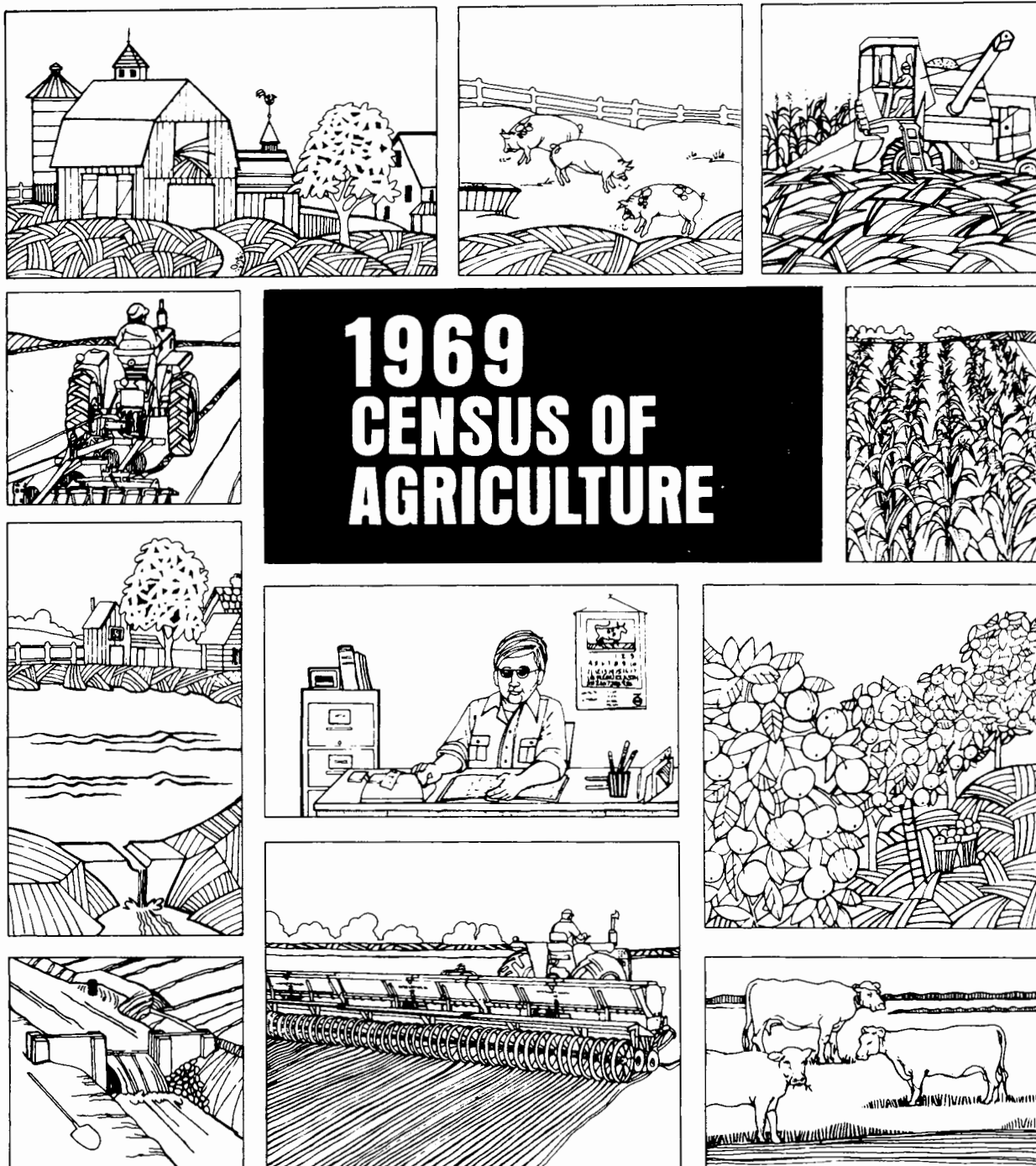


part 16

# EVALUATION OF COVERAGE

VOLUME V  
SPECIAL REPORTS



Issued June 1974



U. S. DEPARTMENT OF COMMERCE

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## REPORTS OF THE 1969 CENSUS OF AGRICULTURE

### Individual County Reports

Eight-page reports have been issued for each county and State.

### Volume I. Area Reports

A separate report has been published for each State, American Samoa, Guam, Puerto Rico, Trust Territory, and the Virgin Islands. The report consists of two sections. Section 1 contains State summary data, county summary of selected data, and miscellaneous items by counties; Section 2 contains the detailed county reports.

### Volume II. General Report

Statistics by subject are presented in separate chapters with totals for the United States, regions, geographic divisions, and States. The nine chapters are being issued as individual reports as follows:

- Chapter 1 General Information; Procedures for Collection, Processing, Classification*
- Chapter 2 Farms: Number, Use of Land, Size of Farm*
- Chapter 3 Farm Management, Farm Operators*
- Chapter 4 Equipment, Labor, Expenditures, Chemicals*
- Chapter 5 Livestock, Poultry, Livestock and Poultry Products*
- Chapter 6 Crops, Nursery and Greenhouse Products, Forest Products*
- Chapter 7 Value of Products, Economic Class, Contracts*
- Chapter 8 Type of Farm*
- Chapter 9 Irrigation and Drainage on Farms*

### Volume III. Agricultural Services

This new report contains data relating to agricultural services for the United States by State and county.

### Volume IV. Irrigation

Data will be included on drainage basins, land irrigated, crop production on irrigated land, water conveyed, users, and types of organizations.

### Volume V. Special Reports

Reports may contain data obtained from supplemental surveys, such as type of farm, horticulture, and farm finance; in addition to information obtained in the census.

- Parts 1 to 9. Type-of-Farm Operations.*—One for each of nine major type-of-farm classifications.
- Part 10. Horticultural Specialties.*
- Part 11. Farm Finance.*
- Part 12. Ranking Agricultural Counties.*
- Part 13. Forms and Procedures.*
- Part 14. Procedural History.*
- Part 15. Graphic Summary.*
- Part 16. Evaluation of Coverage.*

### Volume VI. Drainage of Agricultural Lands

This report will include agricultural drainage statistics collected from individual farms and from publicly organized drainage projects.

**ACKNOWLEDGMENTS**—Many persons contributed to the coverage evaluation program for the 1969 Census of Agriculture. First and foremost are the many farm operators, members of their families, and employees who furnished the information.

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The coverage evaluation program was conducted under the direction of **J. Thomas Breen**, Chief, and **J. Jack Ingram**, Assistant Chief of Research and Methodology, Agriculture Division. The planning, processing, and tabulation of the statistics were performed under the supervision of **D. Dean Prochaska**, Chief of the Program Research and Development Branch, Agriculture Division. Other persons providing major assistance in the processing program and tabulation phases were **Burton Barr**, (SRS detail), **Sidney O. Marcus**, **R. Maurice Kniceley**, **Joy H. Stefan**, **Tom Moore**, **Dorothy Blackistone**, **Esther Stanback**, and **Napoleon Sobolewski**.

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Field followup data-collection activities were administrated by **Richard C. Burt**, Chief, Field Division with assistance from **James Johnson** and the Bureau's Data Collection Center's staff.

**Helen D. Turner** and **Janet W. Hall** were responsible for the various phases of the publication process for Agriculture Division.

