record had never been added back to the census list. Their associated NML expansion, however, amounted to only 675 farms. There were also 125,570 screener records removed from the census list prior to its finalization. There were 48 matches to these records. Again, since the “screen outs” were not on the final census list, any matches to them were considered to be NML. The NML expansion for these was 4,106 farms.

The 48 NML records that matched the screener records provided a basis for evaluating the screener. Two of the matching records were reported as “Nonag tracts with potential” on the June Area Survey. Therefore, not only did the screener form out-of-scope them, but also the ongoing NASS survey considered them nonfarms. The first record had horses only, and the second had sold cattle during the year but currently had none. An attempt was made to classify the remaining records based on the data they reported on the NML form. Of the remaining

records, 12 were CRP only farms. Another 7 had cattle only; 4 had hay only with perhaps CRP acres; 6 had cattle and hay; 7 had cattle and some other commodity; 4 had horses only (excluding the 1 above mentioned record); 1 had sheep only; and 5 had field crops only. Obviously, the largest problems involved cattle (20 records) and CRP acres (15 total records). Of the 48 records, 18 showed no sales, but 3 had TVP greater than \$10,000. The largest two reported crops and cattle with the third record reporting only cattle. The average age of these NML operators was 60.5 years compared to 54.3 for the census and 51.8 for the entire group of NML records. The average operator's age on the CRP only records was 66.8 years. The overall farm size for the 48 records was 184.3 acres, but for the CRP only records, it was 415.1 acres. Also, 17 listed their principal occupation as farming. It's not clear why the non CRP farms screened out unless it was a way to avoid getting additional mail or contacts. As an added note, two of the 48 NML records matching screeners were inaccessible on the area survey (i.e., estimated for) and then subsequently secondary sourced on the NML Survey (again estimated for). In other words, two of the records might not even be farms.

Not-on-the-mail list operations that reported more than \$40,000 in TVP on the area surveys were reexamined to see if there was a pattern as to why they were missed. Approximately 650 records were researched by checking them against ELMO to see what could be learned; 170 were found on ELMO in some form. To summarize: 1) 18 had been added to ELMO during census data collection but were not added to the census list; 2) 4 matched "Ag business only" records; 3) 6 were added to ELMO too late for census (i.e., late 1998 or early 1999); 4) 6 matches were "lost" during the census list development's duplication removal; 5) 18 could be possible matches to the census list but would require a recontact to verify; 6) 78 dealt with partnerships where the area frame respondent indicated an individual operation with only his/her name which subsequently couldn't be matched to the census list; and 7) 40 matched inactive ELMO records. Fifteen of these 40 inactive records appeared to have been dropped without a follow up question on "what happened to the operation?" or, in the case of dissolved operations, "are any of the individuals still farming?". Examples of situations are: 1) partners who are dropped from partnerships (doesn't appear that they are always being asked if they will be farming individually), 2) retired individuals whose kin have taken over, and 3) operations where the operator was deceased. Four of 40 matched inactive records had codes indicating that they were possible farms awaiting criteria work. There were also 3 farms (subsequently NML) reported in the area frame by a farm management service firm with none of these records being found on ELMO.

Secondary sourcing of data was used for refusals and inaccessible cases. The 3,777 NML records can be broken up into four groups: 1) 3,026 records (80 percent) were enumerated (no secondary sourcing); 2) 517 records were secondary sourced during original data collection; 3) 187 UAA cases were mostly secondary sourced due to timing (September-October of 1998); and 4) 47 match verification failures were mostly secondary sourced due to timing (September-October of 1998). Data for the most part came from the area forms. The complex edit imputed other missing items as needed.

Not-on-the-mail list records, for most data items, seemed to be similar to their counterparts in the census. Several tables are presented which highlight some of the differences. The area frame itself was stratified on land usage. Since not all the variables being estimated are really associated with land usage, expanded and unexpanded percentages are shown.

Table 7.2 shows differences in age of the operator. The NML tended to be skewed toward younger farmers although there weren't large differences.

**Table 7-2. Operators by Age Group, Percent Comparison of
Census Records to Not-on-the-Mail List Records, 1997**

Operators by Age Group	Census Percentages	Expanded NML Percentages	Unexpanded NML Percentages
Less than 25 years	1.1	1.0	1.2
25 to 34	6.7	10.6	8.3
35 to 44	19.4	22.5	23.5
45 to 49	12.2	14.0	14.0
50 to 54	12.2	14.2	15.8
55 to 59	11.7	8.9	9.1
60 to 64	10.7	7.9	7.8
65 to 69	9.4	7.4	7.3
More than 69 years	16.6	13.5	13.0

A disproportionate amount of nonwhite operators and female operators were missed by the census. Also, farms smaller than 50 acres were missed disproportionately as were those with less than \$2,500 in sales. When the various commodities were examined, farms with horses and those with layers seem to be the ones that stood out as the most likely to be missed. As an added note, about 10 percent of the NML expansion came from records having only horses, and close to 7 percent of the NML records themselves had only horses. The following tables display some of these data.

**Table 7-3. Selected Operator and Operation Characteristics, Percent Comparison of
Census Records to Not-on-the-Mail List Records, 1997**

Characteristic	Census Percentages	Expanded NML Percentages	Unexpanded NML Percentages
Females	8.6	14.9	13.1
Males	91.4	85.1	86.9
Black and other races	2.5	4.6	4.4
White	97.5	95.4	95.6
Has horses	19.6	39.3	34.9
Has layers and pullets 13 weeks and older	3.8	7.7	6.3
Has pullet chicks and pullets less than 13 weeks old	0.3	1.2	0.6

Table 7-4. Selected Operator and Operation Characteristics, Combined Totals of Census and Not-on-the-Mail List (NML), and Percent Contributed from NML Records, 1997

Characteristic	Total of Census and NML	Percent of Total from NML
Females	208,945	21.0
Males	1,997,487	12.6
Black and other races	61,244	22.2
White	2,145,188	13.1
Has horses	491,114	23.6
Has layers and pullets 13 weeks and older	95,221	23.7
Has pullet chicks and pullets less than 13 weeks old	7,393	30.7
Total farms	2,206,432	13.4

Table 7-5. Acres-in-Place and Total Sales, Percent Comparison of Census Records to Not-on-the-Mail List Records, 1997

Characteristic	Census Percentages	Expanded NML Percentages	Unexpanded NML Percentages
Less than 10 acres	8.0	18.2	14.2
10 to 49	21.5	43.7	35.8
50 to 179	31.0	17.1	26.5
More than 179 acres	39.5	21.0	23.5
Less than \$2,500 in sales	26.0	65.5	56.4
\$2,500 to \$9,999	24.4	21.3	20.8
More than \$9,999	49.6	13.2	22.8

Table 7-6. Acres-in-Place and Total Sales, Combined Totals of Census and Not-on-the-Mail List (NML), and Percent Contributed from NML Records, 1997

Characteristic	Total of Census and NML	Percent of Total from NML
Less than 10 acres	207,050	25.9
10 to 49	539,608	23.9
50 to 179	673,298	11.9
More than 179 acres	786,476	4.1
Less than \$2,500 in sales	689,512	28.0
\$2,500 to \$9,999	529,268	11.9
More than \$9,999	987,652	3.9
Total farms	2,206,432	13.4

Classification Error Survey

Overview: The Census Classification Error Survey (CES) consisted of three components: 1) undercounted farms due to misclassification, 2) overcounted farms due to misclassification, and 3) overcounted farms due to duplication. In 1997, there were two goals set for the CES: 1) provide final survey indications by December 1, 1998, and 2) provide state level commodity indications.

It was a reinterview of a sample of 1997 Census of Agriculture respondents using a unique shorter report form. The CES instrument gathered details on additional persons involved with the place, such as spouse, partners, landlords, and tenants. The information was used in the post-survey record linkage to measure duplication in the census list.

Data were also collected on major crop and livestock commodities in the CES instrument. These data were used to calculate a CES scope for the place. It was also designed to include probing questions to gather more information to help determine the true farm status of the operation and to identify duplication. Every reasonable attempt was made to classify each CES respondent as a farm or a nonfarm following the interview. The resulting farm status data were compared to the census farm status to identify cases which were incorrectly classified in the census. All questionable error cases were reviewed to determine the correct respondent classification.

NASS's SSOs were responsible for every aspect of the CES. The SSOs handled the mailing of paper questionnaires (including second requests), checking in the returned questionnaires, capturing all data from paper using the Computer Assisted Telephone Interview (CATI) instrument, using the Blaise Interactive Edit (IE) to clean up all cases, and outputting various types of data to meet scheduled due dates.

The Process: Historically, the CES was designed with the idea that it would be used for measuring the error in farm numbers. Commodity data were estimated at the national level for CES undercounted farms only. In 1997, CES was designed to yield state level error measurements for commodities for both overcounts and undercounts.

The sample size in 1992 was 21,299 with sample rates ranging from 1 in 125 to 1 in 140. Sampling was at the regional level. The initial sample was drawn prior to census response; nonrespondents to the census were ineligible for the CES. This reduced the available sample to 16,804 records. CES nonresponse further reduced the effective sample size to 14,598. For 1997, however, the sample size was substantially increased. The design mirrored the segment allocation used in designing NASS's June and Fall Area Surveys. The reason was that area segments had been allocated to the state offices based on the importance of various commodities and this was deemed a logical approach to follow with the Classification Error Survey.

Sampling was at the state level. Consideration was given to stratifying records prior to selection for the CES. Variables considered were type of operation (e.g., partnership) and total value of sales. Stratification was dropped because of 1) the lack of data for the stratification variables (i.e., unknown values) and 2) the marginal benefits that would be gained for the added complexities. Operations with Total Value of Product (TVP) greater than \$500,000, abnormals, multi-units, and operations in Alaska and Hawaii were excluded from the CES. Tagged records in 1997 were also excluded. The final 1997 sample size was 37,084.

Because of census nonresponse, the sample was reduced to 30,775. Given the CES nonresponse, the effective sample size was further reduced to 26,119 cases. NASS's state offices handled all processing, except initial duplication searches and the final edit of undercounted data. State office activities, therefore, included mailout and follow-up mailout cases that could not be reached by telephone, telephone calls to all cases with telephone numbers, check-in of completed cases, data entry and "truth scoping." In addition, the state offices recontacted, as necessary, respondents to resolve questionable scope determinations.

Two processes were accomplished within the CES; measurement of misclassification, and measurement of list duplication. Misclassification determination was made first since only Classification Error Survey sample units that were truly in-scope needed to be checked for duplication. Data were collected via CATI and mail with some personal interview. The data were used to:

- Determine scope,
- Provide data for undercounted farms, and
- Provide data that could be used in identifying duplication.

All data collected outside of CATI were keyed into the Blaise system for editing and initial scope determination.

Editing of Survey Data: There were minimal edits on the data with its main focus being for scope determination. The only records requiring a detailed edit were the undercounted records since the Classification Error Survey data would serve as a proxy for the census data. Total Value of Product (TVP) data which was collected as a categorical value, was converted to an

actual value by using class medians based on values reported on the main census. Edits were performed on all the data using the Blaise software, with an additional manual edit done on all the undercount data. For the manual edit, the SAS data set from CATI information was printed out, and then the relationships among variables visually checked for reasonableness by headquarters statisticians. Data were changed as needed. Fourteen undercount records were reset to “non-errors” during data review. Missing values were hand imputed. Total Value Product (TVP) was imputed based on commodities reported, and yields were imputed based on state averages reported on the census. Categorical variables were imputed based on historic data, the individual’s name (e.g., gender might be based on the label name), and other CES reports.

Respondents had noticeable trouble on reporting cattle; they tended to report everything as beef cows (i.e., no other cattle besides cows). Corrections were made using SAS FSEDIT. The summary system itself had additional edits added so as to catch obvious data omissions (e.g., harvested acres and no production). No recontacts were made to correct any of the undercount data. Secondary sourcing was not permitted for the CES data, since it might have led to an erroneous decision on a record’s scope. However, call backs to determine a record’s true scope were encouraged.

Duplication Search: To aid in the duplication search, the Classification Error Survey questionnaire asked the respondent to provide names for landlords, spouse, tenants, and other people associated with the operation. They were additionally asked for any operation name and any old address used.

All of the names were fed into the Automatch software - a record linkage processing system, along with census list respondents, excluding those in the groups noted above. Linkage was run at the state level based on Census Processing Order Codes (CPOC). There were five passes made through the records. Social Security Numbers (SSNs) were used in the first pass, Employer Identification Numbers (EINs) in the second, names and addresses in the third, phone numbers in the fourth, and Enhanced List Management Operation (ELMO) linkage codes in the fifth. Records fell into three groups: matches, possible matches, and nonmatches. The possible matches were reviewed (approximately 9,600 link groups).

A flowchart was designed to aid the process. As with most flowcharts, strict adherence could produce erroneous decisions so the matching process was not perfect and required some subjectivity. Six control data items were included for viewing in Automatch. All the associated data for the potential matches were also populated into a FoxPro file so that a complete data comparison could be made if necessary. Approximately seventeen people in headquarters reviewed the resolution output with the most difficult determinations being referred to the most experienced people or to the SSOs as needed. All records that had a partnership or multiple operations associated with them were reviewed to insure that the correct decision was made on the duplication issue. Cross-state operations were further checked using Employer Identification Number (EIN), Social Security Number (SSN), List Survey Frame Identification (LSFID), and a phone number look-up on the FoxPro database created for the census list.

Conflicting goals made determining list duplication a difficult process. The first goal was to determine overcounted farms due to duplication, and the second goal was to measure overcounted commodities due to duplication. The problem arose when it was obvious that you were dealing with the same operation, but commodity data were only partially duplicated. If the operation was classified as a duplicate, then part of the commodity data would be lost. If it was

not classified as a duplicate, then the error in farm count would be ignored. Operations already linked as duplicates by the census process, were not considered duplicates for CES purposes. Also, a number of duplicates were determined during CES data collection as opposed to Automatch.

Scope Determination: Scope determination was made by the Blaise instrument based on the CATI data. The SSOs were then to review all reports where the CES and census scope were in conflict. Headquarters statisticians reviewed the scope determinations submitted by the states, and in many cases, requested the state office recontact respondents or further review of the data to ensure proper scope determination.

Final scope determination was based on census data, CES data, NASS survey data, and ELMO data. Every effort was made to ensure that the correct “truth scope” was determined. In particular, census linkage codes were traced to insure that seemingly classification errors were actually “non-errors.” For example, a CES in-scope record may have been out-of-scope on the census with the census record linked to another in-scope census record. In this case, there would be no error if the linkages were applied correctly. Occasionally, the linkage codes themselves were in error; in some of these cases, a thorough examination of the records involved reversed earlier decisions. Determining “truth scope” on records that were close to the \$1000 definition was a problem. Over 20 percent of error records had a Total Value of Product (TVP) under \$1,000 with over a third having TVP under \$2,500. In many cases, there was a tendency not to classify a record as an error if it was around the \$1,000 definition (i.e., to retain census scope whatever, it might have been).

Conclusions and Observations: The following table shows a cross classification of the three types of errors with TVP.

Table 7-7. Classification Error Type by Total Value of Product (TVP) Group , 1997

Type	TVP								Total
	None	\$1 to \$999	\$1,000 to \$2,499	\$2,500 to \$9,999	\$10,000 to \$24,999	\$25,000 to \$49,999	\$50,000 to \$99,999	\$100,000 Plus	
Duplicate	21	13	23	62	51	29	34	77	310
Overcount	79	44	73	150	79	40	28	32	525
Undercount	106	87	153	195	98	53	45	37	774
Total	206	144	249	407	228	122	107	146	1,609

Some of the cases where TVP exceeded \$99,999 were examined to see what could be learned. Observations could only be based on data files since the forms themselves were not available. There were 32 overcounts looked at in detail and 37 undercounts. In 10 of the 32 overcount cases, it appeared that the final scope determined by the Classification Error Survey (CES) might not have been correct. However, there was no way to know without recontacting the sampled units. Of the 37 large undercounts, 20 were active ELMO records with current control data. Should these records have been flagged in the edit for review (i.e., large TVP, current control data, yet out-of-scope)? Additionally, four of these undercounts had been correctly scoped originally, but were erroneously made out-of-scope during analytic review. Another three were

linked to other out-of-scope records which raises the question of whether all the duplicates within a group were erroneously out-of-scoped when one should have been kept.

Table 7.8 shows cross tabulations of rental arrangements by type of error. The shaded boxes highlight where the CES and the final census data were in agreement. About two-thirds of the duplicates showed a landlord/tenant relationship on at least one of the data files. Of the overcounts, 197 cases showed that they were landlords on the census with enough data to qualify as a farm. However, on the CES, there were 170 of these that “screened out” as nonfarms prior to any CES data being collected. There were 67 records that showed land rented from others on the census that were determined to be out-of-scope (O/S) on the CES with 59 of these “screening out.”

Table 7-8. Comparison of Reported CES Landlord/Tenant Data to Corresponding Census Data by Type of Error, 1997

CES Reported Data	Census Reported Data				
	Census Landlord	Census Tenant	Census Landlord and Tenant	Neither	Total
Duplicate	28	122	14	146	310
CES Landlord	16	1	3	5	25
CES Tenant	1	101	4	21	127
CES Landlord and Tenant	1	1	4	2	8
Neither	6	10	2	101	119
No CES data	4	9	1	17	31
Overcount	178	48	19	280	525
CES Landlord	19	1	1	23	44
CES Tenant	0	2	0	0	2
CES Landlord and Tenant	0	0	1	0	1
Neither	6	3	0	41	50
No CES data	153	42	17	216	428
Undercount	0	0	0	774	774
CES Landlord	0	0	0	120	120
CES Tenant	0	0	0	170	170
CES Landlord and Tenant	0	0	0	21	21
Neither	0	0	0	463	463

Another way to look at the landlord/tenant issue is to look at tenure which strictly classifies an operation as being operated by a full owner, part owner, or full tenant. This variable does not address whether an operator was a landlord or not. Table 7.9 shows Classification Error Survey (CES) errors by tenure. Not surprising was the duplication problem with part owners and tenants. Note that 181 of the 461 full owners that were identified as overcounts were landlords (based on census data).

Table 7-9. CES Errors by Tenure, Percent and Total, 1997

Source	Tenure						Total
	Full Owners		Part Owners		Tenants		
	Total	Percent	Total	Percent	Total	Percent	
Duplicate	174	56.1	89	28.7	47	15.2	310
Overcount	461	87.8	33	6.3	31	5.9	525
Undercount	588	76.0	122	15.8	64	8.3	774
CES	1,223	76.0	244	15.2	142	8.8	1,609
Census	1,146,891	60.0	573,839	30.0	191,129	10.0	1,911,859

Tenure was further looked at in regard to cattle, but no unusual relationships seemed to be readily evident.

