

CONTENTS

Chapter 7. Census of Agriculture in Puerto Rico

	Page
Introduction	62
Historical Background	62
Legal Authority and Special Agreement	62
Farm Definition	62
Planning	64
Preliminary planning	64
General plan of the census	64
Census schedule	64
Preparatory Operations	64
Report Forms	64
Field Organization and Training	65
General organization	65
Recruiting and training	65
Training and reference materials	65
Maps	66
Publicity	66
Field Enumeration	66
Taking the Census	66
Enumeration portfolios	66
Field enumeration procedures	67
Callbacks	67
Special Farms	68
Compilation of the special farms list and mailout	68
Field followup	68
Field Review and Quality Control	68
Results	68
Data Processing	69
General Information	69
Field Office Processing	69
Check-in	69
Clerical operations	69
Data keying	69
Local tallies	69
Office closeout	69
Computer Processing	69
General information	69
Editing	69
Sampling and Statistical Estimation	70
Tabulation	70
Comparability of the Data	70
Publication Program	70

INTRODUCTION

Historical Background

The Census Bureau first included Puerto Rico in the agriculture census program in the 1910 decennial enumeration, and continued to carry out agriculture censuses of the Commonwealth every 10 years, in conjunction with the decennial population censuses, through 1950. Congress authorized quinquennial censuses of agriculture for the United States in 1915, although the first was not actually conducted until 1925, but neither Puerto Rico nor the other outlying areas (see ch. 8) were included in this program until 1964. (The only nondecennial agricultural enumeration for the Commonwealth in the intervening years was conducted by the Puerto Rico Reconstruction Administration in 1935.) Congress altered the dates of the agriculture censuses in 1952, requiring that they be carried out every 5 years in years ending in "4" and "9." While Puerto Rico still was not part of the regular quinquennial agricultural program, the 1960 enumeration collected data for the 1959-1960 crop year—approximately the same production period as in the census for the United States proper. The Commonwealth was included in the quinquennial census of agriculture for the first time in the 1964 enumeration.

Following legislation passed in 1972 requiring that the agriculture and economic censuses use the same reference years, the Bureau shortened the periods between the two subsequent agricultural enumerations by 1 year each. This enabled the agriculture census to be brought into conjunction with the economic enumerations (carried out for years ending in "2" and "7") for the 1982 and following censuses. The censuses in Puerto Rico had converged somewhat earlier, when, for the 1978 agricultural enumeration, the Bureau retained the offices and office staff organized for the 1977 Economic Censuses, and advanced the schedule for the agricultural enumeration by a full year. The agency made similar arrangements for the 1982 census, but because of the alteration in the general agriculture census schedule, the Puerto Rico enumeration began (as it had prior to the 1978 census) just as the census of the 50 States was being completed.

For the 1987 censuses, the Bureau's Agriculture Division (AGR) assumed responsibility not only for the agricultural enumeration in Puerto Rico, but also for all the economic censuses there. This combining of all agricultural and economic activities in a single staff and organization made possible certain economies of scale, and simplified the total operation. In addition, the planners decided that for the 1987 agricultural enumeration, as much as possible of the edit work on the report forms should be done in Puerto Rico, including computer editing using a minicomputer system and staff in the San Juan office. (The Puerto Rico office also keyed report forms for Guam and the U.S. Virgin Islands, all of which were routed through the San Juan facility before being sent on to Bureau headquarters for editing and tabulation.)

Legal Authority and Special Agreement

Title 13, United States Code, sections 142(a) and 191 provide for a census of agriculture in Puerto Rico every 5 years for years ending in "2" and "7." The conduct of the census is governed by the provisions of Title 13 and relevant acts of the legislature of the Commonwealth of Puerto Rico, to the extent the provisions of such acts are not in conflict with Federal law. The Director of the Bureau of the Census and representatives of the Commonwealth Government signed a special agreement in September 1986 establishing the respective functions and responsibilities of the Bureau and the Commonwealth in the conduct of the agriculture census. (This agreement also covered the conduct of the 1987 Economic Censuses in Puerto Rico.) The Commonwealth Government agreed to

1. Provide office space for testing and training enumeration personnel
2. Cooperate in publicizing the census
3. Identify possible candidates for filling required positions
4. Assist the Census Bureau in collecting maps and boundary information

The Bureau had final responsibility for planning and carrying out the census, including appointing the census supervisor, assigning Bureau staff as census advisors, recruiting and training the census staff, and maintaining confidentiality of the census data. It retained final authority to determine report form content and design, enumeration procedures, tabulations to be made, and data to be published, but agreed to consult advisory committees and interested agencies of the Government of Puerto Rico on these matters. The Bureau bore the entire cost of the basic census program, but agreed to make available to the Puerto Rico Planning Board or other Commonwealth Government agencies, on a reimbursable basis, special statistical tabulations and tapes not included in the publication program.