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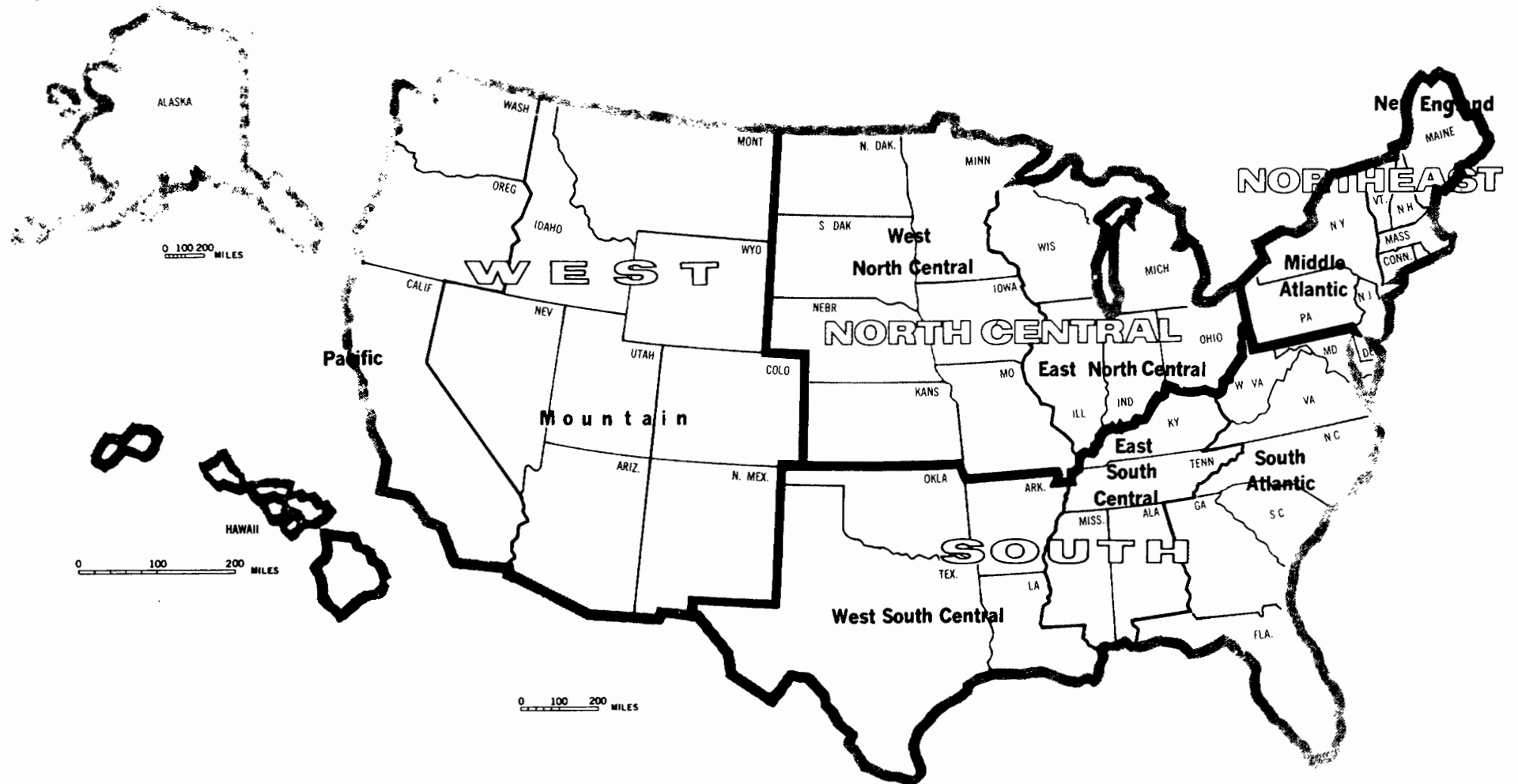
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# CONTENTS

	Page
Map	
Census Geographic Regions and Divisions of the United States . . . . .	IV
Introduction	
General Information . . . . .	1
The 1969 Census of Agriculture . . . . .	2
Survey Design and Methodology . . . . .	3
Coverage Check Results . . . . .	6
Special Census Evaluation . . . . .	9
TEXT TABLES	
Table A. Estimates of Census Coverage and Sampling Error of Number of Farms by Value of Sales Group:	
United States . . . . .	6
B. Comparison of Census Coverage of Farms and Value of Products by Value of Sales Class: United States . . . . .	8
C. Coverage Check Farms Included in the Census by Mail List Sources: United States . . . . .	8
D. Number of 1969 and 1964 Census Farms by Total Value of Products Sold Group: Washington and Oregon . . . . .	10
E. Coverage-Check Missed Farms by Match Status and Relationship to IRS Files: Washington and Oregon . . . . .	10
F. Coverage-Check Missed Farms Filing Individual Returns in 1968 and/or 1969, by State and Value of Products: Washington and Oregon . . . . .	10
G. Coverage-Check Missed Farms With IRS Business and/or Farm Returns in 1968 and/or 1969 State and Total Value of Products: Washington and Oregon . . . . .	11
DETAILED TABLES	
Table 1. Number of Farms by Components of Coverage by Value of Sales Class . . . . .	13
2. Number of Farms by Components of Coverage by Value of Sales Class and Type of Farm . . . . .	14
3. Number of Farms by Components of Coverage by Tenure and Size; Age and Residence of Operator . . . . .	16
4. Number of Acres for Estimated Total and Included in Census With Sampling Error . . . . .	17
5. Characteristics of Farms Missed in the Census by Class . . . . .	18
6. Characteristics of Farms Missed in the Census by Type of Farm . . . . .	20
7. Number of Farms by Components of Coverage by Value of Products Sold Including Adjustments for Nonrespondents . . . . .	22
8. Number of Farms by Components of Coverage by Value of Products Sold Excluding Adjustments for Nonrespondents . . . . .	24
9. Characteristics of Farms Missed in the Census . . . . .	26
10. Sampling Reliability of Estimates for Number of Farms by Components of Coverage and Value of Sales Class . . . . .	28
11. Sampling Reliability of Estimates for Number of Farms by Components of Coverage and Value of Products Sold . . . . .	29
APPENDIX	
Exhibit A. Coverage Check Processing Procedures . . . . .	A-1
B. ZIP Code Reference . . . . .	A-2
C. Form 69-A90 Evaluation of the 1969 Census of Agriculture . . . . .	A-3
D. Coverage Classification Codes . . . . .	A-7

# CENSUS GEOGRAPHIC REGIONS AND DIVISIONS OF THE UNITED STATES



U.S. DEPARTMENT OF COMMERCE  
BUREAU OF THE CENSUS

# Introduction

## GENERAL INFORMATION

### Purpose of Census Coverage Checks

The Bureau of the Census attempts to measure the accuracy of its statistics for all major censuses. The coverage check evaluation program is a major source for indications of data completeness and accuracy in the census of agriculture. The primary purposes of the coverage check for censuses of agriculture are—

1. To provide users of the census data with estimates of the completeness of the census farm counts and of a limited number of items.
2. To identify factors associated with census errors, including an evaluation of the characteristics of the farms missed in the census, in order to improve coverage in the future censuses.