Table 7-10. CES Errors by Tenure and Presence of Cattle, Percent and Total, 1997

Source	Tenure and Cattle Presence						Total
	Full Owners		Part Owners		Tenants		
	Total	Percent	Total	Percent	Total	Percent	
Duplicate	174	56.1	89	28.7	47	15.2	310
No cattle	71	58.2	31	25.4	20	16.4	122
Positive Cattle	103	54.8	58	30.9	27	14.4	188
Overcount	461	87.8	33	6.3	31	5.9	525
No cattle	302	88.8	18	5.3	20	5.9	340
Positive cattle	159	85.9	15	8.1	11	5.9	185
Undercount	588	76.0	122	15.8	64	8.3	774
No cattle	326	79.9	47	11.5	35	8.6	408
Positive cattle	262	71.6	75	20.5	29	7.9	366
CES	1,223	76.0	244	15.2	142	8.8	1,609

The CES error cases seem to be influenced by the age of the respondent. The following table follows shows responses to the census by age of operator as well as showing age breaks for CES error cases. When compared with the main census, it seemed that a disproportionate number of duplicates were associated with younger individuals while a disproportionate number of overcounts seemed to be associated with older individuals. The average age published on the census was 54.3; for the CES, the averages were 54.2 for duplicates, 60.6 for overcounts, and 56.0 for undercounts.

Table 7-11. CES Errors by Age of Operator, 1997

Age of Operator as Reported on CES and Census									
Source	34 or younger		35 to 49		50 to 69		70 or older		Total
	Total	Percent	Total	Percent	Total	Percent	Total	Percent	
Duplicate	32	10.3	93	30.0	126	40.6	59	19.0	310
Overcount	21	4.0	110	21.0	212	40.4	182	34.7	525
Undercount	53	6.8	211	27.3	354	45.7	156	20.2	774
CES	106	6.6	414	25.7	692	43.0	397	24.7	1,609
Census	149,305	7.8	604,287	31.6	841,096	44.0	317,171	16.6	1,911,859

When one looks at type of organization, it appears that the partnerships and corporations are disproportionately causing the most problems with duplication (see Table 7-12).

Table 7-12. CES Errors by Type of Organization, 1997

Type of Organization									
Source	Individual		Partnership		Corporation		Other		Total
	Total	Percent	Total	Percent	Total	Percent	Total	Percent	
Duplicate	211	68.1	69	22.3	27	8.7	3	1.0	310
Overcount	457	87.0	47	9.0	17	3.2	4	0.8	525
Undercount	717	92.6	39.0	5.0	14	1.8	4	0.5	774
CES	1,385	86.1	155	9.6	58	3.6	11	0.7	1,609
Census	1,643,424	86.0	169,462	8.6	84,002	4.4	14,971	0.8	1,911,859

Race did not seem to be a contributing factor to CES error. However, it should be noted that the expansion factors associated with the errors on operations farmed by minorities made that data unusable at the state level. To illustrate: one error on an operation farmed by a minority might expand to 175 records for a given state, yet there might only be 100 minority farms in the state.

Table 7-13. CES Errors by Race of Operator, 1997

Race of Operator					
Source	White		Other Races		Total
	Total	Percent	Total	Percent	
Duplicate	304	98.1	6	1.9	310
Overcount	506	96.4	19	3.6	525
Undercount	758	97.9	16	2.1	774
CES	1,568	97.5	41	2.5	1,609
Census	1,864,201	97.5	47,658	2.5	1,911,859

The next table shows the error records by occupation of the operator. Duplication problems were much higher on those people who stated that farming was their major occupation. More problems with undercounts and “pure” overcounts occurred on the records where the operators did not report their occupation as being farming.

Table 7-14. CES Errors by Occupation of Operator, 1997

Occupation of Operator as Reported on CES and Census					
Source	Farming		Other		Total
	Total	Percent	Total	Percent	
Duplicate	176	56.8	134	43.2	310
Overcount	208	39.6	317	60.4	525
Undercount	285	36.8	489	63.2	774
CES	669	41.6	940	58.4	1,609
Census	961,560	50.3	950,299	49.7	1,911,859

If a respondent answered all “no’s” to the CES screening questions, then there were eight additional questions asked to help determine why the CES case was out-of-scope. Table 7-15 shows the summary of these responses. The questions are worded verbatim in the table (note: some improvement in the wording should be implemented if these types of questions are used in the future). There were 437 responses to this set of questions. Multiple responses of “yes” were allowed.

There were 62 operations that were tabulated with over \$50,000 TVP on the census but yet answered all “no’s” to the CES screening questions. Note that only 29 of these 62 records actually reported \$50,000+ in TVP with the remainder of the data coming from edit/imputation/data review. Of the 437, there were 180 with TVP = 0 on the “keyed” data file and another 36 with \$1 < TVP < \$1,000. During census processing, the TVP was raised to \$1,000+ on 134 of these records.

Additionally, 123 of the 437 showed land as zero on the census “keyed” file but were given acreage during the edit/imputation/review process.

An attempt was made to examine in detail the 29 records that reported TVP>\$50,000. Unfortunately, only 25 SSOs transmitted requested files to headquarters during and following CES processing. As a result, only 20 records could be effectively reviewed. In four cases, it appears that the final scope established by the CES may have been wrong. In nine of the cases, the respondent indicated that all land was rented out on the census form but completed detailed questions anyway. During census processing, these were made farms; the CES then determined these to be nonfarms. In eight of these cases, however, there were government payments on the census form so it was unclear what the “truth scope” should be. From this, it appears to be a problem in establishing the “truth scope” when land was rented out but government payments are positive. In two cases, it appears that there were deceitful answers given on either the CES or census. In the first case, a form was completed for a nursery but on the recontact, the respondent said that he went out of business several years ago. The other said that he went out of business in 1994 on the CES but yet had completed a detailed census form.

Table 7-15. Classification Error Survey Errors by TVP, 1997

Question	"Yes" Responses						Total Response
	TVP level reported on Census						
	None	\$1 to \$999	\$1,000 to \$4,999	\$5,000 to \$9,999	\$10,000 to \$49,999	\$50,000 or more	
Was all of your land removed from agricultural production before January 1, 1997?	19	18	44	27	35	20	163
During 1997, did you rent your land for agricultural production?	24	17	69	37	75	37	259
During 1997, did you participate as a partner, investor, or corporate member of a farm or ranch operated by someone else?	3	0	5	3	3	6	20
Did you retire from farming or ranching before January 1, 1997?	39	20	66	40	63	32	260
Are you no longer involved in an agricultural operation?	28	19	64	31	47	31	220
Was the farm or ranch sold before January 1, 1997?	4	3	14	7	6	7	41
During 1997, did you participate in agricultural activities other than agriculture production such as farm supplier, feed mill operator, provider of custom work, farm market operator, etc?	0	1	2	1	0	2	6
Is there any other reason you were not involved in agriculture during 1997?	21	6	44	19	24	23	137

Other Observations

There were instances where the original census record for a Classification Error Survey (CES) case had been scoped correctly but was then changed to an incorrect scope during processing (i.e., edit, analytic review, etc.). This occurred on 27 undercount cases, 29 overcount cases, and 2 of the duplicates. This was determined by looking at the changes in a record's status across time. The census retains up to four check-in codes for each record which allows for this type of analysis.

The total number of overcount records was 835 with 310 of those coming from duplicates. Of the 525 not coming from duplicates, 197 showed land rented to others (38 percent) on the final census data file. Of these, seven had the same value for land rented to others and land rented from others. There were 3,226 such occurrences in the entire census. Although possible, it seems strange to have land rented from others equal to land rented to others. There appears to be a large number of classification error cases revolving around landlord/tenant relationships.

A problem existed in correctly counting farms where all land was rented out, but government payments exceed \$999. As a related issue, census processing seemed to convert rented out land to land operated in many cases due to the respondent completing detailed information in the crop's section of the form.

Of the 774 undercounts, 13 were nursery, Christmas tree, or horticulture operations. There were 100 farms with equine and 245 with hay.

Secondary source census data were on four of the duplicates and six of the overcounts. If these records had been contacted, as opposed to estimated, perhaps they would not have been error cases. Future evaluations should attempt to target at least a group of these types of records in an effort to assess the secondary sourcing process.

Response rates for CES ranged from 73 percent to 96 percent with an average of 86 percent.

For the 310 duplication errors: 1) 299 matched one other census record, 2) 9 matched two other records, and 3) 2 matched four other records. Duplications to records that were excluded from the CES sampled population had to be handled with care so that the correct duplication factor was applied. There were 18 occurrences in the CES.

There were 28 overcount cases that reported over \$1,000+ in government payments on the census but none on the CES. Similarly, there were 10 overcount cases reporting 10,000+ broilers sold on the census but were deemed out-of-scope on CES.

There were 1) 60 CES overcount cases with land operated and TVP both equal to zero on the keyed census data file; and 2) an additional 260 cases with one of the two variables zero on the keyed file. These 320 records became in-scope during census processing with the CES subsequently identifying them as overcount errors. For the undercounts, there were 97 records with one or both of the two variables equal to zero on the keyed census data file; even though the census out-of-scoped these, the CES later identified them as farms or undercount errors.

Classification and searches for duplications could not be done until the possibility of new adds to the census list frame was halted, and all analytic review completed. This put time lines on a tight schedule.

Original census forms were needed as an aid in final CES scoping. These were not available for census out-of-scope cases in 1997 which made undercount decision making more difficult. For 2002, all forms should be scanned since even the information on out-of-scope forms may be needed later.

Geo-transfers (i.e., state of operation different from state originally identified for the operation) for CES error cases complicated the summarization of the data.

Due to outliers (high and low) at the state level, it was necessary for the 1997 census to smooth the combined Not-on-the-Mail List (NML) and Classification Error Survey (CES) coverage indications across states. Although a methodical approach was used, some of the directions taken were subjective and nonrepeatable. Given high expansion factors and the existence of rare items, demographic and commodity estimation becomes questionable unless U.S. level indications were smoothed across states.

It was necessary to follow census linkage codes to insure that proper adjustments were applied for the possible CES errors that were uncovered.

From reading respondent comments, it was apparent that many thought that “enough was enough” and did not wish to be bothered further with the CES.

In future censuses, we need to:

1. Rectify data on duplication cases so that only “duplicated” data will be adjusted as opposed to all data on the error forms. Historically, the CES focused solely on coverage error and not response error.
2. Search for duplicates across state lines (i.e., not be limited to the state where the record was sampled).
3. Collect data from respondents that a) might not consider themselves to be farms (e.g., Conservation Reserve Program only or nurseries) and b) were only in business during the first part of the census year.
4. Take care to avoid a) classifying a landlord only as an operator b) editing/imputing data that creates farms from nonfarms, and c) improperly scoping point farm cases with points being in the neighborhood of \$1,000 (small differences in response can reverse the scope of an operation).
5. Use historical data during the edit to aid in reducing undercount cases; i.e., flag records that are being out-of-scoped but have current year control data present.
6. Check for circular linkage; ie., if a group of records are all being out-of-scoped as duplicates to one another, the group should be flagged so that a final determination can be made as to whether one of the group should be in-scope or not; and

7. Ensure that NASS State Statistical Offices transmit all Computer Assisted Telephone Interview files to headquarters since the availability of those data are essential for evaluating the processes. This was not done during the 1997 census for the CES.

Final Comments

One of the major goals of the census was to include all farms without duplicating any; at the same time, nonfarms should be excluded from the count. Of course, this goal was never met resulting in "coverage" error. Historically, one of the tools used to assess this error has been the Classification Error Survey (CES). During this survey, respondents were recontacted and reinterviewed to see if their farm 1) was accurately determined during the census, and 2) was duplicated on another form.

The CES form added questions beyond those asked on the census in an effort to arrive at truth and address the two previously discussed concerns. Specifically, a set of screening questions was used to lead into the CES form with the idea that they could arrive at true farm status better than the census form itself. The main purpose of the screening questions on the Face Page was to determine if the sampled unit qualifies to report for the survey items of interest being collected and whether or not the target name sampled was a member of the target population. The addition of these same screening questions on the census form may prevent (or at least attempt to minimize) coverage error as opposed to measuring it.

In order to identify possible duplication, the CES asked respondents to provide the names of any landlords, tenants, or partners as well as that of their spouse. Also, they were asked if their operation had any name other than that on the label. This approach needs to be incorporated into the census itself to help identify duplication (list to list and area to list). These additional names could help to not only reduce list duplication but also to better identify overlap between the area frame and the census list. Wording should be such that only names and data are collected for individuals truly associated with day to day decision making; i.e., names of individuals who occasionally offer input in the decision making process should not be included. The goal to better cover the contributions of spouses in farming operations should not cloud "truth" by over quantifying that contribution. A second advantage of this approach could be that a respondent who has multiple operations will know exactly which operation was being asked about when he/she sees the form with the partner names. The respondent would also be more likely to realize that data for the entire partnership was to be reported as opposed to just his/her portion of the operation. In late 2002, there were on ELMO about 180,000 operations with 2 or more operators associated with them.

Chapter 8. 1998 Puerto Rico Census of Agriculture

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Introduction

Historical Background: The U.S. 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 1992 censuses, the Census Bureau assigned the Agriculture Division 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 area sample farms, and field and telephone follow-up of nonresponse cases. However, this practice changed for the 1998 census. By virtue of the 1997 Appropriations Act, the responsibility for conducting the census of agriculture was transferred from the Commerce Department, Bureau of the Census, to the U.S. Department of Agriculture (USDA), National Agricultural Statistics Service (NASS). Thus, the 1998 Census of Agriculture for Puerto Rico was the first census conducted by NASS.

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 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. Also, to estimate damages to crops and livestock due to hurricanes,

drought, and other natural disasters.

- 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: The census of agriculture is required by law under the “Census of Agriculture Act of 1997,” Public Law 105-113 (Title 7, United States Code, Section 2204g). The law directs the Secretary of Agriculture to conduct a census of agriculture in 1998 and in every fifth year thereafter, covering the prior year. The census of agriculture includes each State, Puerto Rico, Guam, the U.S. Virgin Islands, and the Commonwealth of Northern Mariana Islands.

The census data for Puerto Rico were collected in accordance with a Memorandum of Agreement approved by the Administrator of NASS and the Puerto Rico Planning Board President. The census was conducted with the cooperation and assistance of the Puerto Rico Department of Agriculture and the University of Puerto Rico.

Farm Definition: The farm definition for the 1998 Puerto Rico Census of Agriculture 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, 1998.

Census Methodology: The 1998 Census of Agriculture for Puerto Rico was conducted using a multiple frame approach, made up of a list frame and an area frame. The list frame comprised a list of all known farm operations. The list was compiled prior to implementation of census data collection activities, using historical address lists, and lists of farmers from the Puerto Rico Department of Agriculture, the Agricultural Extension Service, and the private industry. A computer program identified duplicate records. Duplicates were removed and a final list was developed. Every address on this list was mailed a census report form, and those that did not respond, received a second or third report form through the mail. Field staff telephoned or visited operations on the list which did not respond by mail.

Enumerators were assigned individual lists of large or special farms for their assigned municipios. The lists contained names and addresses of all farm operators who were mailed a report form in June. Enumerators verified that the farmer had returned a completed census report form. If the farmer had failed to return a report form, the enumerator was responsible for obtaining a completed one.

After the follow-up on the mail list was completed, an area sample was enumerated to account for those farms that either did not respond or were not on the list. The area sample was comprised of 300 segments of land randomly selected from the entire island of Puerto Rico, and was stratified by land use. Each segment was approximately one-half square mile, and was represented by an aerial photograph. Farms located in segments that were not on the list frame were assigned a corresponding weight representing other farms that were not on the list frame or had not responded.

The enumerators were responsible for drawing the boundaries of each farm located in the segments on the photograph. Because there was an aerial photograph of each land segment, it was possible

to ensure that every farm was identified and outlined within the area sample. Data from the area sample were used to adjust the census to represent all farms that did not complete a mail report form.

Scope and Content: The basis of the agriculture census was the individual operating unit, usually the individual farm. The census requested data on land (cuerdas¹) and land use in the last 12 months, crops (cuerdas) harvested and production, irrigation (cuerdas irrigated, type of equipment 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, and hired workers, agregados, and sharecroppers.

Reference Periods and Dates: The census requested land, land use, production, expenditure, farm labor, and sales data for the 12 months between July 1, 1997 and June 30, 1998. 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, 1998.

Data Collection: The bulk of the data for the 1998 Puerto Rico Census of Agriculture was collected by mail. NASS assembled a mailing list of farms that had reported in the 1992 census, as well as, lists of farm operations provided by the Government and private sector in Puerto Rico. Report forms were mailed to approximately 36,000 addresses in June 1998. The initial mailout was followed by a reminder postcard sent to all addresses on the initial list, and by two mail follow-ups, as needed, to the nonrespondents. Staff from the USDA's Cooperative State Research, Education, and Extension Service and the Office of Statistics in Puerto Rico telephoned or visited some operations that did not respond by mail.

Planning

General Plans: Planning for the 1998 Census of Agriculture in Puerto Rico began in 1994, when the Census Bureau began preliminary planning for data content and enumeration methodology. The original plan was to place Puerto Rico on the same time frame for data collection and processing as the U.S. census of agriculture to avoid budget shortcuts and other problems that hindered the program in the past. Census list compilation, questionnaire design, coding and editing programs were well under preparation when the entire census program was transferred from the Census Bureau to NASS in February 1997. Since the transfer itself required a significant number of changes, a decision was made to conduct the census of Puerto Rico with the least changes possible to the 1992 questionnaire and data collection methodology. NASS and the Commonwealth Government drew up the special agreement covering the two parties' responsibilities in the enumeration, and began preparations for the census. The Puerto Rico Government activated the interagency planning committee to consult with NASS. By July 1997, NASS had proposed the final content for the Puerto Rico report form and developed plans for using a combination of list and area frame enumeration.

Interagency Working Group: The Government of Puerto Rico organized an informal committee composed of representatives of various agencies concerned with the 1998 Puerto Rico Census of

¹ A cuerda equals approximately 0.97 acres.

Agriculture. Offices or agencies represented on the committee were:

Puerto Rico Planning Board.
Puerto Rico Department of Agriculture.
Puerto Rico Farm Bureau.
Puerto Rico Cooperative State, Research, Education and Extension Service.
University of Puerto Rico's Agriculture and Economics Department.
Puerto Rico Rural Development Corporation.
Puerto Rico Farm Service Agency.
Puerto Rico Department of Education.
Puerto Rico Farm Credit.
The National Agricultural Statistics Service.

Beginning in February 1997, NASS officials met with member agency and office representatives periodically and communicated with them on a continuing basis, to discuss plans for report form content and enumeration methodology.

Preparatory Operations

Report Form Design: The Planning, Procedures, and Data Collection Section of the Census Division, with the cooperation of the Puerto Rico Planning Board, designed a single report form for the agriculture census in Puerto Rico. The report form was an 8-1/2" x 11" 10-page booklet printed on white stock with yellow shading, and black text. The standard version was in the Spanish language; an English-language reference version also was prepared for office use.

Based on feedback from data users in Puerto Rico, the following changes were made to the 1998 report form:

- Moved tree seedlings for coffee, orange, plantain, and banana trees from the section on grasses and other crops to the section on horticultural specialties.
- Dropped carts from the machinery, equipment, and buildings section.
- Dropped breakout of layers of less than one year of age and those over one year of age in favor of data on all layers.
- Split section on grains and farinaceous crops, creating a separate section for grains and legumes and another section for root crops and tubers.
- Added onions, and herbs and spice plants to the vegetable or melon section.
- Added bedding plants and tree seedlings to the ornamental plants section.
- Added type of irrigation method used: gravity, drip or trickle, sprinkle, and subirrigation.
- Added breakout of chicken eggs: eggs for consumption and fertilized eggs for hatching.
- Added sales value of farm by-products to the farm related income section.
- Added land treated with organic fertilizers to the fertilizer and chemical use section.