Farm Definition

For the 1987 Census of Agriculture in Puerto Rico, a farm was any place that had, or normally would have had, sales of \$500 or more of agricultural products during the 12 months between July 1, 1987 and June 30, 1988, or that had 10 cuerdas¹ of land or more from which \$100 or more in agricultural products were sold, or normally would have been sold, during the same 12-month period. This was the same definition introduced in the 1982 census, and brought the Puerto Rico farm definition closer to that used in the 50 States, where farm status depended on value of agricultural products sold.

¹.97 of an acre.

Planning

Preliminary planning—The Bureau started planning the 1987 Census of Agriculture in Puerto Rico in mid-1984, when the Agriculture Division staff began drafting preliminary table outlines: Detailed planning of the enumeration and publication programs started in the first week of December 1986, with the first of several meetings between Agriculture Division personnel and representatives of the Puerto Rico Planning Board. Planning became more complicated in June 1986 when the responsibility for conducting the 1987 Economic Censuses in Puerto Rico was transferred to the Agriculture Division. (For more information on these censuses, see the *History of the 1987 Economic Censuses*.) During the summer and early fall of 1986, the Bureau and the Commonwealth Government drew up the special agreement covering the two parties' responsibilities in the enumeration (see above for details of the agreement), and began preparations for the census.

General plan of the census—The agriculture census in Puerto Rico remained primarily a field canvass operation, but, as for the 1982 census, the Bureau compiled a list of "special" farms. ("Special" farms were "large" operations—i.e., those identified in the 1982 census as having had minimum annual sales of agricultural products of \$10,000 or more, or that had 49 cuerdas or more in land.) The census plans called for these farms to be mailed agriculture census report forms, together with an information booklet and a cover letter asking the recipient to complete the questionnaire and hold it until a field enumerator picked it up during the canvassing operation. (If an enumerator did not visit a "special" farm, the respondent was asked to mail the report form to the census field office in San Juan.)

All farm operators were asked to report basic production and inventory data, while information on such things as expenses, use of agricultural chemicals, and machinery and equipment, were collected from a representative sample. The Bureau then used statistical methods to "weight" the sample data and produce estimates at the municipio level for the sample items. Sampling allowed reduced respondent burden on sensitive questions.

The 1982 microcomputer operations at the Puerto Rico field office had been successful, and in 1987, a minicomputer was installed to expand the processing capability. Functions such as check-in, data keying, edit processing, and coverage analysis were handled in Puerto Rico by the minicomputer system. Data analysis and detailed tabulations were carried out at Bureau headquarters in Suitland, MD, using comparable computer resources.

Census schedule—Preparations for the 1987 Census of Agriculture in Puerto Rico began in November 1985, and the census operations in the Commonwealth closed in October 1988. The census office was opened in January 1988, although agriculture census operations did not actually begin until July (the economic censuses were carried

out before the agriculture operation). For a complete schedule, see Appendix E, Chronology of Major Census Activities.

PREPARATORY OPERATIONS

Report Forms

There was a single report form for the agriculture census in Puerto Rico, 87-A1(PR)SP. The questionnaire was a single 22" x 14" sheet of white stock, folded to 11" x 14", with printing and shading in brown ink, with four numbered pages. The standard version employed the Spanish language (hence the "SP" suffix); an English-language version also was produced with printing and shading in black ink on green paper.

All farm operators were asked to complete items 1-20, which requested data on the following:

- Cuerdas owned, rented, or leased
- Location of the operation
- Sugarcane
- Coffee, tobacco, or pineapple
- Grains and farinaceous crops
- Fruits
- Vegetables
- Cultivated and/or improved pasture
- Ornamental and flowering plants, cut flowers, and lawn grass
- Other crops
- Land use
- Irrigation
- Hogs
- Cattle
- Other livestock
- Poultry
- Farm organization
- Sales by selected products (listed)
- Other farm-related income
- Farm operator characteristics

A sample of all farms—consisting of all "large" farm (i.e., farms with 1982 sales of \$10,000 or more, or with 49 cuerdas or more in 1982), all farms in municipios the

had 250 or fewer farms in 1982, and a 1-in-5 sample of farms in municipios that had more than 250 farms in 1982—were asked to complete items 21-25, requesting data on:

Products for home consumption

Insecticides, herbicides, fungicides, pesticides, lime, and other chemicals used

Expenses

Machinery, equipment, buildings, and other facilities

Hired workers, *agregados*², and sharecroppers

Section 26 requested identification information on the person completing the report form. (A facsimile of the form 87-A1(PR) is reproduced in app. C.)

