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Chapter 9. 1988 Census of Horticultural Specialties and Program Sample Surveys

INTRODUCTION

General Information

One of the byproducts of the census of agriculture is the list of names and addresses of agricultural operations enumerated, classified by type of activity. This list provides a sampling frame for use in other, more specialized agriculture related surveys or censuses, and has been used for this purpose after most modern agriculture censuses. The 1987 Census of Agriculture program included three major followon data collection operations—a census of horticultural specialties, taken in cooperation with the U.S. Department of Agriculture's (USDA's) National Agricultural Statistics Service's (NASS's) Commercial Horticulture Survey, and sample surveys of farm and ranch irrigation practices and of agricultural economics and land ownership. All three activities were carried out by mail enumeration, with addresses of sampled operations drawn from the 1987 agriculture census inscope respondent list.

Legal Authority

Title 13, United States Code—Census, section 193, authorized the Secretary of Commerce to "...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." Section 195 empowered the Secretary to use sampling, if feasible, for collecting data for purposes other than the determination of apportionment of Representatives in Congress.

Part of the data published as part of the horticultural census program were collected by NASS. Under title 13, addresses and individual records acquired by the Census Bureau could not be made available to any other agency or individual outside the Bureau, including NASS, but the confidentiality regulations in USDA, supplemented by the authority given the Secretary of Commerce in section 6 of title 13, permitted the Bureau to incorporate data from outside agencies into census files. Paragraph (a) of section 6 authorized the Secretary of Commerce to "... call upon any other department, agency, or establishment of the Federal Government, ... for information pertinent to the work provided for in this title."

Estimation

For both the 1988 Farm and Ranch Irrigation Survey (FRIS) and the 1988 Agricultural Economics and Land Ownership Survey (AELOS), the Census Bureau collected data from a sample of farm operations drawn from the 1987 Census of Agriculture respondent universe, using the information obtained to produce estimates for various geographic levels. The surveys used two statistical estimation procedures to account for (1) selection for the survey samples, and (2) nonresponse to the questionnaires. The survey estimates were computed by weighting each respondent operator's information by an expansion factor, which was the product of the sample weights and the whole-farm operator nonresponse weight.

The Census Bureau used whole farm nonresponse weight for nonrespondent operators to expand the survey data to account for operators who did not respond to the survey for whatever reason, and for the surveys' postmaster returns. The Bureau staff calculated a noninteger nonresponse weight for each stratum (for the AELOS) or State (for the FRIS), and assigned it to each respondent record. The sample weight expanded the survey data to estimate totals as if they resulted from a complete census. (Details of the specific estimation procedures employed were published in the printed reports, *1987 Census of Agriculture*, Volume 3, *Related Surveys*, Part 1, *Farm and Ranch Irrigation Survey (1988)* for the FRIS, and Part 2, *Agricultural Economics and Land Ownership Survey (1988)*, for the AELOS.)

1988 CENSUS OF HORTICULTURAL SPECIALTIES

Introduction

Background information—Horticultural specialty operations represent a significant and rapidly expanding segment of the overall agricultural economy. The 1987 agriculture census indicated that total sales of horticultural specialty crops were over $5.7 billion, an increase of nearly $2 billion and over 50 percent since the previous census. The rapid growth of this part of agriculture in recent years prompted demands from data users for more and more detailed information, in order to make accurate projections of growth, maintain the quality and quantity of production, and promote efficient product distribution, as well as for use in considering public policies in such areas as environmental quality.

Basic data on production and sales of flowers, bulbs, nursery products, and seeds had been collected in the general agriculture census since the middle of the 19th century, but the 1890 agriculture census was the first to include a special survey of nurseries, floricultural establishments, seed farms, and the like. The agricultural census program for 1930 expanded the horticultural survey into a special census to be conducted every 10 years. When the schedule of the agricultural censuses was altered in the 1950's, the horticultural specialties operation continued to be conducted every 10 years, as part of the 1959 and 1969 enumerations. The Census Bureau's decision to conduct the agricultural and economic censuses simultaneously led to the 1979 horticultural specialties census, followed by the 1988 enumeration.

The overall plan for the 1988 Census of Horticultural Specialties called for a two-phase data-collection effort, one based on a list of horticultural specialty operations identified in the 1987 Census of Agriculture, and the

second derived from NASS's 1989 Commercial Horticulture Survey. The two agencies used similar report forms, although both agencies' names appeared on the form used by NASS, while the census report form carried only its own name. The Bureau originally planned to conduct the horticultural census as a mandatory response data collection activity, under authority given in chapter 7, section 221, of Title 13 United States Code—Census, but the Office of Management and Budget (OMB) denied authority to collect data under mandatory regulations; consequently, the Bureau agreed to voluntary response. The NASS collected data in its survey under its own "voluntary" authority.

Scope and reference year—The 1988 Census of Horticultural Specialties covered all 50 States and requested data from respondents primarily engaged in the production of ornamental plants and other nursery products—e.g., bulbs, florists' greens, potted and/or cut flowers, bedding/garden, foliage plants, unfinished plant material, shrubbery, woody plants (including fruit trees and environmentals), flower and vegetable seeds, and sod—as well as those producing mushrooms or vegetables under cover. The questionnaires asked for data for the calendar year 1988.

Preparations

Pretest—The proposed horticultural specialties report form content and format were tested in the summer and fall of 1987. There were three versions of the proposed report form: An 11" x 17" folder (the form A19.01) with instructions to the respondent to complete the form section by section, an 8" x 11" booklet (the A19.02) with the same content, and an 8" x 11" booklet (the A19.03) with special "skip" instructions (e.g., "If your business is involved in growing 'X', go to section 'Y'").

