Appendix A.
Census of Agriculture Methodology

The purpose of a census is to enumerate all objects with a defined characteristic. For the census of agriculture, that goal is to account for "any place from which $1,000 or more of agricultural products were produced and sold, or normally would have been sold, during the census year." To do this, NASS creates a Census Mail List (CML) of agricultural operations that potentially meet the farm definition, collects agricultural information from those operations, reviews the data, corrects or completes the requested information, and combines the data to provide information on the characteristics of farm operations and farm producers at the national, State, and county levels. In this appendix, these census processes are described.

THE CENSUS POPULATION

The Census Mail List

The National Agricultural Statistics Service (NASS) maintains a list of farmers and ranchers from which the CML is compiled. The goal is to build as complete a list as possible of agricultural places that meet the farm definition. The CML compilation begins with the list used to define sampling populations for NASS surveys conducted for the agricultural estimates program. Each record on the list includes name, address, telephone number, and email plus additional information that is used to efficiently administer the census of agriculture and agricultural estimates programs.

NASS builds and improves the list on an ongoing basis by obtaining outside source lists. Sources include State and federal government lists, producer association lists, seed grower lists, pesticide applicator lists, veterinarian lists, marketing association lists, and a variety of other agriculture-related lists. NASS also obtains special commodity lists to address specific list deficiencies. These outside source lists are matched to the NASS list using record linkage programs. Most names on newly acquired sources are already on the NASS list. Records not on the NASS list are treated as potential farms until NASS can confirm their existence as a qualifying farm. Staff in NASS regional and field offices routinely contact these potential farms to determine whether they meet the farm definition. For the 2017 Census of Agriculture, NASS made a concerted effort to work with community-based organizations not only to improve list coverage for minorities but also to increase census awareness and participation.

List building activities for developing the 2017 CML started in 2014 by updating list information from respondents to the 2012 Census of Agriculture. Between 2015 and 2017, NASS conducted a series of National Agricultural Classification Surveys (NACS) on approximately 1.6 million records, which included nonrespondents from the 2012 census and newly added records from outside list sources. The NACS report forms collected information that was used to determine whether an operation met the farm definition. If the definition was met, the operation was added to the NASS list and subsequently to the CML. Addressees that were nonrespondents to a NACS were also added to the CML and identified with a special status code.

Measures were taken to improve name and address quality. Additional record linkage programs were run to detect and remove duplicate records both within each State and across States. List addresses were processed through software programs that utilize the United States Postal Service's National Change of Address System and the Locatable Address Conversion System to improve mail delivery. Records on the list with missing or invalid phone numbers were matched against a nationally available telephone database to obtain as many phone numbers as possible. To reduce costs, operations with characteristics that indicated they were unlikely to be farms, according to the farm definition, were removed from the list.

The official CML for the 2017 Census of Agriculture was established on September 3, 2017. The list contained 2,999,098 records. Of these, 2,259,750 records were thought to meet the NASS farm definition and 739,348 were potential farm records, which included NACS nonrespondents, other records added to the CML by the NASS regional field offices after the record linkage process, and late adds to the CML that were not included in any previous NACS or State screening survey.

Not on the Mail List (NML)

Extensive efforts are directed toward developing a CML that includes all farms in the U.S. However, some farms are not on the list, and some agricultural operations on the list are not farms. NASS uses its June Area Survey (JAS) to quantify the number and types of farms not on the CML. The records in the JAS that are not on the CML are said to be in the Not-on-the-Mail List (NML) domain. If a JAS record in the NML domain is determined to be a farm during the census, it is an NML farm. The NML farms are used to measure coverage associated with the census.

The JAS is based on an area frame, which covers all land in the U.S. and includes all farms. The land in the U.S. is stratified by characteristics of the land. A probability sample of segments is drawn within each stratum for the JAS. Segments of approximately equal size are delineated within each stratum and designated on aerial photographs. The JAS sample of segments is allocated to strata to provide accurate measures of acres planted to widely grown crops, farm numbers, and inventories of cattle. Sampled segments in the JAS are personally enumerated. Each operation identified within a segment boundary is known as a tract.

The 2017 JAS sample was increased to improve the farm counts for operations that produced specialty commodities or had socially disadvantaged or minority producers. The total JAS sample consisted of 13,972 segments of which 3,012 were additional segments. This set of additional segments is referred to as the Agricultural Coverage Evaluation Survey (ACES) segments. The ACES segments were selected using a multivariate sampling design that targeted specific items at the U.S. level. The 2017 JAS consisted of sample segments from all States, with the exception of Alaska where NASS does not maintain an area frame.

During the JAS/ACES enumeration process, each tract is identified as either agricultural or non-agricultural. Each JAS/ACES agricultural tract is identified as a farm or non-farm in June based on the farm definition of $1,000 of sales or potential sales of agricultural products. Non-agricultural tracts are further classified into categories: with farm potential, with unknown farm potential, or with no farm potential. The names and addresses collected in the 2017 JAS/ACES were matched to the CML. Those from the 2017 JAS/ACES that did not match were determined to be in the NML domain and sent a yellow census report form so that they could be differentiated from the green report form sent to those addressees on the CML. Instructions on the census report form directed any respondent who received duplicate forms to complete the CML form and to mail all duplicate forms back together. Those who returned a CML and an NML form had been misclassified as NML and were removed from the NML domain.