- Added cost of veterinarian services and all other expenses to the production expense section.
- Added buildings to house livestock to the machinery, equipment, and buildings section.
- Added three questions on estimated market value of the land and buildings on the farm, broken out by land owned, land rented from others, and land rented to others.
- Redefined definitions of land use. Cropland now has five categories: harvested, used for pasture, planted with soil improving crops not harvested, cropland where all crops failed, and idle. Pastureland was not broken into three categories (improved, natural, or overgrown with brush), as in the past, but was collected as a single item.
- Changed section on cattle to make it easier to accurately report inventory and sales. Steers, bulls, steer calves, and bull calves are no longer classified as dairy or beef cattle. Inventories are collected for dairy cows and heifers, beef cows and heifers, and all steers, bulls, steer calves and bull calves. Sales of cattle are now collected for only calves of less than 500 pounds and cattle of 500 pounds or more, without a distinction between dairy and beef categories.

The final questionnaire version consisted of twenty-six sections and asked for data on:

- Cuerdas owned, rented, or used in the last 12 months;
- Agricultural products (including sugarcane, coffee, fruits, grains, root crops or tubers, vegetables or melons, lawn grass or ornamental plants, and grasses) harvested and products sold;
- Farm-related income;
- Hired farm workers;
- Value of land and buildings;
- Irrigation;
- Land use;
- Aquaculture products for sale;
- Livestock and poultry 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; and
- Number of agregado and sharecropper families on farms.

List Frame Development: The mailing list for the 1998 Census of Agriculture in Puerto Rico was compiled from four principal sources:

- 1) the 1992 Puerto Rico Census of Agriculture database,
- 2) the Puerto Rico Department of Agriculture's general farm list,
- 3) the University of Puerto Rico's Extension Service's farm list, and
- 4) the Puerto Rico Poultry Industry list. Other sources used were the Puerto Rico Farm Bureau, agricultural magazines, and local growers.

The Census Division sorted the lists by last name and municipio, and submitted the resulting file to the Census Bureau's Economic Programming Division (EPD) for processing. The EPD edited the files to eliminate blank lines and add sequence numbers to records to provide a unique identification number during manual review and as a reference number for matching and deleting duplicate addresses from the lists. After editing, matching, and deleting all identified duplicate records, all source files were merged to create the 1998 Puerto Rico list frame file.

Sample Design and Selection: In addition to mailing report forms to all farm operations on the census list, the agriculture census in Puerto Rico used an area frame sample to collect data and develop statistical estimates of agricultural operations at the municipio, region, and Island levels. The purpose of the area sample was to account for farms not on the census list and farms not responding to the initial census data collection efforts.

Within each municipio, land was classified into five different strata based on land use or the amount of agricultural activity present. The strata were defined as:

- Land areas with dense agriculture,
- Sparse agriculture with few houses,
- Sparse agriculture with many houses,
- Cities with no agricultural activity, and
- Areas with no agriculture (such as parks and military installations).

Within each stratum, land was subdivided into primary sampling units (PSU). PSU boundaries were set on permanent physical features like roads and rivers whenever possible. These PSUs were the basic sampling unit for the area frame sample.

Municipios were grouped together to form clusters based on agricultural similarity. Municipios

with a large number of cuerdas of coffee in the previous census formed a cluster, as did municipios with large numbers of cattle and areas of pasture. A stratified random sample of PSUs was chosen within each cluster. The selected PSUs were then broken down into the final sampling unit, called segments. One segment was chosen at random from each sampled PSU. Segment boundaries were also set on physical features to aid in locating boundaries by the field enumerators. The segment sizes varied across the different strata, ranging from 0.10 square miles in city areas to 0.50 square miles in the highly agricultural areas. Sampling rates varied across strata within each cluster with more samples being allocated to areas with agricultural activity. Sampling for the non-agricultural stratum was carried out at the Island level. A total of 300 segments were selected for enumeration. Everyone operating land within the selected segment was contacted by an enumerator to collect the cuerdas operated within the segment, and also to determine if they qualified for a census interview.

Printing and Addressing Report Forms: Private contractors printed the report forms, envelopes, instructions sheets, and other enumeration materials and assembled the mailing packages before delivering them to the National Processing Center (NPC) in Jeffersonville, IN. The quantities of report forms and associated materials printed are shown in table 8-1.

Table 8-1. Report Forms, Envelopes, Letters and Other Printed Enumeration Materials

Form	Description	Quantity
97-A1(PR)SP	Report form (Spanish)	100,000
97-AO1(PR)L1	Transmittal letter (Spanish/English)	40,000
97-A1(PR)SP(I)	Information sheet (Spanish)	100,000
97-AO1(PR)L2	Follow-up postcard (Spanish)	40,000
97-AO1(PR)L3	First Follow-up letter (Spanish/English)	30,000
97-AO1 PR)L4	Second Follow-up letter (Spanish/English)	25,000
97-A7.1(SP)	Initial mailout envelope	40,000
97-A7.2(SP)	Followup mailout envelope	60,000
97-A8A(SP)	Return envelope	100,000

Address Labels: NASS prepared an address label for each address on the 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 NPC in the second week of June. The NPC 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.

Field Office Organization: NASS established an area office at the Agricultural Experiment Station in Rio Piedras to provide an administrative headquarters for the 1998 Puerto Rico Census of Agriculture in the Commonwealth. The office space was provided by the University and opened in May 1998, after a cooperative agreement was signed between NASS and the University of Puerto Rico. The Census Division assigned an employee to manage the office while the remaining office and field staff were provided by the Puerto Rico Department of Agriculture (PRDA) through the cooperative agreement with NASS.

Areas of Responsibility: A toll free telephone number was printed on the cover letters that were included in the report form mailout packages. The Rio Piedras area office provided assistance to farmers requesting information or asking for help in completing the census form.

The area office and the field enumeration staff conducted the Field Follow-up identifying and enumerating those large farms which did not respond to the mail enumeration effort. Upon completion of Field Follow-up activities, the area office was responsible for completing the area sample data collection. The mail portion of the agriculture census began in June, 1998. The area sample data collection effort began in August and lasted through mid-November.

Respondents to the mail census returned their completed report forms to the Jeffersonville office. Report forms completed by the follow-up operation at the Rio Piedras office, in addition to those produced by the area sample enumeration, were shipped to NPC. The report forms and their data were processed by the staff at NPC and by Census Division staff at headquarters.

Recruiting and Training: The Rio Piedras Area Office opened on May 15, 1998, but data collection for the agriculture census did not begin until June. The agriculture census field staff was provided by the Puerto Rico Department of Agriculture and the University Extension Service through a joint cooperative agreement with NASS.

The field staff underwent training during the week of June 1. A NASS representative conducted three different training sessions for the Agricultural Extension Service agents and the Department of Agriculture covering enumeration procedures, coverage and quality control procedures, administrative requirements.

Training and Reference Materials: The Planning, Procedures, and Data Collection Section of the Census Division prepared training and reference guides for use in the agriculture census in Puerto Rico. The principal reference materials used in the field office were the Enumerator's Manual and the Telephone Follow-up Guidelines. These manuals covered basic administrative procedures for the area office, including local telephone follow-up operations and processing activities. The Area Office Manager was responsible for training all personnel assigned to work in the census through out the cooperative agreements.

Staff of the Puerto Rico Department of Agriculture, Office of Statistics, assigned to work on the census received a copy of the Enumerator's Manual as the primary reference for the field enumeration. They also were provided with the Telephone Follow-up Guidelines and a publicity package (see Publicity below). During the census, enumerators and office staff provided assist to farmers requesting help through the use of a toll free telephone number made available to them by NASS. During follow-up work, enumerators were provided a list of large farms in the assigned municipios. The list of large farms included the names and addresses of farm operators who had been mailed a report form in the June mailout, but had not returned a report form. Enumerators had to visit the nonrespondents address and complete a report form by personal interview.

Area Frame Training: A week after the list enumeration concluded, the list was frozen and NASS conducted a special training school for the PRDA personnel assigned to work on the area frame enumeration. The training lasted three days. NASS headquarters personnel joined the Area Office Manager in conducting conferences and exercises intended to prepare the participants for the task of area frame enumeration.

Maps-Aerial Photographs: NASS's Area Frame Section, Research and Methodology Division in Fairfax, VA, designed the area frame used to conduct the sampling in Puerto Rico. They provided the Puerto Rico office and the field enumeration staff with all the materials needed to carry out the area sample enumeration. Research and Methodology Division staff also provided maps and other materials required for the sampling phase of the census in Puerto Rico in early June 1998.

Agricultural Extension Office Support

General Activities: The University of Puerto Rico, Extension Service (UPR-ES) participation in the 1998 Census of Agriculture was part of a cooperative agreement signed between NASS and the University of Puerto Rico. The UPR-ES functions in the same fashion as the U.S. Department of Agriculture's Extension Service, i.e., 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. They assisted NASS by:

- Providing its own list of farms for the census list frame compilation;
- Distributing publicity materials provided by NASS and promoting the enumeration among farmers in personal contacts; and
- Providing help to farmers in completing the census report forms.

In addition, extension service (ES) agents were given a list of small farms in their respective municipios that were mailed a report form in the June mailout, but no report form had been received. The agents visited the nonrespondents address and completed a report form by personal interview.

NASS conducted two 3-hour training sessions for ES agents during the first week of June, 1998. Training was held at the extension service regional offices in Rio Piedras and Mayaguez. The training goal was to familiarize the agents with the census program and to prepare them to answer questions from farmers. Approximately 100 ES agents received training. Topics covered during the training included:

- An overview of the census,
- Data collection methodology,
- Role of the extension service agent in the census, and
- Report form contents.

During training, they were provided with an Enumerator's Manual and a publicity package.

Publicity: The Census Planning and Procedures Section (CPPS) and the Special Projects and Information Section of NASS's Census Division cooperated in developing the publicity plan for the 1998 Puerto Rico Census of Agriculture. Major objectives of the publicity program were to:

- Encourage cooperation and prompt response by farmers to the census enumeration, and
- Provide information to the public about the release of census data products.

The CPPS staff developed several items specifically for the publicity effort in Puerto Rico. Printed materials included a poster, 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 press releases ("14th Census of Agriculture Begins in Puerto Rico" and, "Are you in agriculture? Make sure your farm is counted"). The poster came in a large (11" x 14") size, and announced the census. On June 1, 1998, 1,000 copies of the poster were distributed through local government offices and businesses for display in windows and on bulletin boards. The information packet contained:

- A copy of the transmittal letter;
- A sheet of frequently asked questions about the census, with answers;
- Copies of the Puerto Rico report form and instruction sheet;
- A census telephone contacts list; and
- The newsletter article.

NASS assembled and shipped the information kits to the Puerto Rico area office for distribution to (and through) the Puerto Rico Planning Board, Department of Agriculture; local newspapers; the UPR-ES, and local colleges and agriculture-oriented organizations.

In addition, NASS asked the Governor of Puerto Rico to issue an official proclamation about the census. On May 26, 1998, the Governor signed a proclamation designating July 1998 "Agriculture Census Month" in the Commonwealth.

On June 15, 1998, the U. S. Department of Agriculture's Under Secretary for Research, Education, and Economics, Secretary of the Puerto Rico Department of Agriculture, and the Administrator of NASS, participated in an official ceremony to inaugurate the NASS Area Office, and the proclamation to kick off the 1998 Census of Agriculture.

Data Collection

On June 10, 1998, NASS mailed report forms to the approximately 36,000 addresses on its census list, asking operators to complete and return the forms within 21 days. The agency mailed a friendly reminder/thank you card to all addresses on the census list on June 30. Nonrespondents received a second and a third report form through the mail. Field staff telephoned or visited operations on the list which did not respond by mail. The mail enumeration achieved a 70 percent final mail response rate.

In addition to the mail enumeration, NASS developed and carried out an area sample to collect data on farm operations not included or missing from the list. Selected segments through out the

area were canvassed by field staff, and any farms found within the segment, that had not received a report form, or failed to respond to the mail enumeration, were enumerated by personal interview. Approximately 500 farms were enumerated in the area sample. Their data were weighted based on the number of farms within the area segment boundary found on the list.

Data Processing Overview

Data processing encompasses those activities associated with precomputer processing, computer processing including edit resolution, and data tabulation and review. The Census Bureau's National Processing Center (NPC) in Jeffersonville, IN, processed the report forms from the 1998 Puerto Rico Census of Agriculture. Census Division staff and staff from the Puerto Rico Department of Agriculture (PRDA) resolved edit problems at NASS headquarters offices in Maryland

During precomputer processing, completed forms were check-in and problem cases or forms with attached correspondence reviewed. The NPC staff keyed the data from the questionnaires. The resulting computerized records were subjected to a detailed computer edit for consistency and reasonableness during computer processing. The edit identified erroneous or inconsistent data. In addition, written or extraneous marks on the questionnaire were flagged for further analyst review.

Keyed data, all census questionnaires, and related correspondence were forwarded to headquarters in Maryland, where Census Division staff, with the assistant of personnel from the Puerto Rico Office of Statistics, resolved problem records.

Before publication, Census Division and PRDA statisticians reviewed the tabulations for inconsistencies and potential coverage problems. The 1998 totals were compared to previous census data, as well as other available information, and any problems were analyzed. When necessary, 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 report form 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 NPC office in July, and continued on a flow basis until the last week of November 1998. At the close of the data collection operation, all completed report forms were shipped to the NPC facility in Jeffersonville, Indiana.

After check-in, report forms were routed to the batching control unit where control clerks batched the questionnaires into work units of up to 95 report forms using the Census of Agriculture Tracking System (CATS). The CATS system printed a Data Entry Batch Cover Sheet for each 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." See Chapter 6, "Data Processing," for additional detail about the CATS system.

Consistency and Coverage Review: Historical data from the 1992 census for Puerto Rico were made available to NASS for use in processing the 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. During their review, analysts checked each form for internal inconsistencies, and matched the 1998 data for a specific record against the historical record to evaluate the reasonableness of any changes.

Data Entry: Data entry (or keying) involved capturing data from the census report forms to a machine-readable data file for edit and tabulation. The NPC's Data Services Branch used a key-to-disc interactive system that combined the clerical review of individual census questionnaires with the data entry operation. Quality control procedures included reviewing samples of each keyer's work and, when necessary, correcting keyer errors and retraining keyers.

Computer Processing

General Information: After data keying, data for each report form was 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 Census Division statisticians reviewed all tabulated totals to identify inconsistencies and potential coverage problems. The statisticians made corrections to the individual data records and the specific totals involved were retabulated. After disclosure analysis -- a process that ensures that data for an individual is not revealed or derivable -- was completed, tabulated summaries were published.

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 industry classification code;
- Checked for consistency between and within sections of each record and identified problem data;
- Checked for reasonable relationships between and among data items, values for various sizes of farms, and combinations of commodities, and identified unreasonable relationships; and
- Imputed missing or replaced obviously erroneous data for farms based on other information in the 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 re-edited.

Whenever possible, edit imputations, deletions, or other changes were based on related data contained in 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 operations.

Sample Design: An area sample was selected to find and collect data from farms not on the census mail list, or not responding to the initial census data collection efforts. Enumerators using aerial photographs and municipio maps found and asked each respondent in the area segment enumeration, if they received and returned a questionnaire by mail. If the respondent answered that he had mailed in a questionnaire, the enumerator checked a list with all the names from the census list, each with a code indicating whether or not a questionnaire had been checked in. If the list indicated that the questionnaire for that particular person or farm operation had not been received, then the enumerator was responsible for completing a report form at that time. If the person was found on the list with a code indicating that a questionnaire had been received, then the enumerator simply accounted for the land within the segment for that farm.

Within each municipio, land was classified into five different strata based on the amount of agricultural activity present. Strata were defined as land areas with dense agriculture, sparse agriculture with few houses, sparse agriculture with many houses, cities with no agricultural activity, and areas with no agriculture (such as parks and military installations). Within each strata the land was subdivided into primary sampling units (PSU). PSU boundaries were set on permanent physical features like roads and rivers whenever possible. These PSUs were the basic sampling unit for the area frame sample.

Municipios were grouped together to form clusters based on agricultural similarity. Municipios with a large number of cuerdas of coffee in the previous census formed a cluster, as did municipios with large numbers of cattle and areas of pasture. A stratified random sample of PSUs was chosen within each cluster. The selected PSUs were then broken down into the final sampling unit, called segments. One segment was chosen at random from each sampled PSU. Segment boundaries were also set on physical features to aid in the location of boundaries by field enumerators. The segment sizes varied across the different strata, ranging from 0.10 square miles in city areas to 0.50 square miles in the highly agricultural areas.

Sampling rates varied across strata within each cluster with more samples being allocated to areas with agricultural activity. Sampling for the non-agricultural stratum was carried out at the island level. A total of 300 segments were selected for enumeration. Everyone operating land within the segment was contacted by an enumerator to collect the cuerdas operated within the segment, and also to determine if they qualified for a census interview.

Estimation: Estimates were produced from two components, a list frame component and an area sample component. With regard to the list component, all farm operations on the census list were mailed questionnaires.

Since the area component involved sampling, on average, each operation found in the area component represented about 20 other farms that would not have been found in the original list. As a result, the data from these farming operations found in the area component must be increased or expanded by 20. Approximately 500 previously unknown farming operations were found in the area component and they represent about 10,000 farms.

Although the sample size for the area component insures acceptable precision at the Island level, the sample size was not designed to adequately estimate municipio level data. Increasing the sample size of the area component to an acceptable degree of precision at the municipio level was financially unfeasible. Therefore, a method was devised to redistribute the area component data back to municipio level estimates by utilizing the area component sample design and farm type designation.

To reduce variation in the area component sample, municipios were assigned to one of these nine clusters. In addition, every record in the agriculture census (both from the list and the area component) were classified based on one of thirteen farm types. Expanded data across municipios for each farm type within a cluster were redistributed with weights derived from list and unexpanded area counts at the municipio level for each farm type within a cluster. Cluster level by farm type and, subsequently, island level estimates for the area component remain static with only the municipio level data changing.

Tabulation and Data Review

Tabulations: For Puerto Rico, NASS prepared and published data tables for all farms. Tables showed data for the Commonwealth, the seven agricultural regions defined by the Puerto Rico Department of Agriculture, and for municipios.

Table Review: Table review was done using a spreadsheet program. Analysts could make changes to the data, and on supervisory approval, the changes were written to the appropriate file. The master data file from which tabulated data were obtained -- was then updated.

After all the tables had been reviewed, and data and suppression patterns verified, Census Bureau staff, under contract with NASS, produced the tables using their Table Image Processing System (TIPS). TIPS is a proprietary publication software system developed by the Bureau to produce large, centralized, computer-based tables. The tables were then transmitted to NASS's Census Division for review.

Disclosure Analysis: NASS is prohibited by law from publishing information that could be used to identify individual respondents in any of its censuses or surveys. To ensure that this confidentiality was maintained, all tabulations were checked prior to publication in a procedure called disclosure analysis. This involved a review of all data tables that identified and suppressed specific items that, if published, would result in direct disclosure of datum reported by a particular respondent, company, or reveal information about an individual by derivation.