The staff selected a sample of approximately 1,500 names and addresses identified as horticultural specialty operations in the 1987 census and split the file into three groups of 500, each group to receive one of the test versions of the report form. On July 27, 1987, the DPD mailed the pretest packages, each consisting of the appropriate report form, a cover letter explaining the test, an instruction sheet, and a return envelope. The cover letter included an "800" telephone number for respondents to call if they needed assistance or additional information. There were two mail followups: The first, on August 25, consisted of a reminder letter and the appropriate report form, sent to the approximately 800 nonrespondent addresses. The second followup used a reminder letter only, and was mailed to the remaining 500 or so nonrespondents on September 15. The pretest was closed on October 9, 1987; at that time 1,134 pretest sample operators had completed and returned their forms (an overall response rate of 75.6 percent).

All pretest report forms, as well as all telephone questions by respondents, were returned to Suitland for processing by the Agriculture Division staff. Incoming report forms were examined and tallied for frequency of common reporting problems, overall response, and supplied data. Analysis identified several general problem areas, including (1) the inability of nursery establishments to report requested data (with all three test forms, over 20 percent of the respondents failed to complete all of the items applying to their operations); (2) respondents reporting more than one type of sales unit in each column; and (3) incomplete data in several sections, notably payroll breakdowns and value-of-sales totals. Overall, the form A19.01—
the large folder format—obtained the best overall response rate, and was adopted for the census. To address the specific response problems identified, the staff redesigned the report form to clarify where data were to be reported, and expanded the instructions that would accompany the census report form.

Report forms—The Census Bureau and NASS cooperated in the final design of two report forms used to collect the horticultural specialties data. The report forms had identical formats and nearly identical data content. The census report Form 88-A19.1, 1988 Census of Horticultural Specialties, was a 10 1/2" x 17", 12-page booklet, folded to 10 1/2" x 8 1/2" for mailing, on white stock with printing in black ink and shading in a salmon wash. The form had 18 sections, and requested data on type, number of units or containers sold, total value of sales, and value of wholesale sales of—

- Potted flowering plants by type of container (i.e., flats, pots of specified sizes, or hanging baskets)
- Bedding/garden plants
- Cut flowers
- Cut cultivated florist greens
- Nursery plants
- Foliage plants and by type of container (pots or hanging baskets of specified sizes)
- Unfinished plant materials (e.g., cuttings, liners, plug seedlings, tissue-cultured plantlets, prefinished plants)

The report form asked for acres harvested, total and wholesale value of sales for sod, dried bulbs, corms, rhizomes, or tubers; pounds produced and bed area (in square feet) and value of sales of cultivated mushrooms; square feet under glass or other production, acres used, and value of sales of greenhouse vegetables, vegetable transplants, and seeds; and acres grown, production in pounds, and value of sales for flower seeds. Additional sections requested data on—

- Land, structures, irrigation, and equipment
- Gross sales
- Selected production expenses for all horticultural operations

- Hired labor (number of employees and gross wages paid)
- Business organization (i.e., individual, partnership, corporation, or other)
- Location of growing operations in 1988

The NASS report Form 88-A19.2, Commercial Horticulture Survey 1989, was virtually identical to the A19.1 in format and content, except that it had a purple wash for shading, and sections 1 (potted flowering plants), 2 (bedding/garden plants), 3 (cut flowers), 4 (cut cultivated florist greens), and 6 (foliage plants) requested area in production in 1988 and intentions for production in 1989 for specified kinds of plants and/or by type of container (e.g., flats or pots for bedding/garden plants).

The content and design of the A19.1 and A19.2 report forms were finalized in the fall of 1988; the NASS form A19.2 went to print in November and was distributed in the following month to the 28 NASS State offices involved in their survey. The census form A19.1 went for printing in the first week of January 1989.

Mailing lists—Growers were selected for inclusion in the 1988 Census of Horticultural Specialties if they had reported a minimum of $2,000 or more in sales of horticultural products in the 1987 Census of Agriculture. Approximately 32,000 respondents to the 1987 census qualified and were included in the horticultural specialties mail list. The NASS list covered 28 States and consisted of growers expected to have annual sales of $10,000 or more in floricultural products. The census and NASS lists were clerically matched by the Bureau's Data Preparation Division (DPD) staff at the Jeffersonville facility, and about 8,000 duplicate addresses were deleted from the Bureau's file. The remaining 24,000 cases became the mailing list for the horticultural specialties census.

Data Collection

General information—The printed materials for the Bureau mailings—report forms, instruction sheets, cover letters, and so on—arrived at the Jeffersonville, IN, office during the first week of February 1989. DPD clerks assembled the mailing packages there in late February.

The DPD staff also was involved in the final preparation of the census mail list, matching the Census/NASS horticultural operations lists (see above). The census mail list, which covered all 50 States but excluded horticultural operations with annual sales of $10,000 or more in the 28 States covered by the NASS survey, was ready by the end of February. The adhesive address labels were printed at the Jeffersonville office and the DPD staff applied them to the mailing packages during the first week of March.