### Previous Coverage Checks and Evaluation Programs

A coverage check has been conducted for each census of agriculture since 1945. The basic procedures have been the same for past coverage checks, but techniques have been refined and sample design improved with each census.

The basic procedures have been—

1. Selection of an area probability segment sample and canvass of all farms associated with each segment to establish a measurement base or standard.
2. Match of all farms in the base sample, case by case, to the census reports and lists to establish the relationship of the census to the base sample units.
3. Followup to check and clarify differences and establish "true" values.
4. Processing, tabulation analysis, and publication of results.

The use of an enumerated area sample as a measurement standard was justified on the basis of the higher quality results obtained thru more intensive enumeration and processing of the sample farms than is possible in a nationwide census.

Starting in 1950, the results of the coverage checks have been widely available to users of the agriculture census data.

Publication has been primarily in the regular census of agriculture volumes. Preliminary results of the coverage checks have been made available to the Department of Agriculture as quickly as possible for use in revising the current estimates on number of farms, land in farms, cropland, livestock numbers, and major crops.

In addition to the usual evaluation of census coverage, special evaluation studies have been completed during each census period. These studies include such subjects as accuracy of reporting, coverage of specific commodities or areas, and the effects of various processing operations.

### Objectives of the 1969 Coverage Check

The basic purposes of the coverage check for the 1969 Census of Agriculture have been the same as for previous censuses. However, since the 1969 census was the first to be enumerated by mail, some specific objectives were altered, and others were added in order to determine the effectiveness of the new procedures.

The 1969 coverage check was planned to accomplish the following objectives:

1. To measure the completeness of the census mailing list and the farm count, and the effectiveness of the census processing procedures in identifying farms.
2. To provide estimates for selected items, indicating the characteristics of farms not included in the census.
3. To evaluate the consistency of reporting acres of land in farms by operators included in the census.
4. To evaluate the quality of the various administrative lists used to construct the census mailing list and provide information for improving coverage in future censuses. Special emphasis was placed upon evaluation of the contribution of the different list sources to the number of census farms, the evaluation of the accuracy of the source size indicators and the extent of the duplication between sources.
5. To make estimates of coverage for the larger States, in addition to the regional and national level of estimates provided in prior coverage checks.

## Types of Measurement Error

The error in a statistic is the difference between the statistic and its "true" value. True values are usually hypothetical; therefore, in practice we use target values or estimates of "true" value obtained by improved measurement methods.

It is useful to consider the measurement errors in a census conceptually in two components — response variance and bias. To do this, it is necessary to assume that the census is a repeatable process of measurement; i.e., that independent census enumerations could be carried out with some conditions, such as the form of the questionnaire and written instructions, held constant but with other conditions, such as the particular persons selected as enumerators and the time of day a particular farm operator is interviewed, subject to random fluctuations<sup>1</sup>

For national statistics especially those self-enumerated, the error due to response variance is probably insignificant in comparison to the bias. The response variance arises from factors which tend to average out through compensating errors when large numbers of enumerators and/or respondents are involved, whereas the bias, although it may differ considerably for different areas or different censuses, is essentially independent of the size of the population. For smaller areas, such as counties and townships, however, response variance may be a significant source of error.

The above definitions are appropriate for census items for which data are collected from all farms. If some items are collected on a sample basis, sampling variability must also be considered along with the other components of error.

## THE 1969 CENSUS OF AGRICULTURE

### Background

The following brief description is presented to provide background for the coverage check. A more detailed description is presented in 1969 Census of Agriculture, volume II, chapter 1.

The 1969 Census of Agriculture was the first mailout-mailback self-enumerated national census of agriculture. All prior censuses were taken by personal interview in a complete canvass of rural areas. The first of these was taken in 1840 as part of the Sixth Decennial Census. They were taken every 10 years thereafter as part of the decennial censuses until 1920. In 1909, Congress provided for a national census of agriculture to be taken every 5 years. However, the census was not taken in 1915 because of abnormal conditions created by World War I. The census was taken in 1920 and every 5 years thereafter.

The feasibility of a mail enumerated census was tested prior to the census in a study involving a match of the 1964 coverage sample farms to Internal Revenue Service (IRS) records for the same period.<sup>2</sup> That study indicated that on a national basis

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<sup>1</sup> In practice, of course, independent repetitions of a census cannot be realized; however, the model can reasonably approximate actual census conditions.

<sup>2</sup> Detailed results are published in U.S. Census of Agriculture 1964, Volume III: Special Reports, Part 7: Evaluation Surveys, Chapter 1: Coverage Check, Washington, D.C., Government Printing Office.

about 96 percent of farms with total value of products (TVP) of \$2500 or greater would be included on a mailing list composed of names and addresses from IRS alone. Nationally the indications were that the IRS list would include about 70 percent of the farms with TVP less than \$2500; for the South the indicated inclusion rate for farms with TVP less than \$2500 was about 62 percent.

### The Mailing List

The initial step in conducting the 1969 census was the construction of a mailing list of names and addresses of persons and organizations associated with agriculture. The primary record source for the mailing list was the IRS Form 1040 F file of farm operators and persons with farm income for tax year 1968. Other supplemental files used were the Form 1040 C file of farm businesses, the Form 1065 farm partnership file, the Form 1120 S small farm corporation file, the Form 943 farm employers file, the Agriculture Stabilization and Conservation Service (ASCS, USDA) file in the Northeastern, Southern, and specified North Central States, and an updated large farm list from the previous census. All of the lists contained names of persons associated with agriculture but not all units on the mailing list represented census farms.

The lists were merged and unduplicated on the basis of social security and/or employer identification (EI) number. The total potential census mailing list which resulted had about 5,000,000 names and addresses. The names which had size indicators for under \$2,500 value of agricultural production were sampled at a rate of 1 in 2 for the census. These smaller units were mailed an abbreviated report form (Form 69-A2). All other units were sent the more detailed standard report form (Form 69-A1).

### Data Collection

The major part of the census name and address file (about 3.7 million names) was mailed in late December, 1969. Supplemental lists primarily from ASCS, containing about 132,000 names were mailed in May 1970. In addition, about 309,000 report forms were mailed in July 1970 to units filing 1040 F returns for tax year 1969, but not for the tax year 1968.

It was known that the mailing list contained duplicates and names of persons who were not farm operators (out of scope). Screening questions on the 69-A2 report form were designed to eliminate most of the out-of-scope cases early in the processing.

In order to eliminate duplication which remained after unduplication on identification number, persons receiving more than one report form for the same operation were requested to complete one of them and to return the others marked "Duplicate."

There were five followup mailings after the original December mailing. The first was a reminder card mailed on January 10, 1970, to all units receiving the standard form (69-A1). All nonrespondents (69-A1 and 69-A2) as of February 13 were sent a followup letter on February 25. The third followup was mailed April 8 to nonrespondents and included a letter and report form. The fourth and fifth followups were mailed on May 13 and June 9, respectively, with a report form and letter

being sent in the final mail followup. The cumulative percent returns for the initial mailing at each followup date were as follows: February 25: 61 percent; April 8: 74 percent; May 13: 81 percent; and June 9: 85 percent. The supplemental list units which were added after the initial mailout received only one mail followup and had a much lower rate of return (between 40 and 50 percent).