Publication Program

The 1998 Puerto Rico Census of Agriculture was published in Volume 1, Geographic Area Series, Part 52, Puerto Rico. The report showed estimates for all farms in the Commonwealth, for 7 agricultural regions, and for 78 individual municipios. Tables 1-15 contained data for all agricultural operations in Puerto Rico; tables 16-69 showed municipio-level data; and tables 70-75 presented more detailed tabulations for major data items.

The basic data shown for all farms included number of farms; land in farms and land use; tenure, characteristics, and main occupation of operator; hired workers (agregados and sharecroppers);

selected data on machinery, equipment, and buildings; use of agriculture chemicals and 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, including horticultural specialties; and fish and other aquaculture.

Tables 1-69 showed 1998 and comparable 1993 data for each item. Tables 70-75 showed 1998 summary statistics at the Commonwealth level for farms classified by tenure of operator and type of organization, main occupation and age of operator, size of farm (cuerdas), market value of products sold, and type of farm. In addition to the printed report, NASS released the Puerto Rico census data through the Internet (<http://www.usda.gov/nass/>).

Chapter 9. Censuses of Agriculture for American Samoa (1998), the Commonwealth of Northern Mariana Islands (1998), Guam (1998), and the U.S. Virgin Islands (1999)

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Introduction

Historical Background: For more than 150 years, the U.S. Department of Commerce, Bureau of the Census, conducted the census of agriculture. However, the 1997 Appropriations Act transferred the responsibility from the Commerce Department, Bureau of the Census to the U.S. Department of Agriculture, National Agricultural Statistics Service (NASS). The 1998 Census of Agriculture for the Commonwealth of Northern Mariana Islands, Guam, the U.S. Virgin Islands, and the 1999 Census of Agriculture for American Samoa are part of the first census of agriculture program conducted by the NASS.

The agricultural censuses for the U. S. territories and protectorates have been conducted since 1917, with varying degrees of regularity. In 1917, after purchasing the Virgin Islands from Denmark, a special census that included an agricultural enumeration was conducted. The next agriculture census in the U. S. Virgin Islands was not conducted until 1930, when the Federal Government incorporated an enumeration of the islands into the decennial census program. The first agriculture census on Guam was carried out in 1920, as part of the decennial census of that year. From 1930 through 1960, agriculture censuses continued to be done in conjunction with the decennial census program for both Guam and the U. S. Virgin Islands. Beginning in 1964, these two areas were included in the quinquennial censuses of agriculture, and have been enumerated on a five-year cycle since that time. The agriculture censuses for American Samoa and the Northern Mariana Islands also began as part of the decennial census operation, with the first in American Samoa being conducted in 1920, and the Northern Mariana Islands' first agriculture census being done in 1970. This was the first time, for both American Samoa and the Commonwealth of Northern Mariana Islands, that the agriculture census was conducted apart from the decennial population census.

Uses of Agriculture Census Data: The census of agriculture is the principal source of agricultural production data for American Samoa, the Commonwealth of Northern Mariana Islands, 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:

- Developing and changing farm programs,
- Measuring the effects of these programs,
- “Bench marking” for designing and evaluating their own data collection activities, and
- 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 census of agriculture is required by law under the “Census of Agriculture Act of 1997,” Public Law 105-113 (Title 7, United States Code, Section 2204g). The law directs the Secretary of Agriculture to conduct a census of agriculture in 1998 and in every fifth year thereafter, covering the prior year. The census of agriculture includes each State, Puerto Rico, Guam, the U.S. Virgin Islands, and the Commonwealth of Northern Mariana Islands, and states that the Secretary may include other territories or protectorates in the census program.

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 Census Bureau's population and housing

censuses program. The 1990 decennial census of the Commonwealth of the Northern Mariana 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 among the areas. In CNMI, the enumeration was done in March and April of 1998, and 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 1997.

In Guam and the Virgin Islands, enumeration was done in July and August of 1998, and collected inventory data as of the day of enumeration. Crop and livestock sales, production, and expense data were for the 12-month period from July 1, 1997 through June 30, 1998.

The agriculture census in American Samoa was conducted the following year, with enumeration carried out in February and March of 1999. Inventory data were for the day of the interview, and production, sales, and expense data for the calendar year 1998.

Farm Definition: The farm definition used in Guam and the Northern Mariana Islands was any place that had sales of agricultural products of \$1000 or more. This was the same farm definition used in the main U.S. census, and reflects a change from 1992 when the minimum sales value, to qualify as a farm, was \$500.

For the Virgin Islands, the farm definition remained the same as the 1992 definition, \$500 or more in agricultural sales.

In American Samoa, due to the importance of noncommercial agriculture both economically and socially, the farm definition was much broader and did not include a minimum value of sales. A farm was defined as any place that produced agricultural products for sale or consumption by family members.

Preparatory Operations

General Information: The conduct of the 1998 and 1999 agriculture censuses was a cooperative effort of NASS and the respective territorial governments. Special agreements, governing the conduct of the census in each area, and general plans for the enumeration were agreed to the year prior to the census. NASS prepared the procedures, edit programs, and tabulation programs for handling the information.

Overall designs for the censuses varied among the areas, and were different from previous censuses, where data were collected by canvassing the entire area to locate farm operations. In Guam and the Virgin Islands, lists of farmers were compiled by the local departments of agriculture, based on information available to them through their own efforts at collecting information on agriculture activity in their areas. In the Commonwealth of the Northern Mariana Islands, the Department of Commerce was able to provide a listing of all agricultural producers through their business licensing records. In all three areas, this use of list-based enumeration resulted in a more efficient method of data collection. In American Samoa, because of the broad farm definition, and the high percentage of households which have agricultural activities, a combination of a list of commercial farms provided by the American Samoa Department of

Agriculture, and a sample of all remaining households were enumerated.

General plans for the censuses were formalized in special agreements, negotiated by NASS and the respective area governments.

Special Agreements: Prior to conducting the agriculture censuses, the responsible officials of the local government agencies signed memoranda of agreement with the NASS 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. Local authorities also were responsible for:

- Recruiting qualified personnel for census jobs;
- Training persons hired for the census to following procedures established by NASS;
- Determining local pay rates, subject to review by NASS for consistency and available funding;
- Arranging office space, equipment, and supplies required by the census operation within each jurisdiction;
- Maintaining administrative and financial records for the census and providing this information to NASS; and
- Publicizing the census locally (NASS provided promotional materials).

NASS was responsible for procuring and distributing manuals, 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. NASS, also bore the total cost of the agricultural censuses in each area, with the exception of American Samoa, where the cost was split between NASS and the Department of Interior's Office of Insular Affairs.

Report Form Content: NASS designed the report forms for all the areas in cooperation with the respective governments. The report forms for Guam, the Virgin Islands, and the Commonwealth of Northern Mariana Islands were of similar design and layout. Each form was a single sheet measuring 17" x 14" folded to 8-1/2" x 14", with four numbered pages. 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, and irrigation

The report form for American Samoa also included data on home consumption, sources of financing, fishing, and demographic data on members of the household.

American Samoa

Commonwealth of Northern Mariana Islands

Guam - Election Districts

Virgin Islands of the United States

Preparation of Enumerator Materials

Printing Report Forms and Enumeration Materials: Report forms, materials for the enumerator record books, and administrative forms used in the 1998/9 agriculture censuses for Guam, the Virgin Islands, American Samoa, and the Commonwealth of Northern Mariana Islands were printed by private contractors supervised by the U. S. Government Printing Office. NASS forwarded the materials to the respective census managers for distribution to the field staff.

Staffing and Training: The staffs for the agriculture censuses in the areas were organized into a small office staff and the field enumeration staff. A census manager for each area functioned as the general supervisor for the census and the head of the census office.

Census staffs in all areas except Guam received salaries as temporary employees of the local governments. In Guam, the enumeration was done by permanent employees of the Guam Department of Agriculture on a reimbursable arrangement.

The local governments appointed the project managers who were responsible to NASS 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 NASS headquarters informed about the progress of the enumeration.

In Guam and the Virgin Islands, relatively little clerical work was done at the area offices. Project managers were responsible for ensuring that once the enumeration was complete all required materials were secured and forwarded to NASS headquarters for processing and tabulation.

In American Samoa, manual editing and keying of data were done in the local office. In the Commonwealth of the Northern Mariana Islands, manual editing, keying, and computer editing and analysis were performed by the local personnel.

NASS staff visited the Commonwealth of the Northern Mariana Islands, Guam, and the Virgin Islands in June and July 1998, to train the census managers, crew leaders, and enumerators. Some enumerators left the 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 employed personal interviewing by a field enumerator for the agriculture censuses for all the areas. 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 places with two or more tracts of land, 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 geographical area were enumerated in the geographical area in which the primary agriculture activity was located. 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 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, other than an operator's outright refusal to respond, enumerators sometimes were unable to complete report forms during the first visit a household. In these cases, the enumerator made arrangements for a return visit, a "call back" at a time convenient to the operator. "Call backs" were made as soon as possible after the initial visit, but enumerators were not to conduct more than two personal visit "call backs" to the same respondent unless the crew leader decided special circumstances warranted additional attempts.

Refusals: When an operator refused to respond to the census, enumerators were instructed 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 or to the office supervisor. The crew leader or supervisor was then responsible for determining the correct course of action for obtaining the data.

Field Review: 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 census managers. In addition, crew leaders monitored enumeration progress by receiving periodic progress reports from their enumerators. They also verified both the cumulative figures reported by each enumerator, and completed weekly progress reports for the census manager.

Results: For American Samoa, census data indicates 6,473 farms with 19,736 acres, of which 13,375 were in cropland. In the Commonwealth of Northern Mariana Islands, the agriculture census counted 103 farms with 3,413 acres, of which 490 were in cropland. Guam's agriculture census enumerated 201 farms with 2,144 acres, of which 1,504 acres were in cropland. In the Virgin Islands, the census counted 247 farms, with 13,466 acres, of which 1,144 acres were cropland. The average farm size in the four areas ranged from 3.0 acres in American Samoa to 54.5 acres in the U.S. Virgin Islands.

Data Processing

General Information: Data processing from all four censuses was done in the same manner. After check-in and review of any problem cases, the information was keyed from the questionnaires to a computer data file. The resulting computerized records were subjected to a detailed computer edit for consistency and reasonableness. In addition, the edit 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 by the edit to respondent data was reviewed and verified by agricultural analysts.

Before publication, NASS statisticians reviewed the tabulations for inconsistencies and potential coverage problems. Totals were compared to previous census data, as well as other available information, and potential problems were examined. When necessary, the staff made corrections to the data records and retabulated the affected totals. In Commonwealth of Northern Mariana

Islands (CNMI), the entire process of precomputer processing, keying, editing, and analysis was done by the Census Coordinator in the Northern Mariana Islands, with only the final analytical review and tabulation being done by NASS staff in Washington. In American Samoa, precomputer processing and data keying were done on-site before shipping files and materials back to NASS headquarters in Washington, D.C. In Guam and the Virgin Islands, only the precomputer processing was done in the field; the census manager then boxed and shipped the report forms directly to NASS for data preparation and processing.

Precomputer Processing: After the field enumeration was complete, individual report forms were reviewed to ensure that the form contained a valid farm serial number and enumeration district number, correct geographic area code, complete name and address of the operator, positive entry under "land in Agriculture," and values for either crop production or livestock/poultry inventory.

The edit identified operations that did not meet the farm definition; each case was verified by the CNMI census coordinator. Data for the remaining operations were reviewed for accuracy, consistency, and completeness. Errors in computations, units of measures, data inconsistencies, misplaced entries, and so on, were corrected. Missing information was derived from valid reported data for similar type and size farms in nearby areas.

After the precomputer processing review, data from each operation were keyed into a database on microcomputer equipment using an Integrated Microcomputer Processing System. The processing system used was designed by the U.S. Bureau of the Census to key, edit, analyze, and tabulate data from censuses and surveys.

Computer Processing

General Information: After keying the data from each report form, an item-by-item computerized edit was conducted for each record. Analysts reviewed and verified any substantial changes generated by the computer edits to the data file prior to tabulation. The data were tabulated by geographic level and for each area as a whole, and NASS 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 data were edited by computer for completeness and consistency. Inconsistent entries or suspicious data were identified, i.e. "flagged," by the edit program and were reviewed by analysts. These data were then compared to previous census data, as well as to other available information, to determine if a problem existed with the data. The interactive computer system enabled 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. Errors or problems were reviewed and researched by reexamining individual data records. Any corrections required were keyed to the records and corrected data files re-edited.

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 and Table Review: NASS is prohibited by law from publishing any information that could be used to identify individual respondents to any of its censuses or surveys. To ensure that confidentiality is maintained, all data tabulations were checked prior to publication in a procedure called disclosure analysis. This involved a review of data tables that identified and suppressed specific items that, if published, would:

- Result in direct disclosure of data reported by a particular respondent, or
- Reveal information about an individual by derivation, i.e. by a user adding or subtracting a published subtotal from a published total.

After disclosure analysis was completed, appropriate suppressions were applied to the data. Final tables were then reviewed by NASS analysts for accuracy, consistency, and completeness of disclosure protection.

Publication Program

NASS released the summarized data in two steps, so as to provide data users with the information as soon as possible. The first step was to release the tables, along with a condensed version of text material on the NASS Internet homepage. This was done at the time of final approval of the tables, but before the entire publication package had been sent to the printer. Hence, delays in releasing the data, while waiting for minor wording changes or the contractual agreements with printing companies to be worked out, were avoided. Once the text material was completed and reviewed, the publication package was contracted out to a printer to produce copies. The Virgin Island tables were released on the internet in January 2000, and American Samoa, Commonwealth of Northern Mariana Islands (CNMI), and Guam tables went on the Internet in June 2000.

The census report for American Samoa showed statistics for the territory, districts, and counties. For the CNMI, data was shown for the commonwealth, the Island of Rota, the Island of Saipan, the Island of Tinian, and for the Northern Islands. The report for Guam showed data for the island, and for 19 election districts. The report for the Virgin Islands showed statistics for the territory, for Saint Croix, and for Saint John and Saint Thomas (combined). 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, sales value of fruits, nuts, vegetables, and field crops, selected machinery and equipment, and inventory and sales of livestock and poultry and their products.

Chapter 10. 1998 Census of Aquaculture

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Introduction

Background: The 1998 Census of Aquaculture was the first national census taken for this industry. Conducted by the U.S. Department of Agriculture, National Agricultural Statistics Service (NASS), this census responded to the intense need for an accurate measurement of the aquaculture sector, which grew from \$45 million for value of products sold in 1974 to over \$978 million in 1998. Previously, NASS tracked the catfish and trout industry through monthly catfish processing, quarterly catfish production, and annual catfish and trout surveys. Limited aquaculture data have also been collected during the 5-year census of agriculture since 1974. The census listed catfish, trout, and tropical fish and provided space for producers to list any other food-type fish or other aquaculture products sold from their operation.

Catfish Statistics: The first catfish processing publication dates back to February 1980. Later that same year, NASS conducted the first catfish production survey, covering 10 States. Funding problems resulted in the catfish production survey being discontinued after January 1982. The need for unbiased, reliable statistics led the Catfish Farmers of America to enter into a cooperative agreement with NASS to fund a quarterly catfish production survey in Mississippi. The survey began in October 1984 and continued through April 1988 when funds were appropriated for NASS to conduct the catfish survey semiannually. Subsequently, NASS expanded program consisted of a quarterly program in Mississippi, Alabama, Arkansas, and Louisiana and an annual program in additional states. Currently, the NASS catfish production survey is conducted on a semiannual basis in the four aforementioned States and on an annual basis in nine additional States.

Trout Statistics: The NASS trout production program began in 1980, covering nine States. The survey was discontinued in 1981 but resumed in September 1988 for 15 States. Currently, the NASS annual trout program includes 21 States.

Purpose and Scope of the Census: The 1998 Aquaculture Census was conducted to expand the aquaculture data collected from the 1997 Census of Agriculture and provide a comprehensive picture of the entire public aquaculture sector. The aquaculture census collected detailed information relating to on-farm aquaculture practices, size of operation based on water area, production, sales, method of production, sources of water, point of first sale outlets, cooperative agreements and contracts, and aquaculture distributed for restoration or conservation purposes.

Uses of the Census: The census of aquaculture contained statistics about the Nation's aquaculture production and presents information on the structure of the aquaculture industry at the national, regional, and state levels. Aquaculture census statistics may be used by Congress in developing, evaluating, and changing farm programs. Many National and State programs may use the data to plan rural development, land use management, water resource management, and aquaculture research. Private industry may also use the census statistics to provide a more effective production and distribution system for the aquaculture community.

Authority and Area Covered: The census of aquaculture is covered by Public Law 105-113, the Census of Agriculture Act of 1997 (Title 7, United States Code). The census of aquaculture is a special study program from the 1997 Census of Agriculture which provides more detailed statistics on aquaculture.

Preparations

Data Needs: The first step in the development of the Census of Aquaculture was to learn about industry's needs. NASS canvassed its State Statistical Offices and found that seven were already conducting or had conducted aquaculture surveys for their states as reimbursable projects. Several organizations representing aquaculture's diversity (finfish, shellfish, crustaceans, etc.) were contacted for information, including the National Aquaculture Association, National Association of State Aquaculture Coordinators, and Catfish Farmers of America. U.S. Department of Agriculture's Office of Aquaculture, which coordinates Department-wide aquaculture activities, chairs the Federal-wide Joint Subcommittee on Aquaculture, and coordinates activities of the five Regional Aquaculture Centers, also provided advice. In addition, members of the Advisory Committee on Agricultural Statistics made significant recommendations that helped establish data content.

Questionnaire Development: From the evaluation of data needs, a draft questionnaire was developed and widely distributed for comments. As a result of feedback and evaluation, the final questionnaire collected information about the public aquaculture sector, including noncommercial operations such as Federal, State or Tribal facilities (which are mostly hatcheries), academic, and private research facilities.

Data Collection

Farm Definition: For the 1998 Census of Aquaculture in the United States, an aquaculture farm was defined as any commercial or noncommercial place from which \$1,000 or more of aquaculture products were sold or normally would have been sold during the census year. Commercial operations qualified with sales greater than or equal to \$1,000. Noncommercial operations were those which produced an estimated value of \$1,000 or more of aquaculture, but released or distributed their production for purposes of restoration or conservation. Examples of noncommercial operations were Federal, State or Tribal facilities (which were mostly hatcheries), academic, and private research facilities.

Target Population and List Frame Development: The target population for the Census of Aquaculture was composed of all farms that had aquaculture activity in the reference year 1998. The list of farms with aquaculture activity in 1998 was created from the 1997 Census of Agriculture and supplemented from appropriate NASS survey frames. The list was created by including all farms that indicated a positive response to item 10, section 17 of the 1997 Census of Agriculture questionnaire; this question asked whether there were "fish and other aquaculture products" on the place in 1997. If this activity was present, the respondent provided the name, total quantity sold, and gross value of sales of the fish or products. The Census of Agriculture respondent selected from a list of pre-coded responses that included catfish, trout, hybrid striped bass, other fish, crawfish, or other aquaculture products. Specific type was requested for a response to "other fish" or "other aquaculture products."