Mailout and mail followup—The DPD carried out the initial horticultural census mailing to 24,338 horticultural operations in all 50 States on March 10-14, 1989. A thank you/reminder card was mailed to all addresses on the horticultural mailing list approximately 2 weeks after the census mailout, and there were four followup mailings at about 3-week intervals from mid-April to the end of June. The first and third followup packages consisted of a report form, information sheet, return envelope, and cover letter, while the second followup involved only a letter reminding the addressee that his or her report form had not yet been received. The fourth followup consisted once again of the report form package, but was sent certified mail, as a means of emphasizing the importance of response. Toward the end of July, the Bureau identified some 500 additional horticultural specialty operations from the 1987 agriculture census returns, and added these addresses to the horticultural census file. At the same time, about 200 addresses already in the mail file were identified as out of scope, and were deleted from the mail list. The Bureau carried out a special mailing of horticultural census report forms to these "adds," but because of time constraints, only one followup mailing was done. The characteristics of the census and followup mailings were as follows:

Mailout	Type	Date	Mailed
Initial mailing	Report form	03/10-14/89	24,338
Thank you/reminder	Card	03/29/89	24,338
First followup	Report form	04/14-17/89	15,680
Second followup	Letter	05/05/89	12,292
Third followup	Report form	05/25-26/89	10,693
Fourth followup (certified mail)	Report form	06/23/89	8,940
Census "adds"	Report form	07/31/89	500
Followup for "adds"	Report form	08/18/89	402

The Bureau planned to include a telephone followup of large nonrespondents to the horticultural census, but in an effort to improve overall response, decided to mail the fourth followup, using certified delivery to all cases still nonrespondent after mid-June.

Results—The 1988 Census of Horticultural Specialties was on a voluntary response basis, and in the early stages of the enumeration nearly 20 percent of addressees explicitly refused to respond. By the time data collection was closed in August 1989, overall voluntary response was 75.3 percent, compared with 94.4 percent for the 1979 horticultural census (collected under mandatory authority).

The NASS data collection effort—The NASS's 1989 Commercial Horticulture Survey involved a sample consisting of over 15,000 operations in 28 States. The USDA field

staff enumerated the NASS sample by field interview during February, March, and April 1989. A total of 14,940 horticultural operations were identified and enumerated and, after NASS extracted the data required for its evaluation and analysis, it sent the completed report forms to the Census Bureau's Jeffersonville, IN, office for processing and incorporation into the horticultural census data file.

Data Processing

Receipt and check-in—Check-in of the first horticultural census report forms began in Jeffersonville in late March. Return envelopes for the horticultural census had "Horticulture" overprinted on the left front side, and as these packages arrived, the DPD staff referred them, together with postmaster returns (PMR's), to the batching unit for check-in. Batching clerks grouped incoming report forms by type into batches of report forms and PMR's (a batch comprised the contents of a filled mail tray—about 300 receipts), prepared a Form EC-14, Check-In Batch Cover Sheet, and a batch log (form BC-1476) control form for each, with the batch number assigned and date prepared, and document type (i.e., whether report forms, PMR's, correspondence, etc.), and sent each batch for barcode laser check-in. The check-in unit used the laser reader equipment and the six-pocket mechanical sorter to check-in and sort the horticultural receipts. The equipment sorted the documents into rejects (unable to read the barcode on the address label—pocket 1), horticultural receipts (pockets 2 and 4), PMR's (pocket 3), other trade areas (pocket 5), and machine failures (unable to sort—pocket 6). The staff resubmitted rejects and machine failures three times; if the documents remained unreadable by the equipment, the materials were returned to the opening and sorting unit and were checked in at wand/keyboard stations. This subunit used hand-held laser wand equipment to try to read visible barcodes, and, when this failed, checked in the specific receipts by keying the census file number (CFN) from the rejected case's address label directly to the check-in file.

After check-in, the horticultural receipts went to the open-and-sort unit, which referred all report forms with attached congressional correspondence to the Agriculture Division in Suitland for processing. Materials sent to the attention of a specific analyst (i.e., the analyst's name appears on the envelope, report form, or letter received with the form) were forwarded to that analyst; all other checked-in materials went to the agriculture processing unit for precomputer clerical editing.

Precomputer edit—The clerical edit staff received work units of report forms from the open-and-sort unit on a flow basis, in batches by type (i.e., either Form 88-A19.1, 1988 Census of Horticultural Specialties, or Form 88-A19.2, Commercial Horticulture Survey 1989). Clerks reviewed each report form, item by item, annotating the form as needed. During this edit, the clerks transcribed any entries outside the prescribed location; annotated any line entry that was obscured or illegible; lined through such entries as "same," "all," or "ditto" when they referred to previous numeric entries; converted spelled-out entries to numeric (e.g., "five" to "5"); lined through any remarks they had processed; and wrote in any referral codes needed.

The clerks batched edited report forms without referral codes or attached correspondence by form type and State, prepared a Form A405 Batch Cover Sheet with the new batch number, date, State code, and CFN count, and sent the batches to the data keying unit for keying. Report forms with attached correspondence went to the correspondence unit; blank forms and forms with problem-referral codes were forwarded to agricultural analysts for resolution.

Data entry—The DPD staff used the interactive minicomputer systems and procedures similar to those employed for the general agriculture census to key the horticultural census data to the computer files. The data keying unit received the horticultural specialties census report forms and the NASS survey forms (batched separately), linkage documents, and other materials in work units by State and type of form. Keyers opened each plastic envelope and checked the Form A405, Batch Cover Sheet, and type of report forms before keying the batch. The keyers pulled any forms with problems that required correction during data entry, and held the rejected report forms aside until the entire batch was keyed, then referred them (as rejects) to their supervisors.