Inventory data, information on machinery, equipment, and facilities, and on *agregados* or sharecroppers on the place, were collected as of July 1, 1988. Sales and harvest data were requested for “the last 12 months” prior to enumeration.

The Bureau printed 60,000 copies of the 87-A1(PR)SP (Spanish language) questionnaire, together with 700 form 87-A1(PR) English language versions. The field staff used the Spanish-language version of the report form with the Form 87-A5(PR), Record Books, 1,200 of which were printed for use in the enumeration. For the mailout to special farms, the Bureau printed 8,100 copies each of the form 87-A1(PR)SP-L1 cover letter and the Form 87-A1(PR)SP(I), Instruction Booklet.

Field Organization and Training

General organization—The Bureau established a local office in San Juan for the agricultural census in the Commonwealth. This office and a field enumeration staff carried out the data-collection portion of the census—a combined mail/field enumeration, while the agency’s headquarters staff provided supervision and technical assistance. The Bureau’s Field Division had primary operational responsibility for the field enumeration, although the Agriculture Division’s Outlying Areas Branch developed plans for the census, compiled the list of special farms, and also provided technical advice and assistance. The Data Preparation Division (DPD) assisted in the assembly of data-collection materials and mailed out report forms. The Bureau assigned members of its professional staff as census manager and as subject-matter analysts during the enumeration, but the remainder of the office and field staffs were recruited locally. The Puerto Rico field office

²A member of a family living on a farm not operated by any member of the family. An *agregado* may or may not be an employee of the farm operator and may or may not produce any agricultural products. An *agregado* might own, rent, or use rent-free, the house he/she lives in. The land operated by, livestock belonging to, and the products marketed by an *agregado* are included in the totals for the farm operator in charge of the place on which the *agregado* lives.

staff included a census manager, an office operations supervisor, a field supervisor, 6 assistant field supervisors, and a clerical staff of approximately 30.

The Puerto Rico office opened in the first week of January 1988, in the San Juan suburb of Hato Rey. The Field Division leased approximately 3,000 square feet of office space and rented or borrowed furniture and other standard office fixtures from local Federal offices. The minicomputer facility installed in the office employed 16 terminals for entering data, and 2 printers. Satellite communications made it possible for programmers and analysts at Suitland to communicate with the computer system in Hato Rey. An electronic security system was provided by the owner of the building and the Bureau established the usual security systems for the computer facility. (The Hato Rey office and its staff conducted not only the 1987 Census of Agriculture in Puerto Rico, but also the 1987 Economic Censuses, and also carried out preliminary processing and data entry for report forms from all of the outlying areas.)

Recruiting and training—The agriculture census in Puerto Rico began as the 1987 Economic Censuses sample data collection operation closed down, so that many of the office staff and enumerators from the economic censuses were carried over to the agriculture census staff. However, the agriculture enumeration required a considerably larger field staff than had the economic censuses. The agriculture operation employed 68 crew leaders, 50 quality control (QC) enumerators, and 610 enumerators. Recruiting the field enumeration staff began in April 1988 and continued into July, with hiring based on the results of written tests. Field operations assistants began administering the tests in mid-April and by the beginning of July over 5,000 applicants had been tested. The enumeration staff was selected from the qualified applicants with the highest test scores. The census office and field enumeration staffs were salaried temporary employees of the Bureau and were paid on standard U.S. Government general schedule (GS) pay scales for the appropriate grades.

Crew leaders, who would be the immediate supervisors of the enumerators, had been chosen by the second week of June, and the field operations assistants carried out the 3-day crew leader training course during the period June 20-July 1. The crew leaders then trained the enumerators for their own crew leader districts (CLD’s) July 1-8. By July 8, the main recruiting and training effort had been completed and the enumeration began.