At the time of the fourth followup (about May 13) an intensive telephone and personal interview program was begun for all nonrespondents having indicator codes for \$50,000 or more total value of agricultural products (TVP). The proportion of nonrespondents remaining after the last mail followup was examined at the county level to identify counties with unacceptable response rates. As a result, 371 counties in 29 States were selected for additional followup by personal interview.

The nonrespondents in these counties all had size indicator codes for TVP of under \$50,000, since the intensive telephone followup program begun in May had accounted for those with larger indicators. About 86,000 reports were completed in the field followup.

#### **Treatment of Nonrespondents**

By mid-September, no response had been received for about 13 percent of the total report forms mailed out. The large majority of nonrespondents included farms with TVP under \$50,000 and farms from the supplemental mailings. A regional sample of these nonrespondents, stratified by size class was followed up intensively, using mail and telephone procedures. Based upon the sample, it was estimated that almost half of the names were out of scope of the census or had received more than one report form (duplicate) and had sent only one back. The estimates of in-scope farms in the census nonrespondent group were used in a procedure which replicated reported data for similar sized respondents within the same county to represent the non-respondent farms. In the final census data tabulations the total number of farms replicated was 8.7 percent of the published census farm count. Since these farms were generally smaller than average, they accounted for an estimated 4.5 percent of the total value of agricultural products sold.

#### **Processing the Data**

All report forms received from census respondents were clerically reviewed prior to keying the data. For most farms this operation involved a brief review, primarily to place the data in a keyable format. Reports for large operations were reviewed in detail by the professional staff.

After the data keying, all data were subjected to a detailed computer edit operation which supplied missing data, corrected inconsistent data and made farm classifications needed for data tabulation. Exceptionally large values and major inconsistencies were printed out for technical review.

Data correction runs were made on the computer and another review was made to insure the corrections had been properly carried. The data were then tabulated and again reviewed prior to publication.

## **SURVEY DESIGN AND METHODOLOGY**

### **Standard Used for Measuring Coverage**

The base or standard used for measuring coverage in the 1969 Census of Agriculture was the area sample of farms meeting the census definition from the 1969 June Enumerative Survey. The June Enumerative Survey was conducted by the Statistical Reporting Service, USDA. The use of the June Survey data was based upon a cooperative agreement between the Statistical Reporting Service (SRS) and the Bureau of the Census. The type of survey information to be provided and the conditions for use of the information were specified in the agreement. The agreement illustrates the recent progress being made by government agencies in reducing respondent burden through cooperative studies as well as in reducing costs by consideration of appropriate alternatives.

### **The June Enumerative Survey Sample of Farms**

The June Enumerative Survey sample was a stratified area sample of farms in the 48 conterminous States. It used a modified closed segment approach in associating farms, land, crops, and livestock with the sample segments. The stratification was geographical, based upon the intensity of agriculture.<sup>3</sup> The sample consisted of about 17,000 area segments which included about 23,000 farm operators living in the segments. The average size of segment ranged from about 300 acres in areas where most of the land was under cultivation to about 4,000 acres in the range or grazing areas. The June Survey collected agriculture data for the whole farm if the operator lived in the area segment and only for land in the segment plus livestock data for the whole farm if the operator lived outside the segment. Information for the June Survey was collected in personal interviews by enumerators employed by SRS.

The base used for the 1969 coverage check was the sample of approximately 23,000 farm operators living inside the segment, for whom whole farm data were available, together with a subsample of 1500 of the 30,000 respondents located in the sample segments but classified as nonfarm in the June Enumerative Survey. The June Survey information obtained for the 23,000 segment residence operators included name and address, name of farm or ranch, county of location, telephone number, total acres in place, acres by tenure, and class interval based upon total value of June Survey 1968 sales. Only name and address and county of location were obtained from SRS for the nonfarm part of the sample.

In the coverage check processing, small operations in the June Survey were reviewed to determine if they qualified as farms under the census operational definition. Those not qualifying were excluded from the measurement base.<sup>4</sup> In addition, June Enumerative Survey nonfarm places were reviewed to deter-

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<sup>3</sup> For a more complete description of the sample design and related information, see Trelogan, H.C. and Houseman, E.D., "Progress Toward Optimizing Agricultural Area Sampling," Paper presented at 36th session of the International Statistical Institute, Sydney, Australia, 1967.

<sup>4</sup> Although the Census Bureau and USDA have the same general definition of a farm, some differences occur due to the information available and the operational methods of defining a farm. In general, the USDA criteria produce larger farm counts.

mine if they qualified as Census farms. If they qualified, they were added to the base.

The June Survey provided a source for the coverage check which was operationally independent of the census and the sources used to construct the census mailing list. The sample size was larger than for past coverage checks. It provided the capability for greater reliability, greater geographic detail than was previously possible, and at a considerable savings in cost.

### Coverage Check Processing Procedures

The principal processing operations (see exhibit A) for the coverage check were—

1. Receipt of June Survey data from the Department of Agriculture and transcription to control-match records.
2. A first match (Stage 1) on name and address of June Enumerative Survey sample cases to the entire census name and address microfilm file and preliminary classification as match, nonmatch, or possible match.
3. Mailing of report forms (69-A90) and followup for all nonmatch and possible match cases. The purpose of the mailing was to obtain additional information which would possibly permit a better determination of match status.
4. Second match (Stage 2) of cases in item 3, above, to the census file using the additional information collected.
5. Match to census report forms and technical review for assignment of coverage classification codes to distinguish association with the census.
6. Transcription to keying document and keying.
7. Consistency edit by computer and edit review.
8. Corrections and correction runs.
9. Tabulation of data.

The matching was primarily a clerical operation based upon name and address. Detailed specifications and procedures were provided to clerks in making the determinations between match and possible match situations. In general, when a positive match was found no further search continued. This could contribute to an underestimate of mailing list duplication. The census file was on microfilm and contained about 5.7 million names and addresses. The microfilm file consisted of the following six major parts:

1. Original file: Contained about 3.6 million records from the ASCS files and the following IRS files: 943, 1065, 1120S, 1040F, 1040C. These are names and addresses to which census report forms were mailed in December 1969.
2. "1968 Adds" file: Contained about 72,000 records consisting of all ASCS outside the South having EI numbers and/or government payment codes indicating

\$25,000 and over and some late IRS 1040F and 1040C filers. These were also mailed in late December 1969.

3. "ASCS Adds": Contained about 122,000 ASCS records from New England and Middle Atlantic States and Ohio and Michigan which had not been mailed in December. These were added because of an indication of low coverage in those areas. A list of approximately 10,000 specialized farm operator names from various specialized sources was included in this mailing. These were mailed, for census purposes, in May 1970.
4. "1969 Births": Contained names of IRS 1040F and 1040C, 943, 1065 and 1120S filers who reported farm operations in IRS processing year 1970, but who, after partial unduplication, did not appear to have been included in earlier mailouts. These yielded about 309,000 names and were mailed, for census purposes, in July 1970.
5. Small farms not included in the census 50 percent sample: This file contained about 900,000 names and addresses having size indicators of under \$2,500, which were not selected in the 50-percent sample of small farms.
6. Names and addresses on ASCS lists not included in mailing list: There were about 700,000 names and addresses on the ASCS files not used for the mailing list in the Western and North Central States. Matches against this file were made to measure possible improvement in coverage which use of the entire ASCS file might afford.