As with the regular census report forms, the staff used a series of input programs to key the data from the batch cover sheet and report forms, except that no geographic area code input programs were needed, and the smaller number of data sections on the horticultural forms required only 17 reported-data input programs. The horticultural census data-keying operation was subjected to the same quality control measures as the agriculture census operation, with each keyer's work sampled or 100-percent verified and with all identified errors corrected before the keyed data were entered into the data file. (For details of the census keying and quality control operations, see ch. 6.)

Once each batch had been keyed to disk and any identified errors had been corrected, the lead operator moved the data from the disk to magnetic "pooler" tapes—separate pooler tapes were used for the 1988 Census of Horticultural Specialties data and the NASS survey data—for transmission to the Suitland computer facility by telephone datalink. After Suitland verified receipt of the data from a given pooler tape transmission, the Jeffersonville staff erased the tape for reuse.

Interactive computer edit—The Bureau used the interactive minicomputer systems at Suitland for a detailed, item-by-item edit of the file, checking the consistency and reasonableness of the data, correcting obviously incorrect or inconsistent items, and imputing missing data based on

the records of similar operations in the same geographic area. The computer "flagged" any particularly large individual data entries, as well as any data items changed significantly by the edit, and the Agriculture Division analysts reviewed these items. The interactive edit allowed analysts to resolve all flagged items' problems and reedit the report in one operation. After the interactive edit, the records were ready for tabulation.

Tabulation—The Bureau tabulated the horticultural specialties census data using its table image processing system (TIPS II) software package, producing estimates for the United States and States in data tables. Agriculture Division analysts reviewed the tabulations as they were generated to check consistency and reasonableness compared with the 1987 census data. Any corrections needed were made to the data file before running the final tabulations.

Publication

The data from the horticultural specialties census were released in August 1991, in the *1987 Census of Agriculture*, Volume 4, *Census of Horticultural Specialties (1988)*. The horticultural report presented tabulations for calendar year 1988 for the United States and States, on number of establishments, value of sales of horticultural products, type of horticultural products, and kind of business, as well as measures of the response of establishments to the census. The data also were available on compact disc-read only memory (CD-ROM) and on flexible diskettes, and highlights of the report were released online through the Bureau's CENDATA™ service.

1988 FARM AND RANCH IRRIGATION SURVEY

Introduction

Background information—The 1987 agriculture census showed that while some 14 percent of all farms in the United States were irrigated, those farms accounted for approximately 33 percent of the value of all agricultural products sold, and 51 percent of the value of all crops sold. Hence, information on agricultural irrigation was crucial to legislators and policymakers, economists and farmers, and planners and hydrologists concerned about the Nation's future supplies of both food and fresh water.

Scope and reference year—The 1988 Farm and Ranch Irrigation Survey (FRIS) supplemented the basic irrigation data collected from all farm and ranch operators in the 1987 agriculture census. The survey requested information about on-farm irrigation practices from a sample of 1987 agricultural operators who reported using irrigation on their land during the census year. The survey collected relatively detailed data, but limited the overall response burden for operators. The sample was drawn from farms and ranches—excluding operators in Alaska, Hawaii, abnormal and horticultural specialty operations—reporting irrigation in the 48 conterminous States. The survey sample was designed to provide reliable estimates of irrigation practices for the 18 water resources areas (WRA's) of the 48 conterminous States, as well as for the 27 leading irrigating States.[1]

The survey asked respondents to supply data on land use, irrigation and maintenance expenditures, and other inventory items for calendar year 1988, while irrigated and nonirrigated crops data were requested for the 1988 growing season.

Preparations

Sample design and selection—The 1988 FRIS sample was designed to provide reliable estimates for the United States, each of the 18 WRA's, the 27 leading irrigating States, and the 21 remaining, combined, conterminous States. It included with certainty all farms in a State with a minimum number of irrigated acres, as follows:

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

In addition to these "certainty" farms, the staff selected a sample of all other eligible irrigated farms in the 48 conterminous States. The total eligible farms were stratified based on specific State, WRA, and number of irrigated acres. (The stratum assignment based on irrigated acreage differed from State to State.) Within each stratum, the farms were systematically sampled, with a higher sampling rate for larger irrigated farms. The "certainty" sample yielded 2,013 farms, while a total of 17,311 farms were selected from all other irrigation operations.

Report form—The Form 88-A62, 1988 Farm and Ranch Irrigation Survey, report form was a 17" x 21" sheet of white stock, folded to 17" x 10 1/2" to form four pages,

[1]The WRA's for which data were collected, tabulated, and published corresponded essentially to the water resources regions (WRR's) defined in the past by the U.S. Water Resources Council. The areas differed somewhat from the WRR's because the WRA boundaries were drawn along county boundaries, while the WRR's were defined by topographic drainage characteristics. The 27 leading irrigating States were Arizona, Arkansas, California, Colorado, Florida, Georgia, Idaho, Illinois, Kansas, Louisiana, Michigan, Minnesota, Mississippi, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, Wisconsin, and Wyoming. The reported acreages irrigated in these States ranged from over 7.6 million in California to 162,000 in North Dakota.

with printing in black ink and shaded with a green wash. The report form consisted of 16 sections, the first of which asked whether any land on the farm or ranch operated by the respondent had been irrigated in 1988, while section 16 asked for the name and telephone number of the person completing the form. The remaining 14 sections requested detailed data on the following:

Acreage in 1988

Land use and acres irrigated by category of land use

Acres and yields of irrigated and nonirrigated crops

Method of water distribution and acres irrigated by type of water distribution system