Training and reference materials—The Agriculture and Field Divisions prepared training and reference guides for use in the agriculture census in Puerto Rico. The principal administrative reference used in the field office was the *Office Procedures Manual* (Form A46(PR)SP), which covered basic administrative operations of the field office, and procedures for field office processing of the census report forms. The six assistant field supervisors had primary responsibility for training the crew leaders, and used

the *Guide for Training Crew Leaders* (Form A53(PR)SP) as their primary training manual. Each crew leader received a copy of the *Crew Leader's Manual* (Form A7(PR)SP) as the primary reference for that position, and used the *Guide for Training Enumerators* (Form A52(PR)SP) for training the enumeration staff. Each enumerator received a copy of the *Enumerator's Manual* (Form A10(PR)SP) as the primary reference source for the field enumeration. The crew leaders also used the *Guide for Training Quality Control Enumerators* (Form A54(PR)SP) for training their quality control (QC) enumerators, and QC enumerators were given the *Quality Control Enumerator's Guide* (Form A51(PR)SP) and the *Quality Control Enumerator's Handbook* (Form A54.1(PR)SP) as their principal training and reference materials.

The Suitland staff initially prepared all of these reference and training materials in English, then translated them into Spanish for printing and distribution. The materials distributed in Puerto Rico generally were in Spanish, although English versions were available for reference if needed.

Maps

The census office and field enumeration staff needed detailed maps to carry out a complete enumeration. Three basic kinds of maps were required:

1. Master maps for the census office to use in planning and supervising the census
2. Crew leaders' maps covering each crew leader's area of responsibility
3. Enumeration district (ED) maps for every ED in Puerto Rico

The 1987 agriculture census ED's corresponded generally to those of the 1980 decennial census—i.e., they were drawn within the recognized barrio boundaries—although some boundaries were altered in urbanized areas to allow for changes in land use. The ED maps were inserted in the A5 Record Book for each ED for use in the field enumeration.

The Census Bureau used the new Topologically Integrated Geographic Encoding and Referencing (TIGER) system to produce the census maps for Puerto Rico by computer. The Bureau developed the TIGER system in a cooperative project with the U.S. Geological Survey (USGS), using the 1980 census geographic data base, with additional information from USGS's geographic data files. In Puerto Rico, the new system's ability to produce detailed maps of rural areas represented a continuing effort to improve mapping resources.

Publicity

The publicity program for the census of agriculture in Puerto Rico had two major objectives, to

1. Recruit census staff

2. Encourage cooperation and response by farmers

The Bureau's Agriculture Division (AGR) and Public Information Office (PIO) cooperated in developing publicity for the 1987 census.

For the 1987 effort, the Bureau produced the form 87-A70(PR)SP(P) poster, announcing the census and census staff job openings. In April 1988, the Bureau shipped 2,500 copies of the poster, each with a supply of job application/reply cards, to Puerto Rico for distribution through local government offices. The Agriculture Division included copies of the poster in information kits prepared for the Bureau's participation in the Agro-Expo Fair in Puerto Rico in May 1988. (The kits each contained the poster, a list of questions frequently asked about the census, a pamphlet outlining census activities, copies of the report forms, and a list of telephone contacts.) The Bureau also developed the form 87A70(PR)SP(F) flyer, announcing the census, briefly describing the kinds of information that would be requested, and urging cooperation. The agency shipped 40,000 copies of this flyer to Puerto Rico also in May, for distribution through the field offices of the Puerto Rican Departments of Agriculture and Labor, and to the Postmaster General for distribution to local post offices.

The Bureau prepared a set of four 20-second, one 30-second, and one 60-second radio spots, and distributed copies to radio stations throughout the Commonwealth for broadcast as public service announcements. In addition, beginning early in April, Bureau officials participated in a series of radio and television interviews about census activities.

For the agriculture census, the Census Bureau asked the Governor of Puerto Rico to proclaim July 1987 "Agriculture Census Month." The Governor's representative and Bureau officials met at a public ceremony on June 29, 1988, to formally announce the proclamation to the media and public.

FIELD ENUMERATION

Taking the Census

Enumeration portfolios—Each field enumerator had an enumeration portfolio containing the report forms, listing sheets, and other materials required for the census. Each portfolio contained a map of the enumeration district (ED) assigned to that enumerator, a supply of report form 87-A1(PR)SP, the Form A10, *Enumerator's Manual*, and the Form A5, Record Book. The ED map showed the boundaries of the ED outlined in heavy orange lines, as well as the principal surface features and roads within the ED. (Usually, the individual ED boundaries corresponded to local barrio boundaries, but in some cases portions of more than one barrio were included in a single ED.) The enumerator was to complete a report form for each farm in the ED. The Form A5, Record Book, included Form

A3(PR), Listing Sheets, and a supply of Form 87-A4(PR), Nonresident Operator/Closeout Data Cards. The A3 sheets served as a record of the canvass of the ED and contained (1) prelistings of any special farms in the ED, (2) a series of screening questions for use in identifying households operating farms, and (3) space for listing each household canvassed. Enumerators used the A4 cards to obtain basic information about nonresident operators or households they were unable to contact.