For the purpose of facilitating the match, each of the above six parts was sorted by State, county, ZIP code, and name control (first four letters of last name).

The Stage 1 matching operation was complicated by the lack of precision in assignment of county of location of the agricultural operation in the administrative records used in compiling the census mailing list. County was assigned to the census record from the ASCS source file if it appeared on that file. Otherwise, it was assigned to the "most probable" county based on the ZIP code of the post office named in the address.

This meant that a given agricultural operation might be shown in one county in the June Enumeration Survey, but its county as shown on the mailing list could have been different. A reference file to aid the matching operation was compiled on the computer. It listed each ZIP code in the major census file and each county in which the ZIP code appeared. (See exhibit B.)

The Stage 1 matching operation was completed in June 1970, and a specially designed report form (Form 69-A90) was mailed to all nonmatch and possible match cases in July 1970. (See exhibit C). The 69-A90's were not mailed to matching census nonrespondents, since final nonrespondents could not be identified at that time. The report form contained basic questions on land, land ownership, farm production, and farm operator characteristics. To provide additional information for matching to the census file, questions were asked regarding county of location of all land, changes in acres operated in 1969, alternate mail addresses, Social Security and/or EI number, type of business organization, and names and addresses of other persons associated with the operation. Report forms



were mailed to about 4,200 nonmatched and 3,000 possible match cases. Three followup mailings were performed with about 80-percent mail response. Nonrespondents to the third mail followup were enumerated by personal interview. To reduce costs of the field followup, those farms with size indicators of under \$2,500 total value of products sold were subsampled. Personal interview followups were conducted for all farms with \$2,500 and over total value of products sold.

The Stage 2 matching operation was a second attempt to locate coverage check sample farms in the census files. Supplemental information on the 69-A90 report form was used for this additional search. At this stage, about 4,200 of the 7,200 preliminary nonmatch and possible match cases were found to be included on the census lists. After the Stage 2 match, census report forms were pulled and copies prepared for all matched cases. These materials were assembled and reviewed for acreage comparability and coverage classification in relation to the census.

There were 32 coverage classification codes used to identify coverage check cases within the 3 major groupings: Included, overcounted, or missed in the census. Each of the three major groupings had subclasses which related to the similarity of acres, the part of the sample, or the part of the census involved. (See exhibit D.) Differences in acres of reporting unit were resolved primarily by telephone followup. If the respondents did not have telephones, necessary information was obtained with assistance from the county agricultural offices. The review of very small operations to determine qualification as a farm under the census definition, and the additional search for large farms classified as missed in the census were also completed during the technical review. (See exhibit A.)

Transcription of coverage check data to a keyable format and keying were completed in December 1971. In early 1972, the program for the computer consistency edit was completed. The purpose of the computer edit was to identify technical review and keying errors. Edit correction took place in mid-1972. Preliminary estimates were published in August 1972.<sup>5</sup> Corrections and correction runs followed and were completed in October 1972. Census data records for matched coverage check units were then merged with the coverage data to form a single coverage data file. The tabulation of coverage check data was the final processing step.

### Estimation Procedure

The coverage check provides estimates of three components of coverage in relation to the census. These are estimates of farms and acres —

1. Included in the census.
2. Overcounted in the census.
3. Missed in the census.

<sup>5</sup>Preliminary results were published in a paper titled "Measuring Completeness of Coverage in the 1969 Census of Agriculture," in 1972 Proceedings of the Business and Economic Sections, American Statistical Association, August 1972.

The estimates are based upon the June Survey headquarters sample of farms and nonfarm places (farm operator or nonfarm persons living inside segment) reclassified on the basis of census farm definition. The estimates of coverage take the general form:

$$E' = Y - Y'_o + Y'_m$$

where

$E'$  = Estimate of total farms as determined in the coverage check.

$Y$  = Estimate of all farms included in the census.

$Y'_o$  = Estimate of farms overcounted in the census.

$Y'_m$  = Estimate of farms missed in the census.

The estimates of the proportion of farms included in the census are in the form:

$$\text{Percent included} = (Y/E') \times 100$$

The estimates of the proportion of net missed farms are in the form:

$$\text{Percent net missed} = \frac{Y'_m - Y'_o}{E'} \times 100$$

The estimate for total farms ( $E'$ ) is essentially the original June Survey direct expansion estimate minus places not qualifying as census farms plus June Survey nonfarm places reclassified as census farms.

The estimates for census acres and farms are based upon data from the final edited census data file used for data tabulation and reflect all processing and computer edit changes. The coverage checks in previous censuses used census acres as reported by respondents which were not necessarily the final figures used for tabulating the census.

Two estimation problems arose in preparing the coverage check estimates. One problem was the estimate of coverage for the census nonrespondent population. The procedure (previously described on page 3, Treatment of Nonrespondents) of replicating data from similar sized respondents to represent nonrespondents was used in the census. The census replication rate of in-scope farms at the U.S. level was about 35 percent of all nonrespondents. Of the coverage check units matched to census nonrespondents, about 80 percent were in-scope farms, based upon the June Survey characteristics. This difference can be explained in part by the fact that the census mailing list was composed of names and addresses associated with farm operations or suspected of being farm operators, wherein the June Enumerative Survey lists were primarily of persons who were already determined to be farm operators by June Enumerative Survey enumerators. In fact, it would have been expected that practically all June Survey cases matched to the census files were farms. Since the nonrespondent populations were greatly different, the Census replication rates could not be related directly to the sample estimates of nonrespondents. The estimates presented for number of farms in tables 1 and 7 include matches to all nonrespondents as included and over counted in the census; however, the estimates do not directly reflect the effect of census replication. Use of this method assumes that census nonrespondents (if they had reported)

would correspond directly to the June Survey classification of farm or nonfarm and to the value of sales class indicated by the June Survey value code. The coverage estimates for acres in table 4 and number of farms by value of sales class, type, tenure, etc. in tables 2, 3, and 8 do not include adjustments for the nonrespondent matches. Nonrespondents are also excluded from the sampling reliability estimates in tables 10 and 11.

The adjustment procedure used in tables 1 and 7 was needed to distribute the nonrespondents by value of sales class since census records could not be related to the nonrespondent matched units. Inclusion of the nonrespondents provides more complete estimates of the entire census universe of farms. The procedure involved a separate tabulation of nonrespondent matches by the June Survey value code, which reflected the 1968 value of products sold. The distribution of the units by value code were related to sales class and corresponding adjustments were made for the nonrespondent match units in each State, division, and region. It is believed that this procedure does not introduce any large degree of bias in the estimates.

The second estimation problem involved the coverage check farms which matched small farms not included in the 50-percent census sample. Since the nonsample places did not receive a census report, no measure of the effect of mailing, processing, and respondent reaction was available. Therefore, matches to nonsample cases were not used and coverage check estimates include only the matched sample of the small farms which received census reports. This part of the sample is weighted to represent the small farm portion of the population.