Irrigation frequency, and application of commercial fertilizers and pesticides in irrigation water

Acres irrigated and quantity of water used by source

Number of irrigation wells and pumps

Expenditures in 1988 for maintenance and repair of irrigation equipment and facilities

Investment in irrigation equipment, facilities, and land improvement

Purchase of energy for on-farm pumping of irrigation water[2]

Costs of water received from off-farm water suppliers

Irrigation practices in 1988

Other uses of irrigation water

Water management practices for operators using gravity irrigation

Data Collection

General information—The 1988 FRIS was a mail enumeration, supplemented by telephone followup to selected nonrespondents. Report forms were mailed out in January 1989 to the sample of 19,862 addresses chosen from agricultural operations reporting irrigated acreage in the 1987 census. Four mail followups were carried out between the second week of February and the first week of May; the first and third mailings used letters requesting response, while the second and fourth consisted of report forms. In followup, clerks telephoned nonrespondents with large irrigated acreages (as reported in the 1987 census; these operations were the "certainty" cases included in the survey (see below)). The data collection effort was completed in June, after achieving a 77-percent response.

Mailout and mail followup—The printer shipped the irrigation survey report forms, followup letters, and other mail enumeration materials to Jeffersonville, IN, during October and November 1988. The DPD staff printed the address labels using the computerized address file compiled by the headquarters office; then the clerical staff at the Jeffersonville office assembled the mailing packages there. The initial mailout consisted of the 88-A62 report form, an instruction sheet, a cover letter requesting prompt response, return envelope, and a brochure explaining the need for the irrigation data. The first and third followup mailings involved letters requesting response, while the second and fourth included the report forms and instruction sheets as well.

The Census Bureau prepared a computerized survey mail list after each mail response cutoff (usually about 5 days before the next mailout), and used this to produce adhesive address labels. The clerical staff at Jeffersonville attached the address labels to the mailing packages during the 3-to-5-day intervals between the followup response cutoff dates for each mailing, and the next mailout. The initial survey mailing and the four followup mailings were as follows:

Mailout	Type	Date	Mailed
Initial mailing	Report form	01/13/89	19,862
First followup	Letter	02/16/89	11,901
Second followup	Report form	03/14/89	9,264
Third followup	Letter	04/05/89	6,760
Fourth followup	Report form	05/01/89	6,005

Telephone followup—Prior to the final followup mailing, the Agriculture Division listed all irrigation survey nonrespondent certainty cases—707 in all—for a special telephone followup operation. Clerks at Jeffersonville, IN, researched telephone numbers for the selected cases, and on May 11, began calling those operators still nonrespondent and continued until the end of June, by which time responses had been obtained from all referred cases. Since the certainty operations were all large-scale irrigators, failure to obtain information on their operations could have significantly biased the irrigation estimates.

Results—The 1988 FRIS obtained an overall response rate of approximately 77 percent (including approximately 1,000 PMR's and unprocessable (i.e., blank, illegible, refusals, and so on) cases), with 13,850 report forms completed (including reports from 444 farms that discontinued irrigation between the 1987 census and the 1988 irrigation survey). Operators reported over 11 million acres irrigated. Statistical expansion of these numbers produced national estimates of some 238,710 irrigators in the conterminous United States, with over 46 million acres of irrigated land.

Data Processing

Receipt and check-in—Report forms and PMR's were checked in at the wand/keyboard stations instead of the

[2]Water may to applied to crops to prevent freeze damage (as is frequently done with citrus), crop cooling to prevent early budding or blooming, for leaching to remove salts, etc.

six-pocket mechanical sorter, due to the absence of windows in the return envelopes used for the survey. The return envelopes were slit open and the report forms removed for check-in. Report forms with attached congressional correspondence were sent to Agriculture Division in Suitland for processing; materials sent to the attention of a specific analyst (i.e., the analyst's name appeared on the envelope, report form, or letter received with the form) were forwarded to that analyst; all other checked-in materials went to the agriculture processing unit for precomputer clerical editing.

Precomputer edit—The clerical edit staff received work units of FRIS report forms from the open-and-sort unit on a flow basis, in batches of 50-100. Clerks reviewed each one, item by item, annotating as needed, and forwarded the edited forms to the next processing unit. Edited forms without referral codes or attached correspondence were batched by form type and State and sent to the data keying unit for keying. Forms with attached correspondence went to the correspondence unit; blank forms and those with problem referral codes were forwarded to agricultural analysts for resolution.

Data entry—The DPD staff used interactive minicomputer systems and procedures similar to those employed for the horticultural census to key the FRIS data to the computer files. The data keying unit received the report forms batched by State, linkage documents, and other materials and used a series of input programs to key the data from the batch cover sheet and report forms (see ch. 6 for details of data keying operations), including (for the FRIS) geographic area code input programs. The FRIS data keying operation was subjected to the same quality control measures as the agriculture census operation, with each keyer's work subject to sample or 100-percent verification. All errors were corrected before the keyed data were entered into the data file, edited and corrected again, and moved from the disk to magnetic "pooler" tapes for transmission to the Suitland computer facility by telephone datalink.

Computer edit—The data from each report form were processed through a detailed computer edit at the Suitland facility. The edit imputed missing data and made adjustments to totals based on similar-size farms in the same geographic area. The edit "flagged" large entries, as well as any item changed significantly by the edit itself, for review by Agriculture Division statisticians. After review and approval of any such changes, the record was reedited prior to being merged with the final data file. Every record had to pass the computer edit, with any changes or adjustments made by analysts or by the edit itself, before it could be added to the irrigation survey data file.