The cover of the A5 Record Book served also as the enumerators' progress report. At the end of each week of canvassing, the enumerator completed a column in part 1 of the cover with the date, the number of (1) households canvassed and either enumerated or identified as out of scope, (2) A1 report forms completed, (3) A4 cards filled out, and (4) hours worked.

Field enumeration procedures—The census staff used two canvassing procedures in the field enumeration, procedure "A" in predominantly rural ED's, and procedure "B" in urbanized ED's. Procedure A was a door-to-door canvass of every household in an ED, except in built-up residential areas identified as "clusters." A cluster was any group of 25 or more houses, buildings, or other structures, each on half a cuerda or less of land. Known clusters were shown on the enumerators' ED maps, but enumerators were instructed to identify "new" clusters and to outline them on their maps, assigning a code letter ("A," "B," and so on, in sequence). In clusters, enumerators spot-checked households to find out which ones operated farms, and then visited and completed report forms for those households only.

The field staff employed procedure B in urbanized ED's or in ED's with 10 or fewer farms listed in the 1982 census. For procedure B, ED's, the names and addresses, or name alone, of farm operators located in the ED were prelisted on the listing sheets of the Record Book for the ED, and enumerators canvassed each prelisted address. The interviewers completed a report form for each place qualifying as a farm, and also asked respondents whether anyone else in the area operated a farm. The enumerators visited any places mentioned that were not already prelisted, checked possible farm status, and filled out a report form for any newly identified farms.

Enumerators began interviews in both procedures by asking for the name of the head of the household, and a series of screening questions to identify farm operations. These questions asked whether

1. The respondent, in the last 12 months had raised, produced, or sold any crops, vegetables for sale, ornamental or flowering plants, or had 1 or more cattle, 1 or more pigs, or 15 or more poultry.
2. The operator had sales of agricultural products in the last 12 months or expected sales this year of \$400 or more.
3. This place had 10 or more cuerdas and sales of agricultural products in the last 12 months, or expected sales this year of \$100 or more.

Enumerators assigned a farm serial number³ and completed a report form for each place that qualified as a farm under the census definition. The enumerators tried, whenever possible, to interview the head of the household of each agricultural operation to complete the screening questions; in cases where the head of the household was not available, some other responsible adult member of the household could be asked to provide the necessary information.

Enumerators completed Form 87-A4(PR)SP, Nonresident Farm Operator/Closeout Data Cards, and assigned an A4 serial number for any place that qualified as a farm but (1) contained no housing unit, or (2) had no operator(s) living there, or (3) for which no responsible and knowledgeable person could be located to provide the required information after repeated callbacks. A4 cases were identified as "nonresident operators" or "closeout cases," and the A4 card listed the name and address of the nonresident or absent operator and whatever basic information (i.e., cuerdas, kinds of livestock, major identifiable types of crops, and so on) could be obtained from neighbors or other sources. The enumerators gave copies of the A4 cards completed each week to their crew leaders, who referred the nonresident cases either to the appropriate enumerator in their own area of responsibility, or to other crew leaders responsible for canvassing the ED in which the absentee operator lived.

As they canvassed their own ED's, the enumerators plotted on their ED maps each farm, nonfarm operator, cluster, and so on, so that they and their crew leaders could monitor each ED's coverage.

Callbacks—Callbacks were additional contacts with a household after an enumerator's initial visit, and were necessary when the farm operator was not available to provide the required agricultural data for completing the report form. When the operator was not available, enumerators asked for the best time to attempt to contact the operator and made a note of the suggested time in the "callback" column of the A3(PR) Listing Sheet for that farm's line. Enumerators tried to schedule and complete all callbacks as quickly as possible, including scheduled callbacks in each day's regular work so that they did not accumulate. Except in special cases, the enumerators attempted no more than two callbacks for any specific household. If after two callbacks the enumerator still was unable to interview the farm operator, another responsible adult in the household familiar with the farm operation or a foreman or hired manager who supervised the farm operation could be asked to provide the data needed to complete the report form for the farm.

³Enumerators assigned farm serial numbers beginning in each ED with 001 and continuing sequentially 002, 003, and so on. At the same time, a census file number (CFN) was assigned; the CFN was an 11-digit number consisting of the municipio and barrio numbers, the farm serial number, and a check digit (the latter assigned to each CFN during subsequent processing).