This list was supplemented by adding any existing aquaculture farms from the NASS list frame that did not appear on the list created from the 1997 Census of Agriculture. Also added to the list for enumeration were State and Federal fish hatcheries that distributed fish for restoration or conservation purposes. Undercoverage existed in the population to the extent that some farms that erroneously reported not having aquaculture activity in the 1997 Census of Agriculture also were

not included in the NASS frame for the Annual Catfish and Trout Surveys. Overcoverage existed in the population because some operations were misclassified as having aquaculture activity in the 1997 Census of Agriculture; this problem was identified and corrected during enumeration.

Enumeration: The 1998 Census of Aquaculture for the United States was conducted using a combination of mail, telephone, and personal interviews. The questionnaires were mailed in mid-December 1998 to all known aquaculture producers. Two different versions of the questionnaire were used for the 1998 Census of Aquaculture, with Catfish farmers receiving the second version which asked for water area used to produce catfish and inventory of catfish. The mailings included a cover letter and a postage paid return envelope. Farm operators were requested to return their completed questionnaire within 15 days. Follow-up telephone calls and personal interviews were used to collect data from non-respondents.

Editing Data and Imputation for Item Nonresponse

All questionnaires were reviewed for legibility and data entry irregularities prior to keying. All data were reviewed for inconsistencies prior to analysis and summary. The data were passed through a computer edit to check data integrity within the questionnaire. Editing of catfish and trout data utilized historical comparisons to previous reported NASS survey data for water usage, inventory, production, and sales. Analysis tables were constructed to illustrate the distribution of items in the data set. The outliers in these distributions were investigated and verified or corrected. Logical comparisons given current situations and distributions were made for all operations in the aquaculture census. Every effort was made to correct all inconsistencies, errors, or omissions in reported data.

Fish were reported sold several different ways: by the fish, per pound, pounds per 1,000 fish, etc. To maximize the amount of data that could be published, some data were converted to the more common "per fish" or "per pound" units. For example, fish sold as "pounds per 1,000 fish" were converted to "per fish" sales. Most foodsize fish were reported as sold by the pound. For most species, the few reports indicating food size being sold by the fish were converted to the "per pound" basis. The reverse was true for stockers, fingerling, and fry, which were most often sold by the fish (or 1,000 fish). Any sales for these items by the pound were converted to the "per fish" basis. Most nonresponse to particular questions on the census questionnaire that logically should have been present were resolved after re-contacting the operation. When this was not successful, the population distribution for the specific item was used to determine an imputed value. Data from the 1997 Census of Agriculture were also available.

Data Processing

Data listings were used to identify and correct keying errors, missing data, and erroneous data entries on questionnaires. Data entries of large magnitude and data item changes were again reviewed by statisticians and verified or corrected. Prior to publication, tabulated totals were reviewed to identify remaining inconsistencies.

Census Nonsampling Error

Incorrect or incomplete responses to the census questionnaire or to the questions posed by an enumerator could have introduced error into the census data. To reduce reporting error, each

respondent's answers were checked for completeness and consistency by the edit and data listings. The accuracy of the census was also affected by other nonsampling errors' sources, including incorrect data keying, editing, and imputing for missing data.

Publication

The publication provided information on the number of farms and the market value of aquaculture products sold for each state, five regions, and the United States. Detailed U.S. level data cross-tabulated by market value of aquaculture products sold was also presented. In addition, selected data items for each state, five regions, and the United States were presented. The regions used were defined by the Joint Subcommittee on Aquaculture for the U.S. Department of Agriculture.

In keeping with the provision of Title 7, United States Code, no data were published that would disclose the operations of an individual farm. However, the number of farms in a given size category or other classification was not considered a release of confidential information and was provided even though other information is withheld.

Chapter 11. 1998 Farm and Ranch Irrigation Survey

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Introduction

General Information: The agriculture census began collecting selected data about on-farm irrigation in 1890. In 1900, Congress authorized a census of farms using irrigation. The Department of Commerce's Bureau of the Census conducted censuses of irrigation as part of the decennial censuses through 1950. A survey of on-farm irrigation in selected states was added to the 1954 and 1959 Censuses of Agriculture. Since 1959, on-farm irrigation surveys have been conducted using samples drawn from agriculture census lists frame. In February 1997, Congress transferred responsibility for the census of agriculture from the Department of Commerce, Bureau of the Census to the Department of Agriculture, National Agricultural Statistics Service (NASS).

Agricultural production is a major user of fresh water in the United States. Based on the 1997 Census of Agriculture, 14.6 percent of all farms in the United States were irrigated. Those farms accounted for approximately 16 percent of total cropland and 49 percent of the value of all crops sold. Information on agricultural irrigation is crucial to legislators and policymakers, economists, farmers, and planners and hydrologists concerned about the nation's supply of both food and fresh water.

NASS conducted the 1998 Farm and Ranch Irrigation Survey under the provisions of Title 7. The survey (FRIS) supplemented basic irrigation data collected from all farm and ranch operators in the 1997 Census of Agriculture. A sample of 1997 Census respondents who reported using irrigation, provided detailed information about their irrigation practices.

Scope and Reference Year: Normally, the farm and ranch irrigation survey was conducted for the year immediately following the agriculture census reference year. Therefore, following the 1997 Census of Agriculture, a 1998 Farm and Ranch Irrigation Survey was undertaken. The survey sample was drawn from respondents reporting on-farm irrigation on their census report forms in the 1997 Census of Agriculture. Data collection for FRIS was undertaken during the first five months of 1999 to request irrigation data for 1998.

The survey requested detailed data from about 1 in every 12 respondents reporting on-farm irrigation in the 1997 census. Sampling was designed to provide reliable estimates of irrigation practices for the United States, 20 Water Resources Areas, and, for the first time, all 50 States. The survey asked respondents to supply data on land use, irrigation, and maintenance expenditures, and irrigation practices for calendar year 1998. Data on irrigated and nonirrigated crops was requested for the 1998 growing season.

Estimation: Estimates were produced for the Nation as a whole, for each of the 50 States, and for the geographic domains known as Water Resource Areas (WRA). The estimation methodology accounted for both selection of the survey sample and survey nonresponse. The estimator for the state totals was a direct expansion reweighted estimator. The expansion factor was the inverse of the selection probability for the sample farms in a stratum. This expansion factor was reweighted at the stratum level to account for whole-farm nonresponse. The nonresponse adjustment factor used to reweight the expansion factor was the ratio of the number of sample farms in a stratum to the number of sample farms that responded to the survey in that stratum. The assumption underlying this weighting approach to survey nonresponse was that survey respondents and nonrespondents within a stratum constitute a homogeneous population, thus allowing respondents to represent nonrespondents. The reweighted expansion factor was the product of these two factors and was equal to the ratio of the total number of farms in the stratum to the total number of sample

farms that responded to the survey in that stratum.

An expanded data value for a sample record was obtained by multiplying the data value by the reweighted expansion factor. State totals for a characteristic were estimated by summing the expanded data values from all responding sample records across all stratum within the state. National estimates were obtained by summing across all states. The WRA estimates were obtained by summing the expanded data values for the portion of the sample in the WRA.

Preparations

Planning: Planning for the 1998 Farm and Ranch Irrigation Survey (FRIS) began in 1997, when NASS's Census Division staff conducted a review of previous farm and ranch irrigation surveys. NASS 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. NASS staff reviewed responses for use in evaluating data needs and whether or not additional questions should be added to the survey. The impact of all proposed changes on cost and respondent burden were considered. Methods used in conducting the 1998 Farm and Ranch Irrigation Survey were changed from previous surveys conducted by the Census Bureau, to those that would fully utilize resources of NASS and its forty-five SSO's. Each SSO provided enumerators who helped with data collection in areas of low response. State statisticians reviewed their state's final tabulated data. The 1998 sample size of 23,567 farms increased over the 1994 sample size, primarily due to expanding coverage to all 50 States.

Sample Design and Selection: NASS designed the sample for the 1998 Farm and Ranch Irrigation Survey to produce a relative standard error not to exceed 5 percent on estimated irrigated acreage for the United States and at the state level. NASS calculated that these requirements could be met with a sample of 23,567 irrigation operations. The universe from which the sample was selected included all farms or ranches--excluding abnormal and horticultural specialty operations--that reported using irrigation in the 1997 Census of Agriculture. Horticultural specialty farms were excluded from the irrigation survey since they provided irrigation information in the 1998 Census of Horticulture.

All farm operations eligible for the survey were stratified into stratum groups on the basis of total irrigated acres reported in the 1997 census. Stratum assignment within each stratum group was based on the 1997 reported irrigated acreage, and varied from stratum group to stratum group. NASS 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 1997 Census of Agriculture. State sample sizes, necessary to obtain the desired level of precision, were determined by analyzing the variation of the total acres irrigated variable in each state's sampling frame. These sample sizes were adjusted using historical nonresponse data to account for expected nonresponse to the survey. The total national sample size was 23,567 farms; 1,579 of these farms were selected from the certainty strata - farms that reported a minimum number of irrigated acres in the 1997 Census of Agriculture. The minimum number of irrigated acres varied by stratification type. All remaining 21,988 farms were systematically selected from the noncertainty strata.

Data Collection

General Information: Data collection activities were coordinated by NASS headquarters staff and utilized the resources of NASS's State Statistical Offices for mail preparation and mailing (North Carolina SSO), mail receipt and check-in, and editing (Kentucky SSO), and follow-up efforts coordinated with the other state offices. The 1998 Farm and Ranch Irrigation Survey was carried out mainly using mailout/mailback enumeration. One follow-up mailing, supplemented by telephone and/or personal enumeration was employed to obtain data from nonrespondents. The initial survey mailout involved mailing approximately 22,000 survey packets, each containing a report form (98-A62) and cover letter. These packets were mailed during February 1999. The remaining 1,567 farms were designated for field enumerator or telephone collection. The main body of the report form consisted of 20 sections.

A follow-up mailing to all nonrespondents, approximately 4 weeks later, consisting of a cover letter, a report form, and a return envelope. Six weeks after the initial mailing, the state offices were provided nonresponse lists. The state offices made telephone calls and personal visits to minimize the nonresponse. Data collection was completed in May 1999, and the publication results were released in November 8, 1999.

Mailout and Mail Follow-up: Private contractors printed the report forms and associated materials, and delivered them to NASS's North Carolina SSO in Raleigh, NC, in early December 1998. North Carolina State Statistical Office staff addressed the forms for the mailout using a computerized address file compiled by the Census Division. Staff at the North Carolina SSO assembled the mailout packets. The initial mailout consisted of a report form, a brochure explaining the need for the irrigation data, and a return envelope addressed to the NASS Kentucky SSO.

Mail Receipt, Check-in, Follow-up, Data Editing and Data Entry: The Kentucky SSO staff received mail responses from respondents and subsequently generated a list of nonrespondents which was then used by the North Carolina SSO staff to address forms for the follow-up mailing. Initially, farms designated for telephone enumeration were contacted by the Kentucky SSO. After the final follow-up mailing, the Kentucky SSO staff prepared a list of nonrespondent "certainty cases" for telephone follow-up or possible field enumerator contact. If additional follow-up was required, the respective state office followed-up as needed. Given the limited size of the survey sample, data from large-scale irrigators were considered critical to developing reliable statistical estimates, and subjected these cases to intensive follow-up. Telephone enumerators attempted to contact operators and obtain as much data as possible, especially basic acreage, crop, and irrigation data.

Response Rates: The 1998 Farm and Ranch Irrigation Survey attained a final overall response rate of 70 percent, representing 16,391 receipts. This was about 5 percent greater than the final response rate obtained for the 1994 survey.

Data Processing

General Information: The 1998 Farm and Ranch Irrigation Service (FRIS) report forms were returned to the Kentucky SSO for data processing except for the forms marked by the SSOs for data collection and check-in at the state level. 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 NASS headquarters in Washington, D.C. Before publication, the tabulations from the FRIS data file were reviewed by both headquarters staff and staff from the appropriate SSOs, using data from the 1997 census, to identify inconsistencies or potential coverage problems.

Receipt and Check-In: Completed report forms, as well as “undeliverable as addressed,” from each state office were mailed to the Kentucky SSO for check-in and data processing. Forms with attached congressional correspondence -- notes indicating a respondent intended to contact a congressional office -- were pulled from the processing operation and sent to the Census Division at NASS’s headquarters in Washington, D.C. Census Division resolved the concerns raised by the correspondence and subsequently processed the data.

Correspondence and Telephone Assistance: The Kentucky SSO staff handled any respondent-originated correspondence. The initial mailing packet, and the follow-up mailings, included a toll-free telephone number for respondents to use if they had questions about the survey, or needed assistance in completing their report form. These calls were routed to various SSOs where staff provided assistance to any respondents who needed help. The state offices also answered any questions callers had about requirements to respond, and whether or not their farm qualified as an irrigation operation for the purposes of the survey.

Prekey Review: The Kentucky office staff received report forms on a flow basis and reviewed them prior to data entry. This process involved reviewing item 3 (“Was any land on the farm or ranch you operated irrigated at any time in 1998?”) and item 19 (“Irrigated Land in 1997”) of each report form. If the respondent answered “no” to both items, the report form was marked out-of-scope. However, report forms from large farms that reported irrigation in the 1997 census, but none in the FRIS, were followed up by telephone to clarify the apparent discrepancy. After determining that a report form was in-scope, staff conducted an item by item review of the form, using written edit guidelines. The review checked for the completeness, consistency, and accuracy of reporting.

Data Entry: Report forms were keyed following procedures generally similar to those used for the agriculture census. Quality control procedures for the FRIS data keying operation were also similar to those employed in the agriculture census. Keyed data were subject to a second keying process to verify accuracy.

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 during the initial review, analysts either accepted computer edit procedures to correct individual data items, or initiated corrections of data items on a record by record basis.

Tabulation: Survey data were tabulated using Statistical Analysis System software. The tabulation program compiled 35 tables containing detailed estimates of irrigation data from farm operators reporting irrigated land in the 1997 census and the 1998 Farm and Ranch Irrigation Survey.

Tabulated data were reviewed by statisticians, both at headquarters and in the respective state offices for inconsistencies and potential coverage problems and compared to the 1997 Census of Agriculture data. Corrections, if necessary, were made to the data file before running the final tabulations and releasing the statistics for publication. Final results were reviewed by a "board" of NASS statisticians to ensure that published results were consistent with known changes on farm irrigation.

Publication

General Information: Data from the 1998 Farm and Ranch Irrigation Survey (FRIS) were published in the 1997 Census of Agriculture, Volume 3, 1998 Farm and Ranch Irrigation Survey. Published data were also accessible on the Internet at <http://www.usda.gov/nass> and available on CD-ROM. The published data presented summary irrigation data for all states, with more detailed tabulations for individual states and the 20 Water Resources Areas. Most tables included 1994 historical data for comparison. The tables showed data for calendar year 1998 on farms irrigated by -

- 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;
- North American Industry Classification System;
- market value of crops sold;
- water management systems used;
- participation in government 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.

Within the FRIS publication, there are also maps that show the 1998 precipitation as a percent of normal precipitation for the United States. These maps are included for reference purposes only.

Water Resources Areas: The 1998 FRIS data were tabulated by Water Resource Area (WRA). These boundaries are essentially the same as the water resources regions (WRR) as delineated and defined in the past by the U.S. Water Resources Council. The areas differ somewhat from the regions because of the method used for boundary delineation. Region boundaries are delineated on the basis of topographic drainage characteristics, whereas areas are delineated on the basis of county boundaries approximated to actual drainage-basin boundaries.

Table 11.1 Water Resource Regions for the 1998 Farm and Ranch Irrigation Survey

Region Number	Region Name	Region Number	Region Name
01	New England	11	Arkansas-White Red Region
02	Mid Atlantic	12	Texas-Gulf
03	South Atlantic-Gulf	13	Rio Grande
04	Great Lakes	14	Upper Colorado
05	Ohio	15	Lower Colorado
06	Tennessee	16	Great Basin
07	Upper Mississippi	17	Pacific-Northwest
08	Lower Mississippi	18	California
09	Souris-Red-Rainy	19	Alaska
10	Missouri	20	Hawaii

Comparability of Data: Differences exist between the expanded results of the 1998 Farm and Ranch Irrigation Survey (FRIS) data and the 1997 Census of Agriculture data. FRIS data excludes horticultural specialty and abnormal farms. Furthermore, between 1997 to 1998, 10,067 farms irrigating 2.4 million acres left farming. The survey includes data only for operations who irrigated in both 1997 and 1998. Results from the survey show 18,171 irrigation operations reporting irrigation on 1.2 million acres in 1997 that did not irrigate in 1998. As in previous Farm and Ranch Irrigation Surveys, no attempt was made to identify and select new irrigation operations for 1998.

Chapter 12. 1998 Census of Horticultural Specialties

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Introduction

Background: For more than 150 years, the U.S. Department of Commerce, Bureau of the Census, conducted the census of agriculture and related censuses and surveys. However, the 1997 Appropriations Act transferred the responsibility from the Bureau of the Census to the U.S. Department of Agriculture (USDA), National Agricultural Statistics Service (NASS). The census of horticultural specialties is a part of the agriculture census program.

The 1998 Census of Horticultural Specialties, conducted for the first time by NASS, is the eighth census of horticultural specialties. Previous horticultural specialties censuses were conducted in conjunction with the census of agriculture and were taken in 1889, 1929, 1949, 1959, 1970, 1979, and 1988. The 1998 Census of Horticultural Specialties includes producers of floriculture, nursery, and other specialty crops, such as sod, mushrooms, food crops produced under glass or other protection, transplants for commercial production, and seeds.

Legal Authority: The 1998 Census of Horticultural Specialties was taken in accordance with the provisions of "Census of Agriculture Act of 1997," Public Law 105-113, the Census of Agriculture Act of 1997 (Title 7, United States Code, Section 2204g). The law authorizes the Secretary of Agriculture to conduct censuses and surveys deemed necessary to furnish annual or other data on the subjects covered by the census.

Reference Period: The 1998 Census of Horticultural Specialties covers operations for the 1998 calendar year, except for a small number of operations that maintain their records on a fiscal year basis. These operations were permitted to report their fiscal year that included at least half of the 1998 calendar year. Data on employment, land, structures, and equipment were to be reported for the period specified on the questionnaire.

Definition of a Horticultural Specialties Operation: The definition of a horticultural specialty operation has been changed between censuses. For the 1998 census, a horticultural specialty operation is defined as any place that grew and sold \$10,000 or more of horticultural specialty products during 1998. The definition used for the censuses in 1988, 1979, 1970, and 1959 included operations growing and selling \$2,000 or more of horticultural products during the census year. The definition used prior to 1959 used a \$1,000 minimum sales limit.

The definition of a farm in the census of agriculture, which is the basis for identifying horticultural specialty operations, has also varied. Since 1974, the census of agriculture has included all farms from which \$1,000 or more of agricultural products were produced and sold, or normally would have been sold during the census year. Prior to 1974, the farm definition was based on a lower value of products sold and included a relationship to acres in the place.