Tabulation—The Bureau tabulated the FRIS data using the TIPS II software package. The tabulation program produced detailed estimates for the United States of irrigation data from farm operators who reported irrigated land in the 1987 census and in the 1988 survey. Agriculture Division analysts reviewed the tabulations as they were produced to check consistency and reasonableness compared with the 1987 census data. Any corrections needed were made to the data file before running the final tabulations.

Publication

The data appeared in May 1990 in the *1987 Census of Agriculture*, Volume 3, *Related Surveys*, Part 1, *Farm and Ranch Irrigation Survey (1988)*. The printed report presented summary irrigation data for all States, with detailed tabulations for the 27 leading irrigation States and for the 18 water resources areas. The tables showed data for calendar 1988 on acreage irrigated, crops, method of water distribution used in 1988, source of water used, energy use, and irrigation practices. The data also were released on CD-ROM and flexible diskette, and highlights of the report were released online through the Bureau's CENDATA™ service.

1988 AGRICULTURAL ECONOMICS AND LAND OWNERSHIP SURVEY

Introduction

General information—The 1988 Agricultural Economics and Land Ownership Survey (AELOS) was an integrated survey of farm economics and land ownership. The agriculture censuses have collected information on certain types of farm financial practices since the first agriculture census in 1840, but the principal data requested in most censuses was the value of farm land and of sales of agricultural products. The 1880 census asked for and published data on land ownership characteristics and farm tenure, and in the 1890 enumeration, data were collected on farm mortgage debt.

The 1959 Census of Agriculture included the first of a series of special followon surveys that used samples drawn from the agriculture census lists to collect selected data on farm finances. The 1969 agriculture census program included the 1970 Survey of Agricultural Finance, which expanded the kinds of data requested to include 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, construction of farm buildings and structures, and off-farm income. A decade later the 1979 Farm Finance Survey expanded inquiries further, to include questions on production contracts, farm-related income and expenses, land acquired and date of purchase, the operator's educational and household characteristics, and so on. The survey requested all these data from farm operators, and additional data from landlords on land ownership, sales of agricultural land, participation in management decisions, and type of ownership.

Scope and reference year—The 1988 AELOS covered all 50 States and requested data from farm operators and landlords on agricultural land ownership, income and expenses from farm-related sources, assets, value of land and buildings, sales of land, participation in management decisions (by landlords), and type of ownership. The data were collected in 1989 for calendar year 1988.

Preparations

Sample design and selection—The 1988 AELOS was designed to collect data on land ownership and the economic characteristics of farm operations from landowners and farm operators. The survey used a sample of farm operators and landlords, excluding horticultural specialty operations and abnormal farms. (These excluded operations represented 2 percent of the over 2 million farm operators who responded to the 1987 census.) The AELOS report forms included most of the financial items requested in the earlier farm finance surveys, as well as additional items on land ownership, how land was purchased, type of ownership, acreage acquired or sold for specified years, and on landlords who operated farms as well as landlords who did not. For Census Bureau purposes, a "landlord" was an individual, partnership, or entity that controlled land rented, leased, or used rent-free by a farm operating unit. The number of landlords was not a measure of landholders, but a count of the number of leases or rental arrangements made by farm operating units. "Owners," on the other hand, were individuals, partnerships, corporations, or other entities that owned land used for agricultural purposes (excluding Federal and State agencies, railroad companies, Indian reservations, and abnormal farms). Owners were classified either as owner-operators or nonoperator-owners, based on whether they operated any of the land they owned.

The survey employed a sample of approximately 48,000 names and addresses of farm operators selected from the 1987 agriculture census for all 50 States, excluding horticultural specialty operations and abnormal farms. The survey was designed to provide reliable State-level estimates (i.e., with an average relative error of 15 percent or less) of land ownership and various economic characteristics of farm operations. The sample included approximately 500 certainty cases, and a sample of all other farms. Certainty status depended on value of sales of agricultural products during the census year and varied from State to State, as follows:

Total value of sales	State
$500,000 or more	Alaska
$1,000,000 or more	New Hampshire, Rhode Island, Vermont
$10,000,000 or more	Hawaii, Idaho, Indiana, Massachusetts, New Mexico, North Carolina, Oklahoma, Oregon, Washington
$20,000,000 or more	Arizona, California, Colorado, Florida, Kansas, Nebraska
$30,000,000 or more	Texas
$5,000,000 or more	All other States

The agency stratified the list of all other farms by State, tenure of the operator, and value of agricultural sales, then systematically sampled farm operators from each stratum. Part owners and tenant operators, and farms with larger volumes of sales received a higher probability of selection. The mail list for landlords comprised names and addresses reported as landlords by responding farm operators, except for public landlords (i.e., Federal or State governmental units, railroad companies, and Indian reservations). The Bureau mailed report forms to more than 47,000 landlords identified by AELOS operator respondents.

Pretest—Time and cost constraints prevented carrying out a full scale content pretest of the proposed operator and landlord report forms, so the Agriculture Division staff conducted a series of studies of the report forms with farmers in Pennsylvania, Kentucky, Iowa, Wyoming, and California. (These five States were selected because they represented a fairly wide range of kinds of farming, and relative geographic dispersion.) Three to five meetings were held in each State, each with 10 to 15 farm operators and landlords. During the meetings, participants completed the report forms, then filled out an evaluation report for each section of the survey form, together with their impressions of the level of difficulty of the forms, e.g., whether respondents could provide the data requested through estimates and/or records, and any other comments or suggestions they might have. This was followed by a question-and-answer session with the Agriculture Division staff.[3]

After each meeting, the Agriculture Division analysts in attendance met to discuss and evaluate the results. The group participants found the general content and wording of the report forms acceptable, although they suggested minor rewording of some of the instructions, and modifications to the sequence in which some questions were asked.