## COVERAGE CHECK RESULTS

### Estimates of Census Coverage

Estimates of census coverage of farms are presented in tables 1, 2, and 3 for the United States and census regions, and in tables

7 and 8 for specified States. Estimates of census coverage of land in farms and the sampling error of these estimates are presented in table 4 by census region and division. The major characteristics of farms missed in the census are presented in tables 5 and 6 for the United States and census regions, and in table 9 for specified States. Estimates of sampling error are presented in tables 10 and 11.

The estimates in tables 1 and 7 are from the entire coverage sample and include adjustments for matches to census nonrespondents. The data presented in all tables other than 1 and 7 do not include the part of the coverage sample matched to nonrespondents and represent only those coverage units directly matched to census reports. In general, the estimates excluding nonrespondents indicate a lower level of census coverage, since all units matched to nonrespondents were assumed to be included in the census by virtue of the census replication procedure. The total group matched to nonrespondents is approximately 11 percent of the estimate of all farms included in the census. (See page 5, Estimation Procedure.)

Estimates of the components of coverage are presented in table 1 thru 4 and tables 7 and 8. The components of coverage are groups of farms included, overcounted, and missed in relation to the census. The overcounted farms are a part of the farms included in the census.

The coverage check estimates for number of farms by value of sale class are presented in table 1 and by value of sales class and type of farm in table 2 for the United States and census divisions. Estimates of farms \$2,500 and over and under \$2,500 value of sales are presented in tables 8 and 9 for specified States or State groups. The value of sales class is based upon 1969 census data for units included and overcounted in the census and 69-A90 data for units missed in the census. The 69-A90 value of sales class is assumed to be the same as would have been obtained if the operation had been included in the census.

The estimates in table A below and in table 1 indicate that 85 percent of all farms in the conterminous United States were

**Table A. Estimates of Census Coverage and Sampling Error of Number of Farms by Value of Sales Group: United States**

	All farms		Total value of products sold			
	Number	Standard error of estimate	\$2,500 and over		Under \$2,500	
			Number	Standard error of estimate	Number	Standard error of estimate
Estimated total farms, number . . . . .1,000..	2,708	31	1,586	20	1,122	23
Included in census:						
Number of farms . . . . .1,000..	2,301	34	1,534	25	768	19
Percent of estimated total . . . . . percent..	85.0	—	96.7	—	68.4	—
Overcounted in census:						
Number of farms . . . . .1,000..	70	5	51	3	19	4
Percent of estimated total . . . . . percent..	2.6	—	32	—	1.7	—
Missed in census:						
Number of farms . . . . .1,000..	477	13	103	6	374	12
Percent of estimated total . . . . . percent..	17.6	—	6.5	—	33.3	—

Note: Data may not add to totals due to rounding. Coverage estimates include adjustments for nonrespondents; sampling error estimates do not include nonrespondents.

included in the census. Completeness of the census in the North Central States was somewhat greater (90.5 percent) than in other regions. The United States total underenumeration is represented by a missed farm rate of 17.6 percent and an overcount rate of 2.6 percent for a net missed rate of 15.0 percent. The estimated net missed rate for all farms was 11.3 percent in the 1964 census and 8.4 percent in 1959<sup>6</sup>. The missed farm rate for all farms with total value of products sold (TVP) \$2,500 and over was 6.5 percent and overcount rate was 3.2 percent for a net missed rate of 3.3 percent. For farms with TVP of under \$2,500, the missed farm rate was 33.3 percent and the overcount rate was 1.7 percent, for a net missed rate of 31.6 percent.

The net missed rate has been considerably greater for farms with TVP under \$2,500 than for the larger farms in all censuses for which coverage checks have been conducted. In earlier censuses the larger miss rate for small farms was explained in part by the difficulties experienced by enumerators in locating and identifying the smaller units. This was reflected in the larger miss rates for nonresident operators, operators living in urban enumeration districts, and operators with small acreages. In the 1969 census, the larger miss rate for small farms is accounted for largely by the composition of the mailing list. To the extent that small farm operators had no reason to file farm returns with IRS, did not participate in government programs administered by ASCS, or were not included on other lists they had no chance of appearing on the mailing list, and were, therefore, not included in the census.

The estimated number of units identified as overcounted in the census was about 70,000, or about 2.6 percent of the estimated total. Of these, about 15,000 were nonfarm places which were counted as farms in the census. About 16,000 were duplicated census reports for a single farm, and about 22,000 were represented by multiple census reports for parts of a single farm.

Multiple reports for parts of a farm arose in such instances as partners reporting separate parts of a farm, and husband and wife reporting different parts of the same place. The remaining 17,000 were represented by multiple census nonrespondents or a census report plus a nonrespondent. The only characteristics available for farms "overcounted" in the census were number of farms and acres in place. For that reason, it was not possible to make estimates of net undercoverage in the census for characteristics other than those two. In general, larger farms were more likely to be overcounted in the census. One reason for this is that they were more likely to appear on more than one source list with a different identification number on each list.

#### Characteristics of Missed Farms

This section and tables 5, 6, and 9 refer only to farms which should have been included in the census but were not. These are farms described as "missed in the census" on page 4, Coverage Check Processing Procedures. The missed farm data does not represent net error in the census because detailed data for the overcounted farms could not be derived in the coverage check

and reporting error on correctly counted farms was not measured. Although the missed farms probably represent the larger proportion of the total census error, the data presented do not represent net error.

The estimated total number of farms identified as missed in the census was about 477,000 (with sampling error of 2.7 percent) or 17.6 percent of the estimated total number of farms. The average size of the missed farms was 118 acres with an average of 21 acres of cropland harvested. The missed farms had an estimated total value of agricultural products sold of \$1.5 billion or about \$3,150 per missed farm. About 78 percent of the missed farms had value of products sold of under \$2,500. Most of the missed farms were operated by full owners (76 percent), with 12 percent being operated by part owners, and 12 percent operated by tenants.

It appears that a larger proportion of the livestock-type farms were missed in the census compared to crop-type farms. This could be attributed to the gain in coverage from use of the ASCS lists which are crop oriented or to a number of other factors.

Farms missed in the census were classified into three subgroups:

1. Coverage check farms not located on the census mailing list.
2. Coverage check farms on ASCS lists not included in the census mailing list. These were confined to specific States primarily in the North Central and Western regions.
3. Coverage check farms on the census mailing list which were classified as nonfarm in the census processing due to incomplete reporting or processing error.

About 76 percent of the total farms missed in the census were not located on the mailing list (group 1) and 24 percent were on the mailing list but were incomplete or misclassified in processing (group 3). In 20 North Central and Western States where ASCS names were not used in generating the mailing list, 61 percent of the farms missed were not on the mailing list or ASCS list, 16 percent were on the ASCS list only, and 23 percent were misclassified in processing.

According to the 1969 Census of Agriculture, 37 percent of the 2,730,250 farms enumerated in the census were farms with total value of products sold under \$2,500. These small farms had about 2 percent of the total \$45.6 billion total value of products sold for all census farms. The coverage check estimates show that more than three-fourths (78 percent) of the missed farms were in that class. Thus, the census coverage of farm production without considering the effect of over and under reporting of TVP in the census is estimated to be at least 97 percent for total value of products sold. This compares with the net 85-percent coverage for total number of farms. Table B shows estimates of census coverage for farms and TVP by value of sales class. It should be noted that a direct estimate for TVP was not made and the data in the table are indications using the procedure described in the footnote.