Major Data Changes: Major changes in 1998 to the horticultural specialties census were the inclusion of cut Christmas trees, short term woody crops, and marketing channels. The addition of cut Christmas trees and short term woody crops was the result of the 1997 North American Industry Classification System (NAICS), which reclassified these commodities from forestry to horticulture. NAICS also reclassified vegetable seeds and vegetable and/or melon bedding plant production to vegetable and melon farming which is not considered a horticultural speciality. However, these crops are included in the census of horticultural specialties since it was impossible to identify these operations prior to data collection. In addition, more detailed

information about aquatic plants, herbaceous perennials, tobacco transplants, and irrigation was included.

Uses of Census of Horticultural Specialties Data: The primary objective of the horticultural specialties census is to obtain a comprehensive and detailed picture of the horticultural sector of the economy. It is the only source of detailed production and sales data at the National level. The census of horticultural specialties provides detailed statistics to government agencies, academia, nursery and floriculture industries, and others on the size and structure of the horticulture industry for planning, policymaking, research, and market analysis.

Data Collection

Target Population and List Frame Development: The census of horticultural specialties list frame included all operations identified in the 1997 Census of Agriculture with sales of \$10,000 or more of horticultural specialty crops. Additional operations were added to the list frame from a continuously updated NASS name and address list that identified operations with floriculture/horticulture activity but gave no indication of the sales size of the operations. The final horticulture specialties census list frame consisted of 45,092 names. Of this number, 17,305 represented growers in the 1999 Commercial Floriculture Survey. The 1997 Census of Agriculture reported 32,531 horticultural operations.

Coordination with the 1999 Commercial Floriculture Survey: NASS coordinated the data collection activities for the 1998 Census of Horticultural Specialties with the 1999 Commercial Floriculture Survey (survey data were collected in 1999 for the 1998 production year) to reduce respondent burden and to minimize data collection expenses. The 1998 Census of Horticultural Specialties questionnaire included all questions ordinarily asked in the annual commercial floriculture survey. This format ensured that respondents who qualified for both the census and the survey did not have to file the same information in two separate reports.

The 1998 Census of Horticultural Specialties was conducted primarily by mail and supplemented by telephone calls and personal enumeration using three slightly different questionnaires. Operations that qualified for the commercial floriculture survey received one version of the questionnaire. Hawaii had its own State-specific version of the questionnaire. The remaining operations received a third questionnaire version. Questionnaire content was basically the same. Only the color of the forms was different to facilitate processing and control.

The initial mail package included a questionnaire, letter, and instruction sheet. Data collection for operations identified for inclusion in the commercial floriculture survey began December 28, 1998. Data collection for all other operations began January 4, 1999. A single mail follow-up was mailed out 4 weeks after the initial mailings to all nonrespondents.

Questionnaires were mailed from and returned to NASS regional mail centers. Mail centers opened the returned envelopes, sorted the questionnaires by State, and shipped them overnight to the appropriate NASS SSO on a daily basis.

Data Editing and Imputation for Item Nonresponse

All questionnaires were clerically reviewed in the state offices prior to data entry, to identify basic inconsistencies, and ensure that the data could be keyed. Major inconsistencies, respondent remarks, blank forms, and large horticultural operations were reviewed by analysts prior to data entry. Data from each questionnaire were processed through a computer edit that identified inconsistent entries. Each edit failure was reviewed manually.

After the edit, an imputation program was implemented for missing data and inconsistencies within the questionnaire based on State averages. Any operation that was in business but failed to respond was represented statistically by a similar operation based on type, sales, and geographical area.

Prior to publication, tabulated totals were reviewed by analysts in the SSO's to identify and resolve remaining inconsistencies and potential coverage problems. Comparisons were made to the 1997 Census data and other available check data.

Publication

The publication provided detailed U.S. level data by commodity group. State level data were present for selected data items. Sales and labor data were provided at the county level. County level data were provided by State. States not reporting an item were not listed under the item heading.

In keeping with the provisions of Title 7 of the United States Code, no data were published that would disclose information about an individual operation. States with a limited number of operations reporting an item were suppressed to avoid disclosing individual information. However, the number of operations reporting an item was not considered a release of confidential information and was provided even though other information was withheld.

Chapter 13. 1999 Agricultural Economics and Land Ownership Survey

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Introduction

Overview: Farmers are facing much uncertainty about their future livelihood and ability to maintain sustainable farm operations. Lower farm prices coupled with increased input costs and farmland values, that have only increased slightly in recent years, have placed incredible economic pressures on the Nation's agriculture economy. Strong indications of change in our agriculture economy are evidenced by concerns for farmers liquidity (capability to meet payments), profitability (net income), and solvency (ability to pay off long term debt). Many farmers, particularly smaller farmers, are leaving their occupation of choice because they can no longer rely solely on the farm to support their family, and increased off-farm income has become a necessity. These economic forces have led to significant shifts in land ownership of agriculture lands.

Background: The 1999 Agricultural Economics and Land Ownership Survey (AELOS) obtained data on the economic status of U.S. farm operations and households. It was designed to provide statistically reliable estimates of key economic and demographic variables at the U.S. and state level. The AELOS provides the only detailed estimates of agricultural land ownership, financing, and inputs by farm operators and landlords in each state and the United States.

A decision memorandum was approved by the administrator of NASS on November 11, 1997, authorizing NASS to conduct the 1999 AELOS as a special study to the 1997 Census of Agriculture. Informal working groups were established as early as April 1998. The formal AELOS Team was chartered in March 1999.

Target Population: The target population for the 1999 AELOS was the official USDA farm population defined as "all establishments that sold or would have normally sold at least \$1,000 of agricultural products during the year, excluding abnormal farms, (prison farms, university research farms, etc.)." The AELOS was conducted in every state, including Alaska and Hawaii.

Data Uses: The primary purpose of AELOS was to provide a current measure of key variables in our agricultural economy that can be used by economists, financial organizations, and Congress to assess the overall condition of the U.S. farm population. This comprehensive data set provides state level profiles of farm assets, liabilities, and operator debt, as well as tabulations of information on farm household income and wealth.

The survey results provide detailed statistics that are often used by government agencies, academia, financial institutions, legislative bodies, farmers and farmland owners for planning, policy making, research, market analysis and production decisions. Some of the data users are as follows:

- The Economic Research Service of the United States Department of Agriculture relies on AELOS data to assist policy makers, and provide essential data to economic models.
- Both the United States Congress and state legislative bodies use the data to formulate and assess economic resource legislation.
- Land Grant universities and other research organizations use these data to study the financial and socio-economic characteristics of farm and ranch families.
- Farmers and ranchers can use the AELOS data to help determine the feasibility of expanding their operations or changing some aspect of their operation to make them more profitable. Examples of these data include net cash farm income, off farm

income, operator and landlord debt, and operator and landlord assets.

- Financial Institutions use this same data to help farmers make financial decisions on their operations.

Scope and Legal Authority: AELOS was an integral part of the 1997 Census of Agriculture and was conducted under the authority of the Census of Agriculture Act of 1997 (Public Law 105-113). This law requires the Secretary of Agriculture to conduct a census of agriculture in 1998 and every fifth year following 1998. Like the census of agriculture, response to the 1999 AELOS was mandatory.

Changes from Prior Agricultural Economics and Land Ownership Surveys: The last AELOS was conducted by the Census Bureau for reference year 1988, as a special study to the 1987 Census of Agriculture. It was the continuation and update of similar studies conducted in 1959, 1964, 1970, and 1979.

Unlike previous agricultural economics and land ownership surveys, this survey was not conducted as an independent survey. Rather, NASS coordinated the implementation of the Agricultural Economics and Land Ownership Survey with its ongoing survey program. Based on similarities with NASS's Agricultural Research Management Study (ARMS) program, NASS management decided to coordinate the AELOS with the ARMS Phase III Survey to be conducted in Spring 2000 (reference year 1999). Approximately one-third of AELOS records were completed using data from the 1999 ARMS Phase III. The goal was to have an ARMS questionnaire no longer in length than in 1998. Hence, some detail was sacrificed to make room for the needed AELOS items. The Economic Research Service of the U.S. Department of Agriculture agreed to suspend collection of cost of production data for 1999 due to the increased response burden caused by AELOS. Therefore, ARMS Phase III consisted of one questionnaire version for 1999 – the Cost and Returns Report.

Data Collection

Survey Promotion: The Marketing and Information Services Office (MISO) of NASS provided each of NASS's state offices with examples of survey promotion material. States modified the material, as needed, and included additional material at their discretion. In addition, major farm magazines were contacted by MISO and articles explaining the importance and need for the data collected by the Agricultural Economics and Land Ownership Survey (AELOS) were run. Extension agents, grower's associations, and farmer's cooperatives were also contacted and informed of the importance of this survey.

Survey Phasing: Annually, NASS conducts the Agricultural Resource Management Study (ARMS) in three phases. The ARMS Phase I survey was used as a screening mechanism from which samples for the other two phases were drawn. ARMS Phase II was the Crop Production Practices questionnaire which NASS used to collect data on the detailed cropping practices for selected crops. ARMS Phase III collected information on Costs and Returns version. Data from the AELOS survey are used to provide a benchmark point, linking the agricultural census to the annual time series data collected by the ARMS Phase III survey. In order to reduce the burden on farmers, the questions on the ARMS Phase III survey were modified slightly so that farmers were required to complete only one of the surveys.

A sample of landlords identified in the Farm Operator phase of AELOS or ARMS Phase III were contacted to collect data on the amount of input they had to the farm economy. The ARMS/AELOS sample was divided into two parts, so that part of the farmers (approximately 1/3) received the ARMS III questionnaire and the rest (approximately 2/3) received the AELOS questionnaire. Landlords identified on either of these two surveys were surveyed in the second phase of AELOS. Landlords were asked questions about their entire operation and about each of the operators who identified them in the first phase.

The data collection time table for the operator and landlord components of the survey was:

Operator Questionnaire Version

Mailout (Initial mailing and follow-up mailing)	February - March, 2000
Reminder phone call or mailing	Mid-March, 2000
Non-response follow up	Late March - Late April, 2000

Landlord Questionnaire Version

Mailout (Initial mailing and follow-up mailing)	May, 2000
Reminder phone call or mailing	Mid-June, 2000
Non-response follow up	Late June - Late July, 2000

<u>Operator / Landlord Reconciliation</u>	August, 2000
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Methodology: A mix of data collection methodologies were used. Collection of AELOS data relied heavily on the mail; a mailout/mailback approach. Also, a combination of mail reminder, telephone follow-up, and/or personal enumeration was employed to obtain information from non-respondents.

Each NASS SSO was responsible for mailing their own questionnaires. Three to four weeks after the first mailing, a second mailing was sent to all non-respondents with a replacement questionnaire, cover letter and another return envelope. After the seventh week, the SSOs either sent out another replacement questionnaire or used phone enumerators to call and urge the respondents to reply. At this same time the phone enumerators offered to help operators complete the questionnaires over the phone if they choose to do so. On or around the start of the ninth week, states began field follow-up, if necessary, to achieve desired response rates. This same procedure was followed for both the operator and landlord questionnaires.

Coordination: Every effort was made to eliminate duplication in sampling and enumeration between the AELOS and other NASS probability surveys. To the extent possible, all information was collected during one contact. Farm operators who were selected for the Agricultural Resource Management Study Phase III (ARMS III) were not contacted for the AELOS survey, unless they refused to cooperate on the ARMS III survey. Data collected on the ARMS III survey were used in combination with AELOS survey to set state and National estimates.

Landlords who were identified on the AELOS operator questionnaire or the ARMS III questionnaire received a Landlord questionnaire for each tenant. This questionnaire was mailed to them in early May, with a follow up procedure similar to that used for the operators. The only major difference involved enumerators hand delivering questionnaires to landlords that received multiple questionnaires.

Questionnaire Content and Requested Data: Information about all phases of farm earnings and production expenditures were requested. Major information categories included:

- Production expenditure data for operators and their landlords, including contractor data; Respondents were asked to report only the farm share of expenses for items that may include both farm and household shares, such as electricity and telephone costs;
- Capital expenditure information was obtained for equipment and building improvements, as well as depreciation of existing capital assets;
- Components of gross income, such as net rent received, custom work, and machine hire; and
- Farm assets and debt, e.g. purchases and sales of assets such as buildings, machinery and land, changes in their value, and any associated debt.

Publication

Results of the 1999 Agricultural Economics and Land Ownership Survey (AELOS) were published in August, 2001. Copies of survey results can be obtained in electronic or paper format. An electronic copy of the survey publication can be obtained from the NASS homepage (www.usda.gov/nass) and a paper copy from NASS's Publication Office.

Chapter 14. Publication Program

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Introduction

General Information: The purpose of the census of agriculture is to collect and disseminate comprehensive, complete statistics on the production of agriculture in the United States, to various government offices, farm organizations, agribusiness, Congress, and the general public. Consequently, each census includes an extensive publication program designed to make census data available to users as economically as possible. The 1997 Census of Agriculture publication program provided that data be published in a variety of formats—Internet, printed reports, and compact-disc read only memory (CD-ROM)—accessible to the largest audience possible.

NASS issued detailed county and state level tabulations in the Volume 1, Geographic Area Series printed reports—one for each State, Puerto Rico, Guam, the U.S. Virgin Islands, and the Commonwealth of Northern Mariana Islands, and American Samoa.

The data file used for the Volume 1 printed reports formed the core of the statistical data from the 1997 Census, and also was disseminated on Internet 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 would have been sold, during the census year) as well as additional detailed data for farms with annual sales of \$10,000 or more.

Composition Systems: The principal components of census data publications are statistical tables and explanatory text and graphics. The text and graphics were prepared by Census Bureau staff using their Census Electronic Publication System (CEPS) and a commercially available electronic graphics system (EGS). The tables were produced on their Table Image Processing System II (TIPS II). TIPS II is proprietary software developed at the Bureau to produce large numbers of statistical tables for printed reports. TIPS II was modified in 1992 to be compatible with the Census Division's Tabulation and Disclosure System (TADS) which was also used in 1997 by Division staff to develop and review statistical tables electronically.

The Census Electronic Publication System (CEPS) enabled the publication staff to develop automated page layouts 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 files were output as postscript files for final review. All approved files were concatenated into individual state publication files and then copied in portable document files (PDF) format onto one CD-ROM for final printing. NASS contracted with a commercial printer, through the Government Printing Office, for production of the individual publications.

Quantity of 1997 Statistics Published: Budget constraints led NASS to both stretch out the publication program for the 1997 Census, and to reduce the total volume of material published without reducing the usefulness of the census data. The 1992 census publication program had included 2-page advance reports for each county and state, but no advance reports were released for the 1997 census. This change reduced the total volume of published pages by 6,200. The 56-part Volume 1, Geographic Area Series, State and County Data, series AC97-A-1 to -56, included final state and county (or equivalent) detailed data for the 50 States, United States Summary, Puerto Rico, Guam, the U. S. Virgin Islands, American Samoa, and Commonwealth of Northern Mariana Islands. The set contained over 24,800 pages of tabular data and text, compared

to approximately 23,000 pages in the 1992 reports.

The Volume 2, Subject Series, for 1997 comprised four reports:

- **Agricultural Atlas of the United States, AC97-SU-1**, with pages of maps and charts illustrating national agricultural statistics. It features a series of maps highlighting agricultural activities and characteristics such as farm number and size, selected crops harvested, livestock and poultry inventories and number sold, agricultural sales, production expenses, land use, irrigation patterns, fertilizer and chemical use, and machinery and equipment inventories. Data displays some changes from 1992-97; and it covers the United States, states, and counties. It is available on the Internet and as a printed report.
- **Ranking States and Counties, AC97-SU-3**, with pages of tables showing the comparative ranking of leading states and counties for selected items. It ranks the leading states and counties for selected items from the 1997 Census of Agriculture. The items ranked include number of farms, value of products sold, inventory of livestock and poultry, and production and acreage of major leading counties. Also, most tables include the cumulative percent of the United States total as each leading state or county is ranked. It is available on the Internet and as a printed report.
- **History, AC97-SU-4**, described the major census operations for the 1997 Census of Agriculture, including the follow-on censuses and surveys and the censuses of outlying areas. It is available on the Internet and as a printed report.
- **ZIP Code and Congressional District (105th Congress) Tabulations, AC97-CD-ZCCD**, showed agricultural statistics by five-digit postal ZIP Code and Congressional district (105th Congress) in two separate files, for all farms in all 50 States. Tables show the total market value of products sold and the number of farms by size of land in farms, cropland harvested, selected crops, and inventory of cattle, calves, hogs, and pigs. Crops vary by state, and tables show number of farms by acres harvested for commodities such as tobacco, cotton, soybeans for beans, peanuts for nuts, and land in orchards. It is available on the Internet and on CD-ROM.

The Volume 3, Special Studies, for 1997 also comprised four reports:

- **Farm and Ranch Irrigation Survey (1998), AC97-SP-1**, contained pages of irrigation data for the United States, individual states, and for 20 water resources areas. It represents the results from a sample survey of farm and ranch operators who reported using irrigation in the 1997 census. Data include acres irrigated; yields of specified crops; method of distribution; quantity and source of water used; number and depth of wells; pumps used in moving water; energy use; and expenditures for maintenance and investment for each state, 20 water resources areas, and the United States. In addition, it include some comparative data from 1994. It is available on the Internet and as a printed report.
- **1998 Census of Horticultural Specialties, AC97-SP-2**, present tabulations on number of establishments, value of sales, type of horticultural products, and other data items for horticultural operations. It cover the United States, each state, and leading counties. It is available on the Internet and as a printed report.
- **1998 Census of Aquaculture, AC97-SP-3**, provides data on size of operation,

methodology, sales by category, losses, irrigation, and other topics. This is the Nation's first census of aquaculture. It is available on the Internet and as a printed report.

- **1999 Agricultural Economics and Land Ownership Survey (AELOS), AC97-SP-4**, provides data for land ownership, production and capital expenses, farm acres, farm debt, and farm related incomes at the U.S. regional and state levels. It is available on the Internet and as a printed report.

Publication Media

General Information: The Census of Agriculture was traditionally published in printed reports. The popularity and convenience of electronic data by both public and private data users, led NASS 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.

USDA celebrated the release of its first census of agriculture on Wednesday, February 3, 1999 on the Jamie L. Whitten Building patio. This special occasion highlighted the:

- Transfer of the census of agriculture from the Department of Commerce, Bureau of the Census to the United States Department of Agriculture, National Agricultural Statistics Service (NASS);
- Continuation of censuses of agriculture in outlying areas (Puerto Rico, Guam, Virgin Islands, Northern Mariana Islands, and American Samoa) and assurance the future of special and follow-on studies;
- Fact that census data collection and processing utilized NASS's 45 field offices and the unique partnerships these offices maintain with State Departments of Agriculture and land-grant universities; and
- Release of U.S. census of agriculture results, ten months earlier than in previous censuses.

Data for the 1997 Census of Agriculture were published first on the Internet; and then in printed reports, and on CD-ROM. A brochure featuring "Quick Facts from the 1997 Census of Agriculture" was also available the same day the data were released on the Internet, February 3, 1999. The Government Printing Office (GPO) and the NASS vendor, the National Technical Information Service, sold the printed reports.

On-Line Access (Internet) State and County: Highlights tables and profiles, as well as the printed reports, for each state and the United States, were made available on line in Portable Document File (PDF) format. Reports for the outlying areas (Puerto Rico, Guam, Virgin Islands) were placed online as soon as they were prepared, and the printed versions followed shortly afterwards.