Special Farms

Compilation of the special farms list and mailout—A “special farm” in Puerto Rico was any place with 49 or more cuerdas of land, or with expected annual sales of agricultural products of \$10,000 or more. Coverage of these comparatively large operations was particularly important if the census was to obtain accurate data on agriculture in Puerto Rico. For the 1982 census, the Census Bureau had compiled a special farms list from the results of the 1978 census, and mailed enumeration packages to some 4,200 addresses, with a request that the recipient hold the report form until an enumerator stopped to pick it up. This methodology proved reasonably successful, and the agency adopted a similar plan for the 1987 census. The special farms list was extracted from the 1982 Puerto Rico agricultural census in-scope file, resulting in a mail list of approximately 5,000 addresses. The Bureau’s Data Preparation Division (DPD) office in Jeffersonville, IN, assembled mailing packages, each consisting of a report form 87-A1(PR)SP, a form 87-A1(PR)SP(I) information and instruction booklet, and a form 87-A1(SP)PR(L1) cover letter requesting the respondent to complete and hold the report form until an enumerator visited the operation. In the first week of June 1988, the DPD staff at Jeffersonville shipped the mailing packages to the central San Juan post office, which then mailed them to the addressees.

Field followup—Enumerators visited the special farms in the course of their regular canvassing and collected the completed questionnaires, or, when necessary, conducted personal interviews with farm operators to obtain census information. The listing sheets attached to each enumerator’s A5 Record Book identified special farms in each ED, and enumerators were directed to visit and make certain a report form was completed for each.

Field Review and Quality Control

The quality control plan for the 1987 agriculture census in Puerto Rico involved (1) an observation period for selected enumerators, (2) field review of each enumerator’s work, and (3) a coverage check that matched enumerators’ farm lists to prelisted addresses for each ED.

Crew leaders supervised the field quality control effort. Each crew leader selected the four enumerators he or she considered most likely to have difficulties completing the assigned work satisfactorily and spent approximately half a workday with each during canvassing. The crew leaders noted any procedures that caused the enumerators difficulties and then scheduled and carried out any retraining needed. No enumerators selected for observation began canvassing without crew leader supervision until they demonstrated to their supervisors the ability to adequately perform the assigned job.

Crew leaders also formally reviewed each enumerator’s completed work at weekly meetings, and again at the completion of canvassing for each ED. The formal review involved five major steps:

1. Matching records on the listing sheets with plotted line numbers on the ED map to ensure the interviewer was canvassing the ED properly and thoroughly.
2. Checking the A3(PR) Listing Sheets and A4(PR) Nonresident Operator’s Cards to ensure that both were completed legibly, completely, and correctly.
3. Matching completed report forms to the listing sheets in the record book.
4. Checking the content of the completed report for legibility, completeness, and accuracy.
5. Checking that Procedure B listing areas and special farms were being adequately covered.

The reviewing crew leader discussed any problems discovered with the enumerator concerned and observed the field work of enumerators who were having difficulties to make certain they were canvassing correctly.

Crew leaders also checked the coverage of their crew leader districts (CDL’s) at their weekly meetings with their enumerators. The coverage check of each enumerator’s farm list involved recon canvassing selected dwellings in each ED to determine whether the enumerator had adequately canvassed the ED. Prior to the enumeration, quality control (QC) enumerators visited each ED. The QC enumerators carried ED maps with four “starting points” marked with an identifying letter (A, B, C, or D) and a directional arrow. The QC enumerator began canvassing at each starting point in succession, traveling in the direction indicated by the arrow at that point, and listed the first five houses visited. When the QC enumerator encountered a second starting point before listing 5 houses, he or she continued listing houses after the second point until 10 were listed for the 2 points together. The QC enumerator visited each place and carried out a short interview to determine whether a report form should be completed for it, and entered the information obtained on A3 Listing Sheets. The crew leaders used these sheets to check coverage obtained by the regular enumerator for each ED. The QC enumerator joined the crew leaders and the regular enumerators for each ED at their weekly meetings until the regular enumerator had covered the entire ED concerned. The enumerator’s A3 Listing Sheets were checked against the prelisted addresses for the part of each ED enumerated; then the prelisted addresses were checked to see whether a report form should have been completed for each. In cases where a matched address was identified as a farm operation in the prelisting operation, but not by the regular enumerator, the QC enumerator revisited the address to resolve the question. The crew leaders visited and completed a report form for any prelisted farms missed by one of their field enumerators.