<sup>6</sup> For more detailed description see reference in footnote 2.

**Table B. Comparison of Census Coverage of Farms and Value of Products by Value of Sales Class: United States**

(Includes adjustments for nonrespondents)

	Net percent of coverage	
	Number of farms	Total value of products <sup>1</sup> (TVP)
All farms .....	85.0	96.6
Class 1 - 5:		
Sales of \$2,500 and over .....	96.7	97.1
Class 6 - 8:—		
Sales of under \$2,500 .....	68.4	73.5

<sup>1</sup> Estimates are based upon census TVP class group averages applied to coverage estimates of number of farms included in the census plus sample estimates of TVP for missed farms. They do not reflect possible over and under reporting of TVP for farms included in the census, nor the contributions of errors in processing.

#### Other Results

As stated on page 1, Objective of the 1969 Coverage Check, one of the objectives was to evaluate the quality and

characteristics of sources for the census mailing list. Two studies have been completed. One analyzes the sources from the point of view of the number of farms each of them contributed to the census; the other analyzes the sources from the point of view of the relationship of the measure of size provided by the source to the total value of products (TVP) reported in the census. The study reported on here is the analysis of the contribution of farms to the census by source.

Table C shows estimates for the United States by mailing list source or source combination and whether a report for the coverage farm included in the census was matched to one address or more included in the census mailing list.

The stub of the table gives the mailing list sources and source combinations for farms included in the census. It is apparent that no one source was adequate for determining the mailing list. The largest contributor of names and addresses of farms included in the census were sources available from the Internal Revenue Service. These accounted for about 89 percent of the farms. However, some of the sources providing relatively small numbers of farms accounted for a high proportion of the total value of products. Lines showing Precanvass (PC) Only and MID Only account for the majority of these.

Due to the fact that several different sources were used in accumulation of the mailing list and to the ambiguousness of some of the identifying information, on occasion more than one

**Table C. Coverage Check Farms Included in the Census by Mail List Sources: United States**

	Total farms included in census		Included in the census			
	Number	Percent of all farms	Matched to one census record		Matched to two or more census records	
			Number	Percent of all farms	Number	Percent of all farms
All farms .....	2,243,066	100.0	1,872,667	100.0	370,399	100.0
Precanvass (PC) only .....	1,246	.1	1,061	.1	185	—
MID only <sup>1</sup> .....	58,668	2.6	54,067	2.9	4,601	1.2
1040 F and C only .....	402,393	17.9	388,750	20.7	13,643	3.7
ASCS only .....	245,232	10.9	231,964	12.4	13,268	3.6
P.C. and MID .....	7,021	.3	5,566	.3	1,455	.4
P.C. and 1040 F and C .....	266	—	105	—	161	—
P.C. and ASCS .....	251	—	196	—	55	—
MID and 1040 F and C .....	60,637	2.7	19,971	1.1	40,666	11.0
MID and ASCS .....	35,198	1.6	10,727	.6	24,471	6.6
1040 F and C, and ASCS .....	1,137,780	50.7	1,061,469	56.6	76,311	20.6
P.C., MID and 1040 F and C .....	4,284	.2	2,284	.1	2,000	.5
P.C., MID and ASCS .....	5,759	.3	3,470	.2	2,289	.6
P.C., 1040 F and C, and ASCS .....	1,549	.1	1,541	.1	8	—
MID, 1040 F and C and ASCS .....	279,599	12.5	91,316	4.9	188,283	50.8
All sources .....	3,183	.1	180	—	3,003	.8

Note: The total farms included in the census is in slight disagreement with other tables due to computer programming differences. Includes adjustments for nonrespondents.

<sup>1</sup> The MID list was a combination of units from the 1065, 1120S and 943 file.

report form was mailed to some respondents who should have completed only one form. Instructions were given to each such respondent to complete only one of the forms and return the other one blank. In some cases this instruction was not followed. The last two columns of the table give estimates by mailing list source of the number of times a census farm appeared on the mailing list after unduplication. To the extent that a farm submitted more than one report and was not discovered in processing, the result could have been a duplication in the data file. Duplication is discussed in Estimates of Census Coverage.

In the matching operation, farms in the coverage check sample were matched against all names on the mailing list. The second through the fifth columns give the results of the match.

### Accuracy of the Estimates

Estimates of sampling variability, expressed as standard errors are presented in tables 4, 10, and 11. The chances are about two out of three that the difference between an estimate based on the coverage check sample and the figure that would have been obtained by applying the coverage check procedures to all farms would be less than the sampling error shown. The chances are about 95 out of 100 that this difference would be less than 2 times the sampling error.

All estimates of sampling variability exclude matches to census nonrespondents. The standard error for the coverage check estimates of total number of farms expressed as percent of estimated total, ranges between 4.8 percent and 14.5 percent at the State level; 2.2 percent and 6.6 percent at the census division level; and is 1.3 percent at the United States level. The standard error for estimates of acres range from 4.0 percent to 13.5 percent for division level data, and is 3.8 percent for the United States. Sampling errors were not computed directly for the "included in census" component; however, they are approximately equal to the sampling error of the estimated total. The estimates of sampling error for the overcounted farms are based upon a very small number of observations and are not considered reliable. Coverage estimates are presented for census division or State groups where individual State estimates are not considered reliable.

There are several aspects of the coverage check procedures and sample design which make it probable that the estimates of net error are somewhat larger than the actual undercount. First, the difficulty of carrying out searching and matching procedures was great, and some of the census farms corresponding to coverage check farms may not have been located.

The search for coverage check farms was usually limited to the five digit ZIP code area within the specified county, with the search for missed farms expanded to cover adjacent counties and ZIP code areas. An intensive study of missed farms in Washington and Oregon using the complete IRS files as an added information source indicated about 5 percent of the farms classified as missed were in fact included in the census (See Special Census Evaluation).

Second, once a census farm corresponding to a coverage check farm was located, there was no systematic attempt to search the

census files further for duplicate report forms, so that some cases of duplication in the census may have been overlooked. Duplicate cases which were found were normally adjacent in the file and in the same ZIP code area. To make a thorough search would have been costly in terms of both time and money, as it would have been necessary in all matched cases, to make additional checks in adjacent ZIP code areas and counties.

The quantitative estimates from the coverage check sample are low in relation to data from other sources. Examples are the coverage check estimates of 2.7 million total farms compared to the USDA official estimates of 2,994,000 farms and the coverage estimate of 2.3 million farms included in the census compared to 2.7 million farms counted in the census. The primary reasons for this low level of the quantitative estimates appear to be factors involving the sample design of the June Survey and the difference between enumeration dates for the census and the June Enumerator Survey.

The measurement base used for the coverage check was the June Survey area sample of farm operators living inside the segment boundaries. Although the June Survey contains some urban segments, there are indications that the part of the sample used for the coverage check may underrepresent farms operated by persons not living on the farms they operate. A special tabulation of farms in the coverage sample by residence was made for all States and compared to census counts. The census data indicated about 19 percent of the farm operators did not live on their farms. The data for coverage check farm operators included in the census indicated about 9 percent did not live on their farms. The proportion of nonresident operators for coverage check farms missed in the census was about the same as for those included.