Printed Reports: A series of individual brochures containing colorful charts, numbers, and graphs that provide an overview of the subject matter at a quick glance. These brochures were prepared as a follow-on series to the 1997 Census of Agriculture. See list below:

Overview of U. S. Agriculture

Puerto Rico 1998 Census of Agriculture

Characteristics of Hispanic Farm Operators

1998 Farm and Ranch Irrigation Survey

1998 Census of Aquaculture

1998 Census of Horticultural Specialties

1999 Agricultural Economics and Land Ownership Survey

Appendix A: Provisions of Title 7 and Title 13 U.S.C. Relating to the 1997 Census of Agriculture

Overview: Because of the transfer of the census of agriculture from the U.S. Bureau of the Census to the U.S. Department of Agriculture, the 1997 Census of Agriculture and its components - censuses of outlying areas and special studies - were implemented under two provisions of U.S. Code. Prior to February 1997, the census was conducted under the provisions of Title 13 U.S.C. Since February of 1997, the census was conducted under the provisions of Title 7 U.S.C. Essentially, the provisions to conduct censuses and its components were the same under Title 7 as they were under Title 13 U.S.C.

Applicable sections of Title 7 U.S.C. and Title 13 U.S.C. as they relate to the 1997 Census of Agriculture follow.

Provisions of Title 7, United States Code

CHAPTER 55 - Department of Agriculture

Sec. 2204g. Authority of Secretary of Agriculture to conduct census of agriculture

(a) Census of agriculture required

In 1998 and every fifth year thereafter, the Secretary of Agriculture shall take a census of agriculture.

(b) Methods

In connection with the census, the Secretary may conduct any survey or other information collection, and employ any sampling or other statistical method, that the Secretary determines is appropriate.

(c) Year of information

The information collected in each census taken under this section shall relate to the year immediately preceding the year in which the census is taken.

(d) Enforcement

(1) Fraud

A person over 18 years of age who willfully gives an answer that is false to a question, which is authorized by the Secretary to be submitted to the person in connection with a census under this section, shall be fined not more than \$500.

(2) Refusal or neglect to answer questions

A person over 18 years of age who refuses or willfully neglects to answer a question, which is authorized by the Secretary to be submitted to the person in connection with a census under this section, shall be fined not more than \$100.

(3) Social Security number

The failure or refusal of a person to disclose the person's Social Security number in response to a request made in connection with any census or other activity under this section shall not be a violation under this subsection.

(4) Religious information

Notwithstanding any other provision of this section, no person shall be compelled to disclose information relative to the religious beliefs of the person or to membership of the person in a religious body.

(e) Geographic coverage

A census under this section shall include -

- (1) each of the several States of the United States;
- (2) as determined appropriate by the Secretary, the District of Columbia, the Commonwealth of Puerto Rico, the Commonwealth of the Northern Mariana Islands, the United States Virgin Islands, and Guam; and
- (3) with the concurrence of the Secretary and the Secretary of State, any other possession or area over which the United States exercises jurisdiction, control, or sovereignty.

(f) Cooperation with Secretary of Commerce -

(1) Information provided to Secretary of Agriculture

On a written request by the Secretary of Agriculture, the Secretary of Commerce may provide to the Secretary of Agriculture any information collected under Title 13 that the Secretary of Agriculture considers necessary for the taking of a census or survey under this section.

(2) Information provided to Secretary of Commerce

On a written request by the Secretary of Commerce, the Secretary of Agriculture may provide to the Secretary of Commerce any information collected in a census taken under this section that the Secretary of Commerce considers necessary for the taking of a census or survey under Title 13.

(3) Confidentiality

Information obtained under this subsection may not be used for any purpose other than the statistical purposes for which the information is supplied. For purposes of sections 9 and 214 of Title 13, any information provided under paragraph (2) shall be considered information furnished under the provisions of title 13.

(g) Regulations

A regulation necessary to carry out this section may be promulgated by -

- (1) the Secretary of Agriculture, to the extent that a matter under the jurisdiction of the Secretary is involved; and
- (2) the Secretary of Commerce, to the extent that a matter under the jurisdiction of the Secretary of Commerce is involved.

Sec. 2276. Confidentiality of information

(a) Authorize disclosure

In the case of information furnished under a provision of law referred to in subsection (d) of this section, neither the Secretary of Agriculture, any other officer or employee of the Department of Agriculture or agency thereof, nor any other person may -

- (1) use such information for a purpose other than the development of reporting of aggregate data in a manner such that the identity of the person who supplied such information is not discernable and is not material to the intended uses of such information; or
- (2) disclose such information to the public, unless such information has been transformed into a statistical or aggregate form that does not allow the identification of the person who supplied particular information.

(c) Violations; penalties

Any person who shall publish, cause to be published, or otherwise publicly release information collected pursuant to a provision of law referred to in subsection (d) of this section, in any manner or for any purpose prohibited in section ¹ (a) of this section, shall be fined no more than \$10,000 or imprisoned for not more than 1 year, or both.

(d) Specific provisions for collection of information

For purposes of this section, a provision of law referred to in this subsection means -

- (7) section 42 of Title 13;
- (11) section 2204g of this Title.

(e) Information provided to Secretary of Commerce

This section shall not prohibit the release of information under section 2204g(f)(2) of this title

¹ So in original. Probably should be “subsection”.

Provisions of Title 13, United States Code

CHAPTER 1. - ADMINISTRATIVE

Subchapter I - General Provisions

Sec. 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.

Sec. 2. Bureau of the Census

The Bureau is continued as an agency within, and under the jurisdiction of, the Department of Commerce.

Sec. 4. Functions of Secretary; regulations; delegation

The Secretary shall perform the functions and duties imposed upon him by this title, may issue such rules and regulations as he deems necessary to carry out such functions and duties, and may delegate the performance of such functions and duties and the authority to issue such rules and regulations to such officers and employees of the Department of Commerce as he may designate.

Sec. 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.

Sec. 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.

Sec. 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.

Sec. 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 costs, of such projects are 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 monies 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.

Sec. 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, or local government census liaison, may, except as provided in section 8 or 16 or chapter 10 of this title or section 210 of the Departments of Commerce, Justice, and State, the Judiciary, and Related Agencies Appropriations Act, 1998 or section 2(f) of the Census of Agriculture Act of 1997
- (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.

- (a) 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.

Sec. 11. Authorization of appropriations

There is authorized to be appropriated, out of the Treasury of the United States, such sums as may be necessary to carry out all provisions of this title.

Sec. 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

Sec. 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.

Sec. 22. Qualifications of permanent personnel

All permanent officers and employees of the Bureau shall be citizens of the United States.

Sec. 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.

Sec. 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.

Sec. 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.

Sec. 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 V - Geographic Scope, Preliminary and Supplemental Statistics, and Use of Sampling

Sec. 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.

Sec. 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.

Sec. 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

Sec. 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.

Sec. 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.

Sec. 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.

Sec. 214. Wrongful disclosure of information

Whoever, being or having been an employee or staff member referred to in subchapter II of chapter 1 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, or whoever, being or having been a census liaison within the meaning of section 16 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

Sec. 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 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.

Sec. 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.

Sec. 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.

Sec. 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

Sec. 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.

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.)

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

¹ The Federal Government published a separate report covering the nondemographic data collected 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.

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 Census of Agriculture form 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

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, 1987, and 1997 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.

In 1997, Congress transferred the Census of Agriculture program from the Department of Commerce, Bureau of the Census to the Department of Agriculture, National Agriculture Statistics Service. This transfer of authority was enacted into law (P.L. 105-113 on November 21, 1997). Because the census was transferred mid-way during the five year census cycle, implementation was a joint process between Census Bureau and the National Agriculture Statistics Service (NASS). However, beginning in February 1997, NASS was responsible for coordination and completion of the census mailout, data processing, and publication of the results. This transfer of authority included future censuses in the 50 states and outlying areas, and follow-on surveys.

The transfer of the census of agriculture to the USDA assured sufficient resources for the census of agriculture. Planning, collection, and release of census results were expected to be more efficient by consolidating the experience and resources of NASS and the Census Bureau. Expectation was that this consolidation would reduce response burden. Furthermore, past data collection activities of these two agencies, NASS and the Census Bureau, required both to maintain separate lists of farms and ranches. With the census responsibility, NASS can develop one master list that can be used both for the census and ongoing sample surveys.

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

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.

on Indian reservations. In later canvasses, farmers and farmers' wives frequently were hired to carry out the canvass.

In the 1954 Census of Agriculture, 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 Census of Agriculture, 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 follow-up activities.

While far more convenient for farmers and more economical 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 follow-up 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.

During the 1992 and previous censuses, American Indian farm operations on reservations were enumerated at the reservation level, generally as a single unit. In the 1997 Census, the historic methodology was used in conjunction with an additional procedure to count American Indian farm operators on reservations, who were not counted individually.

Sampling: The Census Bureau introduced sampling for specific information in the 1940 Census of Agriculture, when it sampled the collected data for a series of special tabulations. The 1945 Census of Agriculture 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 sample³ that included approximately 7 percent of all farms in the United States.

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 Census of Agriculture 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 Censuses of Agriculture. However, following the 1978 operation, Congress withdrew funding and ended the agricultural services censuses program.

Follow-on Sample Surveys: Follow-on surveys enabled the Census Bureau, and more recently NASS, 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 agriculture census program to draw a sample from the pool of agriculture census farms, and requested operators to provide more detailed information on their agricultural activities, than was possible 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

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 farmers in the segments to collect the data needed.

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.

In conjunction with the 1997 Census of Agriculture, three follow-on surveys were conducted. They were the 1998 Farm and Ranch Irrigation Survey, 1998 Agricultural Economics and Land Ownership Survey, and 1998 Census of Aquaculture.

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, follow-on surveys usually were carried out for the calendar year following the census reference year; e.g., the 1997 follow-on program data collection activities all took place in 1999, and requested data for calendar year 1998.

Report Form Content and Format

Content: During 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). Content of the 1997 Census of Agriculture was essentially the same as the 1992 Census. However, because farms were classified according to the new North American Industry Classification System (NAICS), two new commodities - cut Christmas trees, and acres of maple trees and number of maple trees tapped - were added to the census questionnaire. Additional detail on plantain and tanager production was added. Items removed from the 1997 Census included land diverted under annual commodity adjustment programs, and Commodity Credit Corporation loans for honey and rye.

Format: 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. 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 Bureau of the Census eliminated 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 forms⁴ were used only for Hawaii, Puerto Rico, and the outlying areas.

The census used the standard form, for farms in the 50 States which were expected to have \$2,500 or more in agricultural products sold during the census year. 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 nonsample⁵ forms 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. The longer form 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, 1992, and 1997 Censuses, although the number of regions was raised to 13. (In the 1982 Census, 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. In 1997 Hawaii and Alaska were separate regions.)

⁴ The Census Bureau also produced separate report forms for the agricultural services census, and the decennial censuses of irrigation, drainage, and horticultural specialties were 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.

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 Census of Agriculture) 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 Census of Agriculture 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 Census of Agriculture. 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 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. As a result of the transfer of the agriculture censuses from the Bureau of the Census to the Department of Agriculture, National Agriculture Statistics Service (NASS), in 1997 census activities were conducted by NASS's state offices. Specifically, collection of data on "tagged" records and telephone follow-ups were conducted by the respective state offices. In addition, each state offices each reviewed the preliminary data tabulations and the final tabulations before being published. Appropriate follow-up and corrections were made by the state offices. This approach allowed NASS to utilize its knowledge of local agriculture and incorporate known information into the state tabulations.

Publication: Census of Agriculture 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 Census 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 Census of Agriculture 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 of the Census provided 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 discs virtually identical to those introduced for audio recordings, and a single read only memory disc 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 Census of Agriculture data file could be contained on a single CD-ROM disc with room to spare. The Census Bureau, after producing two test discs to evaluate the capabilities of the new medium, adopted it for future censuses and issued the final 1987 Census of Agriculture data file on a single CD-ROM. The basic State and county data for the 1992 Census of Agriculture 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:

- Involved in, or connected with, agricultural operations, and
- 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 following).

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.

- 1978-1992 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.
- 1997 Agricultural operations with all acreage in the Conservation Reserve Program (CRP) or Wetlands Reserve Program (WRP) were included as farms in the 1997 Census tabulations. For the 1992 Census, farms that had all their acreage in the CRP or WRP were not included.

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 Census of Agriculture - actually conducted in 1990 for the Commonwealth of the Northern Mariana (CNMI) 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. In 1997 for Guam and the Virgin Islands of the United States, any place with \$500 in annual sales of agricultural products qualified as a farm. In CNMI, any place with \$1,000 in annual sales qualified as a farm. In American Samoa, any place that raised or produced any agricultural product for sale qualified as a farm.

Appendix C: Volume of 1997 Census of Agriculture Mailout and Follow-up Mailings

**Table C1. 1997 Census of Agriculture: Initial Mailout (December 10-19, 1997),
Supplemental Mailing (December 15, 1997 - January 16, 1998),
and Forms Handled by State Statistical Offices**

Form Type	Quantity
Forms Mailed From National Processing Center:	
Initial Mailing:	
Nonsample (forms 97-A0101 to 97-A0111)	2,090,424
Sample Non-must (forms 97-A0201 to 97-A0213)	568,047
Must Cases (forms 97-A0301 to 97-A0311)	121,371
Forms with Special Inserts (Xmas Trees and Maple Syrup)	<u>22,083</u>
Sub-total	2,801,925
Supplemental Mailing:	
Screener in-scope and Nonresponse forms, and late adds)	368,038
Cases Handled by State Statistical Offices:	
Citrus Caretakers (form 97-A0215)	288
Multi-units (forms 97-A0201 to 97-A0213 and 97-A0301 to 97-A0311) ..	4,064
Abnormals (forms 97-A0201 to 97-A0213 and 97-A0301 to 97-A0311) ..	1,513
Tagged Records	<u>29,350</u>
Sub-total	35,215
Total Forms	3,205,178

**Table C2. Geographic Groupings Used During the 1997 Census of Agriculture
Mail-Follow-up Operations**

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

Table C3. First Follow-up: Reminder/Thank You Card, 1997

Date	Quantity
January 7-9, 1998	2,933,170

Note: The Reminder Card was mailed to all addresses in the mail file except multi-units and abnormals.

Table C4. Report Forms Mailed by Segment and Mailout Follow-up, 1997

Segment	Second Follow-up (February 11 - 24, 1998)	Third Follow-up (March 19 - April 1, 1998)
1	60,780	41,710
2	168,113	98,685
3	129,942	83,730
4	164,213	98,188
5	146,310	84,568
6	183,162	113,488
7	176,659	107,354
8	132,999	82,085
9	<u>113,144</u>	<u>71,015</u>
Total	1,275,322	780,823

Table C5. Receipts of Undeliverable As Addressed (UAA) and Retailed Corrections, 1997

Undeliverable As Addressed (UAA) Activity	Mailout Date	Quantity
UAAs Received:		
UAAs from First Mailing	December 18 - 31, 1997	55,191
UAAs from Second Mailing	January 2 - 26, 1998	<u>93,139</u>
Total	--	148,330
Corrected UAAs Mailed	On flow basis	65,000

Table C6. Summary of Screener Form Results, 1997

Screener Activity	Quantity
Total Screener Forms Mailed	478,299
Screener Receipts with Out-of-Scope Status	125,570
Screener Receipts Not Classified as Out-of-Scope	352,729
Results of Questionnaire Mailing to Screener I/S and NR:	
In-scope (I/S) Report Forms	198,300
Non-response (NR) Report Forms	154,429

Appendix D: Chronology of Major 1997 Census of Agriculture Program Activities

<u>Major Activities</u>	<u>Began</u>	<u>Completed</u>
1997 Census of Agriculture (United States) --		
Determination of Processing Framework and Resources	01/95	10/96
Report Form and Related Materials Preparation and Printing:		
Forms content and design	06/94	11/96
OMB clearance	05/96	09/96
Form contract and printing	03/96	10/97
Census List Frame Development:		
Procure source lists	10/95	09/97
List model development	04/96	04/97
List production	04/96	09/97
Final list creation	10/97	10/97
Mail Preparation and Mailouts:		
NPC mail packet preparation for postal delivery	11/97	04/98
Initial mailout	12/97	12/97
First (reminder card) follow-up	01/98	01/98
Second and third follow-up	02/98	04/98
Computer Assisted Telephone Interview (CATI):		
Planning, development, and testing	03/95	10/97
Data collection	03/98	07/98
Precomputer Processing:		
Receipts (Open and Sort) and Check-in	12/97	07/98
Special case processing and "2+" processing	12/97	07/98
Large farm coverage	02/98	07/98
Data entry/capture	01/98	07/98
Computer Processing:		
Edit/item imputation	03/98	12/98
Analytical/table review	06/98	07/99

<u>Major Activities</u>	<u>Began</u>	<u>Completed</u>
1997 Census of Agriculture (United States) Con. -		
Coverage Evaluation [Data collection activities only]:		
Nonresponse Survey	04/98	10/98
Classification Error Survey	03/98	12/98
Not-on-the-Mail List Survey	02/98	12/99
Tabulation/Publication	08/98	09/99
Census of Agriculture (Outlying Areas) --		
1998 Census of Agriculture - Puerto Rico:		
Negotiate special agreements	02/97	11/98
Planning and development	07/94	03/00
Data collection	06/98	11/98
Editing, tabulation, and review of data	12/98	06/99
Publication and release of data	07/00	03/00
1998 Census of Agriculture - Virgin Islands:		
Negotiate special agreements	01/98	05/98
Planning and development	04/95	05/98
Data collection	07/98	08/98
Editing, tabulation, and review of data	10/98	04/99
Publication and release of data	01/00	03/00
1998 Census of Agriculture - Guam:		
Negotiate special agreements	01/98	05/98
Planning and development	04/95	05/98
Data collection	07/98	08/98
Editing, tabulation, and review of data	10/98	06/99
Publication and release of data	06/00	03/01
1998 Census of Agriculture - Northern Mariana Islands:		
Negotiate special agreements	01/98	05/98
Planning and development	04/95	05/98
Data collection	07/98	08/98
Editing, tabulation, and review of data	09/98	06/99
Publication and release of data	06/00	03/01

<u>Major Activities</u>	<u>Began</u>	<u>Completed</u>
Census of Agriculture (Outlying Areas) Con. -		
1999 Census of Agriculture - American Samoa:		
Negotiate special agreements	03/98	01/99
Planning and development	03/98	01/99
Data collection	03/99	04/99
Editing, tabulation, and review of data	06/99	01/00
Publication and release of data	06/00	06/01
Follow-on Surveys and Special Studies --		
1998 Census of Horticultural Specialties:		
Planning and development	05/97	11/98
Data collection	01/99	06/99
Editing, tabulation, and review of data	02/99	03/00
Publication and release of data	03/00	03/00
1998 Census of Aquaculture:		
Planning and development	06/97	12/98
Data collection	12/98	03/98
Editing, tabulation, and review of data	01/99	12/99
Publication and release of data	01/00	02/00
1998 Farm and Ranch Irrigation Survey:		
Planning and development	05/98	02/99
Data collection	02/99	04/99
Editing, tabulation, and review of data	04/99	11/99
Publication and release of data	11/99	11/99
1999 Agricultural Economics and Land Ownership Survey:		
Planning and development	04/98	05/00
Data collection	02/00	07/00
Editing, tabulation, and review of data	05/00	08/01
Publication and release of data	08/01	12/01

Appendix E: General Methodology and Data Changes

Background Information: Because of the transfer of the agriculture census from the Department of Commerce to the Department of Agriculture during the planning and design phase of the 1997 Census of Agriculture, the Department of Commerce and Secretary of Agriculture shared authority and responsibility for the design and content of all census data collection forms. This task was delegated to the Director of the Bureau of the Census and the Administrator of the National Agricultural Statistics Service (NASS).