Report forms—The AELOS used two report forms, the Form 88-A9A, Operator's Report, and the Form 88-A9B, Landlord's Report.

The form 88-A9A was a sheet of white stock 14" x 27" folded to 14" x 10 1/2", with six numbered pages (pages 4 and 5 were "half-page" size, measuring 14" x 5 1/2").

[3]The National Young Farmers, part of the Farm Bureau Federation, helped in making the necessary arrangements for the focus group meetings and contacting farm operators and others to participate in the activities.

Printing was in black ink, with a pink wash used for shading. The form had 14 numbered sections, with sections 3 (expenditures and expenses) and 10 (assets) divided into parts "A" and "B." (Subsections 3A and 3B requested data on purchases and expenditures during 1988 for the agricultural operation, and agricultural operating expenditures and other purchases during 1988, respectively, while sections 10A and 10B asked for household and business assets, respectively.) The operator's report served not only to collect specified data on the farm operation and economic situation of the particular operation, but also to identify any landlord for separate contact and enumeration.

The form 88-A9B used white stock, 14" x 21", folded to 14" x 10 1/2", with four numbered pages, and with printing in black ink and shading in a blue wash. The landlord's form had 12 numbered sections, with sections 2 (expenditures) and 10 (characteristics of the landlord) divided into parts "A" and "B" as well. (Subsections 2A and 2B asked for data on purchases and expenditures during 1988 and operating expenses and other purchases, respectively; while 10A and 10B requested information on characteristics and occupation of the landlord, and corporate landlords.)

Each of these report forms requested basic data on the identification and characteristics of the operator or landlord, acreage and current market value of the land and buildings owned or operated by the respondent, purchases and expenditures for agricultural operations and other expenses during the reference year, debt as of the end of 1988, and the real estate taxes paid on, and assessed value of, the land owned or operated by the respondent. In addition, each report form requested specific data from the respective types of respondents, as follows:

88-A9A Operator's Report

Agricultural land ownership and mailing address of any landlords

Market value of agricultural products sold in 1988

Income and expenses from other farm-related sources

Net cash farm income of partner ships

Business and household assets

Off-farm income and household size

Off-farm work and education (of operator and spouse)

88-A9B Landlord's Report

Assets owned by landlord

Participation in management (i.e., landlord only, tenant only, or joint) for farm land report

Net cash income

Type of ownership (i.e, sole, husband/ wife, family partnership, etc.)

Corporation landlords (including whether involved in other agriculture-related activities)

Total business receipts (farm related, and proportion of total receipts from all sources from sales of agricultural products and/or rental income from all agricultural lands owned and/or operated

Data Collection

General information—The 1988 AELOS was carried out by mail. The first mailout was in January 1989, to farm operators selected from the 1987 census respondent files. Each mailing package consisted of a report form, an instruction sheet, a cover letter explaining the objective of the survey and requesting prompt response, and a return envelope. The Bureau mailed a thank you/reminder card to all addresses on the initial survey list on January 27, 1989, plus four mail followups to nonrespondents at approximately 4-week intervals. The mailouts used third-class postage, except for the fourth and final followup, which employed certified delivery. (Using certified mail increased response by approximately 10 percent.)

The Bureau began compiling the landlords' mailing list as soon as responses began to arrive from operator respondents; time constraints did not allow the agency to wait until it completed the farm operator data collection before it began collecting data from landlords. Consequently, the landlords' mail list was compiled in four "waves," each "wave" consisting of the landlords identified by operators responding before a specified cutoff date. All landlord mailouts used third-class postage.

Mailout and mail followup—The details of the mailings to operators were as follows:

Mailout	Type	Date	Mailed
Initial mailout	Report form	01/05–06/89	45,006
Thank you/ reminder card	Card	01/27/89	45,006
First followup	Report form	02/14/89	34,448
Second followup	Report form	03/13/89	20,245
Third followup	Report form	04/10/89	16,758
Fourth followup (certified mail)	Report form	05/08–09/89	15,055

The first two "waves" of landlords received an initial mailing consisting of a report form, cover letter, instruction sheet, and return envelope, followed by a thank you/reminder card mailing, and three followup mailings to nonrespondents, each including a report form. Wave 3 got the initial mailing, a thank you/reminder card mailing, and two mail followups. Landlords in the fourth "wave," because of time constraints, received only the initial mailing and a

single report form followup. The details of the landlord mailings were as follows:

Mailout	Type	Date	Mailed
WAVE 1			
Initial mailout	Report form	03/21/89	10,207
Thank you/ reminder card	Card	04/04/89	10,207
First followup	Report form	04/26/89	4,129
Second followup	Report form	05/24/89	2,814
Third followup	Report form	06/16/89	2,202
WAVE 2			
Initial mailout	Report form	04/20-24/89	19,366
Thank you/ reminder card	Card	05/12/89	19,366
First followup	Report form	05/26/89	10,044
Second followup	Report form	06/22/89	6,688
Third followup	Report form	07/24/89	4,891
WAVE 3			
Initial mailout	Report form	06/12/89	7,453
Thank you/ reminder card	Card	06/28/89	7,453
First followup	Report form	07/15/89	3,933
Second followup	Report form	08/09/89	2,598
WAVE 4			
Initial mailout	Report form	07/11/89	7,483
First followup	Report form	08/04/89	4,868

The fifth "wave" of 1,281 landlord cases was compiled, but again, time constraints prevented additional mail or telephone data collection, and the Agriculture Division staff imputed data for these cases based on information from landlords in the same geographic area.