Results

The agriculture census for Puerto Rico enumerated 20,245 farms, with a total land in farms of 886,846

cuerdas, and a total value of agricultural products sold in 1987 of approximately \$415 million.

DATA PROCESSING

General Information

The 1987 census used a minicomputer system in the Hato Rey office to check in reports, key data, edit, and research data base records. After the processing office closed in October, the report forms were shipped to Bureau headquarters in Suitland, MD, for further processing. Upon completion of the final computer edit, all data were tabulated and reviewed before publication.

Field Office Processing

Check-in—The receipt and check-in staff of the Hato Rey office sorted incoming ED portfolios and stored them in municipio and ED order until processing. The portfolios were opened and the contents sorted; the A5 Record Books, ED maps, and completed A4 Nonresident Operator/Closeout Data Cards went to storage to await shipment to Bureau headquarters after the Hato Rey office closed; and completed A1 report forms were sorted into special and nonspecial farms, batched into work. The work units then went to check-in, where the census file number from each form was keyed to the check-in file—the CFN's for special farms were keyed to a separate special farms mail file. Each work unit, or batch, had a Check-in Batch Cover Sheet attached. (The Hato Rey minicomputer system also processed the report forms from Guam and the U.S. Virgin Islands, so as each work unit entered processing, the keyer concerned had to first select the appropriate geographic area.) The keyers entered the batch number for each batch, then the CFN for each report form. The computer program automatically checked each CFN to determine whether it was legitimate—i.e., that the municipio and ED codes within the CFN were acceptable.

Clerical operations—The clerical unit carried out a screening routine for report forms received from the special farms and portfolio check-in units. Screening clerks checked each report form and (1) changed all spelled-out numbers to numeric entries, (2) deleted bracketed entries, (3) converted fractional and decimal parts of "cuerda" entries to centesimos, and (4) checked section 15 (Other Livestock) for correct item coding. After screening, all report forms were referred to the data keying unit for keying.

The clerical unit also received computer printouts of report forms that failed the computer edit. The clerical staff pulled any report forms that failed, in the order they appeared on the printout, and referred them to agriculture analysts for review and correction. The analysts used an online computer system to correct failed records. All corrections were resubmitted for edit processing and acceptance. Upon completion of keying and editing, the report forms were returned to the clerical staff for filing.

Data keying—The data keying unit received work units of completed report forms after check-in and clerical review. Data keyers entered the batch number for each work unit, then the CFN for the first case. The computer program matched the CFN to the check-in file and, if the CFN had been checked in, accepted the record for data keying. The keyer then keyed the data on the report form; skipping blank items and items with a response of "zero," "none," "NA" (not applicable), and so on. The keying program performed a series of tests on the data as they were entered, checking for nonnumeric entries, illegal values, and for entries either too long or too short for a particular data cell. After keying any report form, the keyer could review the entire record for that form and correct any problems. All keyed data were subjected to verification, and all discrepancies were resolved before releasing the data for each batch.

Local tallies—As the data were keyed, the computer system program produced weekly tallies of total number of farms and selected items by municipio and for Puerto Rico. These tallies provided the census manager with information needed to detect potential coverage problems, and enabled corrective action to be taken while the field enumeration was still underway.

Office closeout—The Census Bureau closed the Puerto Rico census office in mid-October 1988. The staff packed the questionnaires and review materials for use by Agriculture Division analysts and shipped them to Suitland for further processing.

Computer Processing

General information—The minicomputer system in the Puerto Rico census office performed complex edits of the individual census data records. Additional editing, as well as statistical estimation for sample weighting, and tabulating the data, were carried out using the mainframe computer facilities at Suitland.

Editing—The edit program comprised an item-by-item check of each data record that (1) checked consistency between reported data totals and the sum of reported data detail; (2) flagged questionable items; (3) imputed data for missing or obviously incorrect entries, or printed a code indicating the type and location of any problems; and (4) coded each record for size by cuerdas, economic class, type of farm, and age and tenure of operator.

The edit stored all flagged records for analysts' review and correction. Any given flagged case might undergo several edits, since changing a specific entry might cause the edit program to detect inconsistencies elsewhere in the record. No record was added to the data file until it had passed the edit program. Once all the data records had been edited and corrected, the data file was ready for tabulation.

Sampling and Statistical Estimation

To reduce overall respondent burden, the agriculture census report form requested detailed data in sections 21-25 only of a sample of farms in the Commonwealth. This sample included "certainty" farms—i.e., those with expected agricultural sales greater than \$10,000, or more than 49 cuerdas—plus all farms in municipios that had fewer than 250 farms in the 1982 census, and a 1-in-5 sample of all farms in municipios that had 250 farms or more in 1982.