Interested organizations and agencies, including the U.S. Department of Agriculture, the Bureau of Economic Analysis, and others, are regularly consulted for comments and suggestions regarding the report forms and needed data. The Census Bureau's advisory committee on agricultural statistics reviewed the proposed forms, and made suggestions, comments and data requests, and makes their own recommendations on the priorities to be assigned to the various items for inclusion in the final report forms. Because of timing issues associated with the 1997 Census of Agriculture, and the organization of NASS's advisory committee on agricultural statistics, the NASS advisory committee on agricultural statistics did not have an opportunity to comment on the 1997 Census forms used for the states, follow-on censuses/surveys, and those used in outlying areas. The governments of the outlying areas and their respective data users contributed to the development of the questionnaires and data collection methodology used. Additional details about the data and report form consultation process is contained in the respective chapters of the corresponding publications.

1997 Census of Agriculture - States

General Methodology: The 1997 state report forms used the same basic format, layout, and data items as the 1992 report forms. The census retained the regionalized census report forms. A total of 9 multi-state regions were used. The States of Florida, Texas, Hawaii, and Alaska were considered individual regions and a separate report form was developed for each of these states. A total of 13 regionalized forms were developed.

Three report forms were used for each region except Hawaii and Alaska – a “nonsample” version, a “sample” version, and a “must” version. Hawaii and Alaska used only the “sample” version. All of the report forms used identical formats, but employed tailored items to list crops and livestock common within each region.

The nonsample questionnaires contained the items asked of all respondents, while the sample versions included additional questions asked only of the sample of farmers. The additional questions included 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.

In addition, a separate form (97-A0215) was designed and used for the Citrus Caretaker survey.

Prior to the initial mailout of the census forms, a "screener" form was sent to preselected names and addresses on the mail list that had a high probability of not being a farm based on the census definition of a farm. The form consisted of four basic "yes" or "no" questions. If all four questions were answered "no", the name and address was deleted from the mail list. Remaining respondents and nonresponse respondents were included in the census mail list.

Major Content/Data Item Changes: Most data are comparable between the 1997 and 1992 Censuses. The bulk of the data collected on agricultural operations focused on basic information on 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 was adjusted to reflect these changes. Farms with all acreage in the Conservation Reserve Program (CRP) or the Wetlands Reserve Program (WRP) are included in the census tabulations. For the 1992 Census, farms that had all their acreage in the CRP or WRP were not included in the tabulations.

For the 1997 Census, farms were classified according to the new North American Industry Classification System (NAICS) Due to NAICS, short rotation woody crops, which includes Christmas tree and maple sap gathering, are considered crop production. Individual datum item changes were as follows.

Significant wording changes:

- **Section 2:** "Potatoes, Irish" changed to "Potatoes"
- **Section 4:** "Bedding plants (include vegetable plants.)" changed to "Bedding/Garden plants - annuals, herbaceous perennials, and vegetable plants"
- **Section 16:** "Hens and pullets of laying age" changed to "Layers 20 weeks old and older"
- **Section 16:** "Pullets 3 months old or older not of laying age" changed to "Pullets 13 weeks old to 19 weeks old"
- **Section 16:** "Pullet chicks and pullets under 3 month sold" changed to Pullet chicks and pullets less than 13 weeks old"
- **Income from Farm-related sources:** "Sales of forest products and Christmas Trees - Include maple products, naval stores, firewood, etc." changed to "Sales of forest products – Include naval stores, firewood, etc. (DO NOT include sales of Christmas trees or maple products.)"

- **Characteristics and Occupation of Operator:** “Spanish/Hispanic origin” changed to “Spanish, Hispanic, or Latino origin”

Deleted items:

- **Section 12:** “How many acres were set aside (or diverted) under annual commodity acreage adjustment programs?”
- **Government CCC Loans:** “Rye, and honey”

New items:

- **Section 4, Nursery and Greenhouse Crops:** Cut Christmas trees harvested.
- **Section 7, Other Crops:** Maple trees tapped (number of taps).

Item sub-divided:

- **Machinery and Equipment:** “Wheel tractor other than garden tractors and motor tillers – 40 horsepower (PTO) or more” sub-divided into “Wheel tractors 40 to 99 horsepower (PTO)” and “Wheel tractors 100 horsepower (PTO) or more”

1998 Census of Agriculture - Puerto Rico

General Methodology: The method used for collecting data for the 1998 Census of Agriculture for Puerto Rico differed slightly from that used for the previous census. Though both the 1998 and 1993 Censuses used list and area frames, the 1998 Census of Agriculture mailed questionnaires to every operation on the mail list, while in 1993 questionnaires only went to those operations that were believed to have produced \$2,500 or more in agricultural products. Also, the area frame used in 1993 used segments based on political boundaries and were enumerated by using maps, whereas the 1998 area frame used segments based on physical boundaries selected from satellite photos.

Major Content/Data Item Changes: Based on feedback from data users in Puerto Rico, including the Puerto Rico Department of Agriculture, the College of Agriculture of the University of Puerto Rico, the Extension Service, and the Puerto Rico Planning Board, the following changes were made to the 1998 report form:

Item/Section sub-divided/consolidated:

- **Land use:** Categories of land use altered. Cropland was expanded from two to five categories.
- **Pastureland:** Categories of pastureland altered. Pastureland consolidated from three categories to one category.
- **Poultry:** Breakout of “layers less than one year of age” and those “over one year of age” consolidated into “all layers.”

- **Poultry:** Breakout of chicken egg production from “total” to “eggs for consumption” and “eggs for hatching.”
- **Grains and Farinaceous Crops:** Created separate sections, one for “Grains and Legumes” and another for “Root Crops and Tubers.”

Deleted items:

- **Machinery, Equipment, and Buildings:** Carts (oxen or tractor drawn)

New items listed:

- **Vegetable or Melon:** “Onions,” and “herbs and spice plants” listed as an item.
- **Ornamental Plants:** “Bedding plants” and “tree seedlings” listed as an item.

Added items:

- **Land Irrigated:** “Type of irrigation method used, gravity, drip or trickle, sprinkle, and subirrigation.”
- **Income from Farm-related Sources:** “Sale of farm by-products or waste materials.”
- **Lime, Fertilizers, Pesticides, or Other Chemicals:** “Land treated with organic fertilizers.”
- **Production Expenses:** “Veterinarian services” and “All other expenses.”
- **Machinery, Equipment, and Buildings:** “Buildings to house livestock.”
- **Market Value of Land and Buildings (New Section):** Estimate of the market value of “All land and buildings owned,” “All land and buildings rented or leased from others,” and “All land and buildings rented or leased to others.”

Moved items:

- **Horticultural Specialties:** Tree seedlings for coffee, orange, plantain, and banana trees moved from section on grasses and other crops to the section on horticultural specialties.

1998 Census of Agriculture - Guam

General Methodology: The same method of data collection was used for the 1998 as was during the 1993 Census of Agriculture. However, there were two changes, the farm definition and reference period. The statistics collected in the 1998 Census relate to places with agricultural operations qualifying as farm operations according to the census definition. This included all places from which \$1,000 or more of agricultural products were produced and sold, or normally would have been sold during the 12 month period between July 1, 1997 and June 30, 1998. The

farm definition differs from that used in 1993 when the minimum value of sales to qualify as a farm was \$100. In addition, the a slightly different reference period was used. For the 1998 Census, enumerators asked their questions in terms of "... in the last 12-months?" whereas for the 1993 Census, questions were asked in terms of "... in 1992?"

Major Content/Data Item Changes: There were no significant changes to the content of the questionnaires between the 1993 and 1998 Censuses. The 1998 questionnaire included all the same items as the 1993 report form. However, two additional items were specifically preprinted on the 1998 Census report form and one question was subdivided, and one item on the 1993 questionnaire was no longer preprinted.

New items listed:

- **Section 2, Root Crops:** Ginger, where as on the 1993 questionnaire it would have been reported under "Other root crops - Specify."
- **Section 3, Vegetables or Melons:** "Alfalfa and/or bean sprouts", where as on the 1993 questionnaire were reported under "Other vegetables and melons - Specify."

Item sub-divided:

- **Section 9, Fish or Aquaculture:** The 1993 questionnaire asked "How many PONDS did you use?" where as the 1998 questionnaire asked, "How many in-ground ponds did you use?" and "How many above-ground tanks did you use?"

Item no longer listed:

- **Section 3, Vegetables or Melons:** Beans, bush (K.W.), where as on the 1998 questionnaire were reported under "Other vegetables and melons - Specify."

1998 Census of Agriculture - Virgin Islands

General Methodology: The same method of data collection was used for the 1998 as was during the 1993 Census of Agriculture. However, there was only one change, the farm definition. Statistics collected in the 1998 Census relate to places with agricultural operations qualifying as farm operations according to the census definition. This included all places from which \$1,000 or more of agricultural products were produced and sold, or normally would have been sold during the 12 month period between July 1, 1997 and June 30, 1998. The farm definition differs from that used in 1993 when the minimum value of sales necessary to qualify as a farm was \$100.

Major Content/Data Item Changes: There were no significant changes to the content of the questionnaires between the 1993 and 1998 Censuses. The 1998 questionnaire included all the same items as the 1993 report form. However, one question was subdivided.

Item sub-divided:

- **Section 8, Fish or Aquaculture:** The 1993 questionnaire asked "How many PONDS did you use?" where as the 1998 questionnaire asked, "How many in-ground ponds did you use?" and "How many above-ground tanks did you use?"

1998 Census of Agriculture - Commonwealth of Northern Mariana Islands

General Methodology: The same basic method of data collection and the type of data collected for 1998 were the same as during the 1990 Census. This is the first agriculture census taken in the Commonwealth of Northern Mariana Islands that was done as part of the population census. Expectation is that future agriculture censuses will be conducted on the same five-year cycle used for the main U.S. census of agriculture. The major difference between the 1998 and 1990 Census is the farm definition. The farm definition for 1998 included all places from which \$1,000 or more of agricultural products were produced and sold, or normally would have been sold during the calendar year of 1997. The definition differs from that used in 1990 only in the minimum amount of sales necessary to be classified as a farm; 1990 definition was \$100.

Major Content/Data Item Changes:

New items listed:

- **Section 2, Root Crops:** Ginger, where as on the 1993 questionnaire it would have been reported under “Other root crops - Specify.”
- **Section 3, Vegetables or Melons:** “Alfalfa and/or bean sprouts”, where as on the 1993 questionnaire were reported under “Other vegetables and melons - Specify.”

Item sub-divided:

- **Section 9, Fish or Aquaculture:** The 1993 questionnaire asked “How many PONDS did you use?” where as the 1998 questionnaire asked, “How many in-ground ponds did you use?” and “How many above-ground tanks did you use?”

Item no longer listed:

- **Section 3, Vegetables or Melons:** Beans, bush (K.W.), where as on the 1998 questionnaire were reported under “Beans, all other varieties.”

1999 Census of Agriculture - American Samoa

General Methodology: The same basic method of data collection and the type of data collected for 1999 were the same as during the 1990 Census. This is the first agriculture census taken in American Samoa that was not done as part of the population census. Future agriculture censuses in American Samoa will be conducted on the same five-year cycle used for the main U.S. census of agriculture. The major difference between the 1998 and 1990 census is the farm definition. Statistics collected in this census represent all places in American Samoa with agricultural operations during the 1998 calendar year. The 1999 farm definition was any place that raised or produced any agricultural production for sale or consumption. This is a broader farm definition than was used in the past; the 1990 definition required a minimum of \$100 in sales.

Major Content/Data Item Changes:

New items:

- **Sections 6** asks for information on how many ponds or tanks were used to produce Tilapia, Shrimp, Crayfish, Clams, and Other species, and collects data on pounds sold, gross value of sales, and quantities raised for home consumption.
- **Section 7** asks for data regarding fishing activities, including the number of boats used, and the quantities caught and sold, the value of sales, and the quantities consumed of fish and giant clams.
- **Section 10** of the 1999 questionnaire collects information on household characteristics, requested by the Department of Interior and the Bureau of Census to complement household surveys that they conduct in American Samoa.
- **Section 9, Equipment and Facilities:** Tillers of all kinds, Chain Saws, Weed Eaters, Mist Blowers, and Knap Sacks were added to the list of equipment to be reported.

Items sub-divided:

- **Section 2, Field Crops, Melons, and Vegetable:** Eggplant, Green onions, and Tomatoes were preprinted on the report form, whereas in the past they would have been included in the “Other” category.
- **Section 3, Fruits and Nuts:** Bananas were sub-divided into two categories, Fai Palagi and other varieties. Previously there was only one category for bananas.
- **Section 4, Land Use:** Woodland was added as a separate use of the land, whereas before it was included in “All other land.”

1998 Census of Horticultural Specialties

General Methodology: The 1998 Census of Horticultural Specialties, conducted for the first time by NASS, was last conducted in 1988. The 1998 Census of Horticultural Specialties includes producers of floriculture, nursery, and other specialty crops, such as sod, mushrooms, food crops produced under glass or other protection, transplants for commercial production, and seeds.

The definition of a horticultural specialty operation changed between the 1988 and 1998 Census. For the 1998 Census, a horticultural specialty operation was defined as any place that grew and sold \$10,000 or more of horticultural specialty products during 1998. The definition used for the census in 1988, and the three previous censuses (1979, 1970, and 1959) included operations growing and selling \$2,000 or more of horticultural products during the census year.

Major Content/Data Item Changes: Major changes in 1998 to the horticultural specialties census are the inclusion of cut Christmas trees, short term woody crops, tobacco transplants, aquatic plants, marketing channels, source of irrigation water, method of irrigation used, and percent of irrigation water recycled. The addition of cut Christmas trees and short term woody crops is a result of the 1997 North American Industry Classification System (NAICS), which

reclassified these commodities from forestry to horticulture. NAICS also reclassified vegetable seeds and vegetable and/or melon bedding plant production to vegetable and melon farming which is not considered a horticultural speciality. However, these crops are included in the census of horticultural specialties since it was impossible to identify these operations prior to data collection. In addition, more detailed information about aquatic plants, herbaceous perennials, tobacco transplants, and irrigation were included.

Significant wording changes:

- Vegetable transplants for commercial truck crop production changed to Transplants for commercial production.
- Greenhouse produced vegetables changed to Greenhouse produced food crops.

Deleted items:

- **Method Used to Grow Nursery Plants:** Data were not published on the method used to grow nursery plants, such as container grown or field grown. Prior to 1998, number sold and sales data were collected and published by method used to grow nursery plants. In 1998, this section was revised to provide more information on growing area and more detailed information on field grown nursery plants. Although the revised section was tested and appeared to have no major problems, there was inadequate response to the section during data collection. Poor data quality and lack of time to resolve the data problems caused the data to be withheld. Planning for the next census of horticultural specialties should include plans to reinstate the data series on method used to grow nursery plants.

Changed Items:

- **Sod Harvested:** Sod harvested was changed to Sod harvested, sprigs, or plugs. Previously sprigs or plugs were excluded because they were reported as other crops in the agriculture census instead of other horticulture.
- For foliage plants the number of pot sizes decreased from 5 to 3 and the number of hanging basket sizes decreased from 2 to 1.
- Herbaceous perennials were given their own section and taken out of the bedding/garden plants and nursery sections.
- There were also some changes to the list of plants in most of the sections.

1998 Farm and Ranch Irrigation Survey (FRIS)

General Methodology: The basic method of data collection - mail and telephone follow-up - and the type of data collected for the 1998 survey were similar to the 1994 survey. However, the 1998 Farm and Ranch Irrigation Survey (FRIS) utilized the resources of NASS's 45 State Statistical Offices (SSOs). This provided expanded opportunities for telephone follow-up and/or personal enumeration of nonresponse cases. Furthermore, this was the first FRIS to collect and publish data for each of the 50 States. Previous farm and ranch irrigation surveys published data for only leading irrigation States, with a U.S. total, excluding Alaska and Hawaii. The current farm definition, first used in 1974, is any place from which \$1,000 or more of agricultural products were produced and sold, or normally would have been sold, during the census year.

Appendix F: Abbreviations

AELOS	Agricultural Economics and Land Ownership Survey
AGR	Agriculture and Financial Statistics Division
AHS	Annual Housing Survey
ARMS	Agricultural Resources Management Study
ASCS	Agricultural Stabilization and Conservation Service
CAAS	Census of Agriculture Area Sample
CATI	Computer Assisted Telephone Interview
CATS	Census of Agriculture Tracking System
CD-ROM	Compact Disc-Read Only Memory
CEPS	Census Electronic Publication System
CES	Classification Error Survey
CFN	Census File Number
CNMI	Commonwealth of Northern Mariana Islands
CPPS	Census Planning and Procedures Section
CPOC	Census Processing Order Code
CRP	Conservation Reserve Program
CRR	Cost and Returns Report
DKWU	Data Keying Workunit
DPD	Data Processing Division (Currently NPC)
DSB	Data Systems Branch
DUP	Duplicate
EGS	Electronic Graphics System
EIN	Employer Identification Number
ELMO	Enhanced List Maintenance Operations (system or database)
ERS	Economic Research Service
EPD	Economic Programming Division
ES	Extension Service
FAS	Fall Area Survey
FRIS	Farm and Ranch Irrigation Survey
GDP	Gross Domestic Product
GPO	Government Printing Office
ICO	Incorrectly Classified (Overcount)
ICU	Incorrectly Classified (Undercount)
ID	Identification

IE	Interactive Edit (Blaise)
IRS	Internal Revenue Service
I/S	In-scope
JAS	June Area Survey
LFCU	Large Farm Coverage Unit
LSFID	List Survey Frame Identification
MISO	Marketing and Information Services Office
NAICS	North American Industry Classification System
NASS	National Agricultural Statistics Service
NML	Not-on-the-Mail List
NPC	National Processing Center
NR	Non-response
NRS	Non-response Survey
O/S	Out-of-Scope
PDF	Portable Document Format
PES	Post Enumeration Survey
PPDCS	Planning, Procedures, and Data Collection Section
PRDA	Puerto Rico Department of Agriculture
PSU	Primary Sampling Unit
PTO	Power Take-off
REE	Research, Education, and Economics
RFO	Resident Farm Operator
SAS	Statistical Analysis System
SIC	Standard Industrial Classification
SMS	Survey Management System
SSN	Social Security Number
SSO	State Statistical Office
TADS	Tabulation and Disclosure System
TIPS	Table Image Processing
TVP	Total Value Product
UAA	Undeliverable As Addressed
UPR-ES	University of Puerto Rico - Extension Service
USDA	U.S. Department of Agriculture
USVI	U.S. Virgin Island
WRA	Water Resource Area
WRP	Wetlands Reserve Program