Results—The AELOS achieved a final operator response rate of approximately 82 percent, with 35,684 report forms completed (including 3,148 operators who were no longer farming in 1988). Farm operators reported over 47,000 landlords, but only 44,038 were mailed report forms (the remaining landlords were identified as "public" landlords (e.g., Federal or State agencies), railroad companies, Indian reservations, and hence excluded from the survey). The actual response rate for landlords achieved was 78 percent.

Data Processing

Receipt and check-in—The AELOS report forms were checked in using procedures similar to those employed for the FRIS—i.e., the return envelopes had to be opened and the report forms checked in at the wand/keyboard stations. After check-in, report forms with attached congressional correspondence were referred to the Agriculture Division in Suitland for processing; materials sent to the attention of a specific analyst (i.e., the analyst's name appears on the envelope, report form, or letter received with the form) were forwarded to that analyst; and all other checked-in materials went to the agriculture processing unit for precomputer clerical editing.

Precomputer edit—Clerks at the Jeffersonville office reviewed each AELOS report form before sending it for data keying. Forms from "large" operations, i.e., those operations with reported value of sales of agricultural products meeting or exceeding specified limits ($500,000 in most States, but higher in some Western States), as well as any forms with pertinent remarks that could not be readily coded, were referred to agricultural analysts for review and resolution. The clerks checked each form to ensure the legibility and completeness of entries, corrected obvious errors, changed alphabetic responses to numeric (e.g., changed "five" to "5"), coded the forms for respondents who refused to answer the debt inquiries (this enabled the computer edit program to impute responses for these items), and identified any respondents reporting off-farm work. The DPD staff coded the report forms for respondents reporting off-farm work, using the Bureau's 1980 census industrial and occupational classification system.

Clerks reviewed the return from each landlord reporting as operating a farm or ranch in 1988 and compared the name and address to the 1987 agriculture census mail file. The entry for any landlord not found in the 1987 file, or found to have been identified as a "nonoperator" in the census file, was deleted from the AELOS data file.

After each report form had been reviewed, and all changes and required codes made, the clerks referred them to the batching unit for grouping into batches of about 50 cases each, by State and type of form, before data keying. The batching unit clerks checked each report form to determine whether it was for an operator or landlord. They batched any landlord forms first, and referred them to the Data Systems Branch for updating the landlord mail file. After being returned to the batching unit, the batches, with a Form 87-A405, Batch Header Sheet attached, were referred for data keying.

Data entry—The DPD staff used interactive minicomputer systems and procedures similar to those employed for entering the AELOS data to the computer files. The data

keying unit received the AELOS report forms batched separately by State and type (i.e., whether operator or landlord), linkage documents, and other materials. The keyers used a series of input programs to key the data from the batch cover sheet and report forms (see ch. 6 for details of data keying operations). The AELOS data keying operation was subjected to the same quality control measures as the agriculture census operation, with each keyer's work subject to sample or 100-percent verification, and with all errors corrected before the keyed data were entered into the data file.

Once each batch had been keyed to disk and all errors corrected, the keyer moved the records from the disk to magnetic "pooler" tapes for transmission to the Suitland computer facility by telephone data link. After Suitland verified the receipt of the data from a given pooler tape transmission, the Jeffersonville staff erased the tape for reuse.

Computer edit—At Suitland, the staff used the mainframe computer for a detailed, item-by-item edit of the file, checking the consistency and reasonableness of the data, correcting obviously incorrect or inconsistent items, and imputing missing data based on the records of similar operations in the same geographic area. The computer compared key items from the AELOS records with the 1987 agriculture census to confirm accuracy and reasonableness. The computer edit also reconciled data reported by operators and their landlord(s). The reconciliation checks covered only the data items common to both—i.e., acres rented, assigned value of land and buildings, assets, and expenses.

The computer edit also included a matching operation to identify for manual coding duplicate landlord data (since landlords who rented land to more than one operator could be counted more than once in the data on land ownership) and grouped the records for all landlords with similar name codes with the same five-digit ZIP Code area. Any landlord found more than once on the landlord list for each area was identified as a multiple report. The data from multiple landlords were tabulated only once for land ownership.

Tabulation—The AELOS data were tabulated using the TIPS II software package. The tabulation program produced estimates for the United States, regions, divisions, and States in 113 data tables. Agriculture Division analysts reviewed the tabulations as they were produced to check consistency and reasonableness compared with the 1987 census data. Any corrections needed were made to the data file before running the final tabulations.

The estimates produced were not absolute totals for calendar 1988, but were based on the 1987 census universe, less the horticultural specialty and abnormal farm operations.

Publication

AELOS data were released in August 1990, in the *1987 Census of Agriculture*, Volume 3, *Related Surveys*, Part 2, *Agricultural Economics and Land Ownership Survey (1988)*. The printed report presented economic and land ownership data for the United States and States on farmland owned and leased, land use, amount and source of debt, production contracts, taxes, assets, off-farm income, and, for landlords, type of ownership and ownership characteristics, as well as measures of the statistical reliability of the data. The data also were released on computer tape and online.