During processing, the "noncertainty" sample farms in each municipio were stratified into 32 strata based on total value of agricultural products sold (TVP), type of farm, and size of farm. The variable groups used for this stratification were as follows:

TVP	Type	Size
\$0 to \$499	Crop	0 to 9 cuerdas
\$500 to \$999	Livestock	10 cuerdas or more
\$1,000 to \$1,199		
\$1,200 to \$1,999		
\$2,000 to \$2,499		
\$2,500 to \$4,999		
\$5,000 to \$7,499		
\$7,500 or more		

For each municipio, the estimation program assigned each sample farm record an initial weight equal to the ratio of the total farm count to the sample farm count for the stratum containing the sample farm. Any stratum with fewer than 10 farms, or that had a ratio of total farms to sample farms of more than twice the sampling rate, was combined with another stratum within the same variable group. When all strata satisfied the criteria, the ratio adjustment procedure was used to readjust weights for the sample farms to ensure agreement between the expanded sample counts and the census counts. Fractional weights were randomly rounded to whole numbers (e.g., if the farms in a sample group had a final weight of 5.2, then one-fifth were randomly assigned a weight of 6, and the remaining four-fifths were assigned a weight of 5). The tabulation program estimated municipio total values for sample data items by multiplying the data items for each sample farm by the corresponding sample weight and summing overall sample records in the municipio.

Appendixes to the Volume 1 data report for Puerto Rico provided estimates (with associated reliability) for sample data items for all farms and for farms with sales of \$2,500 or more, for all farms in each municipio, and for the Commonwealth.

Tabulation

Between November 1986 and October 1987, Agriculture Division subject matter specialists prepared table outlines and specifications for tabulating the Puerto Rico

census data. The Bureau's Economic Programming Division (EPD) developed table programs, and the Administrative and Publications Services Division (APSD) used its table image processing system II (TIPS II—for a description of TIPS II, see ch. 11) software packages, with a combination of the mainframe computers and minicomputers at Suitland, to prepare three sets of tabulations for publication—15 tables for all farms in Puerto Rico, 56 for farms by agricultural region (as defined by the Commonwealth Government) and municipio, and 6 tables of more detailed data for farms in Puerto Rico with sales of \$2,500 or more. Subject-matter specialists reviewed the tables for accuracy and consistency as they were produced early in March 1989. Corrections were keyed by support staff at headquarters and corrected tables were produced for review. Only when all the tables had been corrected and approved was the file released for publication.

COMPARABILITY OF THE DATA

The Bureau used much the same combination of mail and field enumeration for collecting data for the 1987 agriculture census as it had employed in the 1982 enumeration. Once again, the census collected sample data on home consumption, chemicals used, expenses, machinery and equipment, and hired labor. These items comprised sections 21-25 of the A1 report form (see above for details on the sampling procedure). The detail and volume of data published for the 1987 census was virtually the same as that released for the 1982 enumeration. The 1987 data in the published tables were accompanied by 1982 historical data.

PUBLICATION PROGRAM

The Census Bureau did not issue an advance report for Puerto Rico, but published the final census data in July 1989 in Volume 1, *Geographic Area Series, Part 52, Puerto Rico*, that included data for all farms for the Commonwealth as a whole, for 5 agricultural regions, and for 75 individual municipios. Tables 1-15 provided data on agricultural operations for the Commonwealth; tables 16-71 contained more detailed tabulations for major data items (i.e., specific crops, livestock operations, and so on) for the Commonwealth, the agricultural regions, and individual municipios; and tables 72-77 presented detailed data for farms with sales of \$2,500 or more. The basic data shown for all farms included:

Number of farms

Land use

Operator characteristics by main occupation

Hired farm labor

Machinery, equipment, buildings, and facilities on the place

Agricultural chemicals used
Irrigation
Selected production expenses
Market value of agricultural products sold
Farm-related income
Livestock, poultry, and their products—inventories and sales
Crops harvested and sales of selected crops
Ornamental and flowering plants, cut flowers, and lawn grass
Products for home consumption

The tables showed the 1987 data, with 1982 census data for comparison.

For farms with sales of \$2,500 or more, summary statistics on tenure of operator, type of organization, main occupation and age of operator, size of farm, market value of agricultural products sold, and type of farm—all for 1987—were presented.

The Bureau provided users with data highlights from the printed report through the CENDATA™ “online” system. No other electronically readable files or unpublished data were made available for the 1987 agricultural enumeration in the Commonwealth.