The enumeration for the June Survey took place in the latter part of June 1969, while the census data were collected during the first few months in 1970. The difference in reporting date caused some matching difficulties when farms were sold, operators moved to different farms, or operators died. In general, farms "dropped out" of the base sample as a result of these situations and there was no practical method available to add "new farms" into the base sample. The number of farms affected by the difference in dates has not been determined from the coverage sample; however, a previous study made in connection with the 1965 Sample Survey of Agriculture indicated about 5 percent of the farms had changes of ownership or operators during a 1-year period.

The net result of the nonresident and enumeration date problems is that a portion of the farms in the universe had an inadequate chance for inclusion in the base sample which resulted in an incomplete measurement of the census.

## SPECIAL CENSUS EVALUATION

### Special Studies

Several special studies were conducted in connection with the 1969 Coverage Check. Among these were studies of the accuracy of reporting of livestock inventories; underreporting of soybean and hay crops in the census; and evaluation of the accuracy of the administrative list size indicators compared to

the size reported in the census. The results of these studies will be used primarily for planning future censuses.

An additional study was the administrative record study of missed farms in Washington and Oregon. The Internal Revenue Service (IRS) record check study was initiated in an attempt to determine possible reasons for the large decrease in the number of farms reported between the 1964 and 1969 censuses in Washington and Oregon (see table D). Although other administrative source lists were used, only the IRS file was used in this study since it was the source of the majority (about 78 percent) of the 1969 census mail list names in the United States.

**Table D. Number of 1969 and 1964 Census Farms by Total Value of Products Sold Group: Washington and Oregon**

	<u>Washington</u>		<u>Oregon</u>	
	<u>1969</u>	<u>1964</u>	<u>1969</u>	<u>1964</u>
All farms:				
Number .....	34,033	45,574	29,063	39,757
Percent change 1964 to 1969 ....	-25.3	-	-26.9	-
Total value of products sold:				
Under \$2,500:				
Number .....	12,245	22,643	12,060	21,772
Percent change 1964 to 1969 ..	-45.9	-	-44.6	-
\$2,500 and over:				
Number .....	21,788	22,931	17,003	17,985
Percent change 1964 to 1969 ..	-5.0	-	-5.5	-

The basis for the study was the "missed farm" group from the 1969 Census Coverage Check sample. There were originally 189 unweighted missed farms (106 in Washington and 83 in Oregon) out of the total 895 farms in the coverage check sample in the two States. Missed farms are places which were classified as agricultural in the coverage check which were not included on the census mailing lists or were classified as out of scope in the census processing. Estimates of census coverage for the two States are presented in table 7.

#### General

The 189 missed sample farms were matched against IRS files at the Western Service Center in Ogden, Utah to obtain Document Locator Number (DLN) and the indication of the type of form filed. All work was performed under the Census-IRS agreement which insures that the strict confidentiality requirements of both agencies are observed. No data relating to an individual tax filer or census respondent are made available except in the form of statistical totals. The totals are reviewed prior to release to insure that there is no disclosure.

Copies of the IRS files were then reviewed for all farms with individual business or farm returns along with coverage check materials in an effort to determine the reason for exclusion from the census mail lists.

#### Results

The distribution of the original 189 missed farms in relation to the IRS files is presented in table E. About 76 percent of the missed farms were not included on lists obtained from IRS because the persons filing gave no identified indication of agriculture activities, about 8 percent of the missed farms were not on the census mailing list but should have been, and about 11 percent were excluded from the census because of response or processing error. The remaining 5 percent classified as missed, represent inadequacies in the coverage check matching procedure or incompleteness of information used for matching.

**Table E. Coverage-Check Missed Farms by Match Status and Relationship to IRS Files: Washington and Oregon**

	<u>Number</u>	<u>Percent</u>
Not on census mailing list—Not justified .....	15	7.9
Filed farm return (schedule 1040 F) .....	8	
Filed business return (schedule 1040 C) with some farm activity .....	5	
Information not received from IRS .....	2	
Not on census mailing list—Justified .....	144	76.2
Filed business return (nonfarm schedule C) .....	10	
Filed individual return (schedule 1040) .....	92	
Not located on IRS file in 1968 or 1969 .....	42	
On census mailing but matched to census out of scope .....	20	10.6
On census mailing list but located after IRS search. ....	10	5.3
Total .....	189	100.0

Almost half (92) of the 189 farms filed only individual returns (form 1040). Two farms in this group had a total value of products (TVP) sold over \$2,500 as indicated by coverage check material. One of these farms had timber sales as the primary source of farm income and the other had cattle income. Seven other small farms (under \$2,500) in this group had some entry relating to agriculture income (see table F).

**Table F. Coverage-Check Missed Farms Filing Individual Returns in 1968 and/or 1969, by State and Value of Products: Washington and Oregon**

		<u>Washington:</u> <u>Total value of</u> <u>products of—</u>		<u>Oregon:</u> <u>Total value of</u> <u>products of—</u>	
		<u>\$2,500</u> <u>Under</u>	<u>and</u> <u>over</u>	<u>\$2,500</u> <u>Under</u>	<u>and</u> <u>over</u>
IRS individual return with at least one agriculture item ....	10	3	1	5	1
IRS individual return no agriculture .....	82	48	—	34	—
Total .....	92	51	1	39	1

Twenty-five of the 150 sample farms not on the mailing list filed a business or farm return (1040 C or F) in 1968 and 1969. The characteristics of these cases in relation to the IRS files are presented in table G.

Only 8 (4.2 percent of all missed farms) of the 25 farms in this group filed a Schedule "F". These are cases which ordinarily should have been included in the mailing list, but were not. Six of the eight had indications as being late returns, correspondence or audit cases which may be the reason for exclusion from the census mail lists. Five of the 25 farms with business or farm returns filed Schedule "C" with some agriculture related activity. Three of these five agricultural related activities may have been considered nonfarm according to SIC criteria.

### Conclusion

The decrease in the published census count of farms between 1964 and 1969 in Washington and Oregon appeared to have had a significant component due to undercoverage in 1969 and a smaller part due to response and processing error in addition to the actual decline in number of farms. Most of the missed farms (86 percent) in Washington and Oregon had value of products of under \$2,500. The farms are very small, marginal operations (usually livestock and hay) and most of the products are probably for home use. Off-farm wages or retirement income were often reported. Apparently, there was little farm income

or expenditures which qualified for reporting to IRS. There is no indication that a major part of the intended IRS file was excluded from the census mailing list. Use of ASCS list would improve coverage somewhat; however, it is doubtful that the use of administrative records currently available to us will have much effect in improving census coverage of small farms (TVP < \$2,500).

**Table G. Coverage-Check Missed Farms With IRS Business and/or Farm Returns in 1968 and/or 1969 State and Total Value of Products: Washington and Oregon**

	Total	Washington: Total value of products of—		Oregon: Total value of products of—	
		\$2,500		\$2,500	
		Under \$2,500	and over	Under \$2,500	and over
Filed Form 1040 "F" . . . . .	8	—	3	2	3
Filed Form 1040 "C" with some agriculture related activity . . .	5	2	1	2	—
Filed 1040 "C" nonfarm . . . . .	10	6	—	4	—
IRS form not received . . . . .	2	1	—	1	—
Total . . . . .	25	9	4	9	3