The initial NML mailout consisted of 42,430 records. A total of 41,787 NML records were summarized of which 2,799 records were confirmed to be NML and in-scope.

The farm/nonfarm status of each NML domain operation was determined based on the reported data in the census form. An operation in the NML domain that was determined to be a farm is referred to as an NML farm. Characteristics of NML farms and their producers provided a measure of the undercoverage of farms on the CML. The percentage of farms not represented on the CML varied by State. In general, NML farms tended to be small in acreage, production, and sales of agricultural products. Farm operations were missing from the CML for various reasons, including the possibility that the operation started after development of the CML, the operation was so small that it did not appear in any agriculture-related source list, or the operation was misclassified as a nonfarm prior to census mailout. The CML was used with the NML in a capture-recapture framework to represent all farming operations across all States in the JAS sample.

DATA COLLECTION OUTREACH AND PROMOTIONAL EFFORTS

NASS planned and executed a multi-phase strategic communications campaign for the 2017 Census of Agriculture, to increase the level of awareness and response among all U.S. agricultural producers.

- Phase 1 ran from December 2016 − June 2017. It raised awareness about the census and list building, encouraged producers to sign up in response to NASS mailings and at community, association, and other stakeholder meetings where NASS partners reached out.

- Phase 2 ran from July 2017 − December 2017. It notified farm producers and agricultural organizations that the census would be mailed in December, and encouraged communications regarding the census.

- Phase 3 ran from December 2017 – July 2018. It focused on census data collection with messaging urging response, reminding producers that it was not too late to respond.

- Phase 4 ran from August 2018 – February 2019. It thanked producers for their participation and NASS partners for their support, and informed all of the February 2019 data release plan.

The communications campaign focused on these primary areas: partnership building, local-level outreach, public relations, media relations, paid media, and social media. Some external support was provided by a private communications agency (i.e. primarily assistance with paid media/advertising strategy and ad creation) and a freelance writer.

The unifying force behind the 2017 communications campaign was the theme "Your Voice. Your Future. Your Opportunity." This was accompanied by supporting messages and artwork that created a consistent look and feel for all census communications. All messages and materials served the purpose of inspiring action: *Grow Your Farm Future - Shape Your Farm Programs - Boost Your Rural Services - Fill out your Census of Agriculture - Do your part to be counted - The Census of Agriculture is Your Voice, Your Future, Your Opportunity*.

Partnership and Local-Level Outreach

At the national level, NASS officials met with leaders from dozens of agricultural organizations, State Departments of Agriculture, and other USDA agencies to successfully secure their support in promoting the census among their constituencies. Stakeholders partnered with NASS to promote the 2017 Census of Agriculture through publications (e.g. newsletters), special mailings, speeches, social media, websites, and other communications. In addition, through grassroots-level outreach and efforts, NASS partnered with a number of community-based organizations to reach minority and limited-resource farmers and ranchers. National-level outreach was encouraged and mirrored at the regional, State, and local levels. Among the highlights of these partnership efforts was the production of multiple television and radio public service announcements featuring the U.S. Secretary of Agriculture, State secretaries, directors, and commissioners of agriculture and leaders from community-based organizations.

Coverage of American Indian and Alaska Native Farm Producers

To maximize coverage of American Indian and Alaska Native agricultural producers, special procedures were followed in the census. A concerted effort was made to get individual reports from every American Indian and Alaska Native farm or ranch producer in the country. If this was not possible within some reservations, a single reservation-level census report was obtained from knowledgeable reservation officials. These reports covered agricultural activity on the entire reservation. NASS staff reviewed these data and removed duplication with any data reported by American Indian or Alaska Native producers who responded on an individual census report form. Additionally NASS obtained, from knowledgeable reservation officials, the count of American Indian and Alaska Native producers (on reservations) who were not counted through individual census report forms, but whose agricultural activity was included in the reservation-level report form.

Table D, **American Indian and Alaska Native Producers: 2017** provides the number of producers (1) reported as American Indian or Alaska Native in the race category, either as a single race or in combination with other races, on the individual census report forms (for up to four per farm) and (2) identified as American Indian or Alaska Native producers farming on reservations by reservation officials. The count from the individual report forms is summarized in the "Individually reported" column. It includes up to four producers on or off reservations. The "Other" column provides counts of producers on reservations as reported by a reservation or tribal official. The "Total" column is simply a sum of the "Individually reported" and the "Other" columns. Tables in other parts of the publication count the reservation-level reports as single farms.

Public Relations

In the public relations arena, NASS worked with internal and external stakeholders to equip them with communications tools and resources to deliver the census communications message to their audiences. NASS utilized its Intranet and the Partner Tools page on the census website to deliver materials to the 12 regional and 46 field offices as well as to external stakeholders. The materials included but were not limited to: customizable news releases, public service announcement scripts, and a PowerPoint template; Secretary of Agriculture video public service announcements, and drop-in advertisements; informational, instructional, and testimonial videos; website buttons and banners; brochures in multiple languages; flyers; posters; FAQ sheets, talking points, and more. In addition, at the national level, NASS issued six news releases during data collection (three more were produced before data collection to inform and prepare producers) citing department and agency spokespeople, published half a dozen timely and relevant pieces to the USDA blog highlighting the census, and conducted three social media campaigns. These public relations efforts at the national and local-levels helped ensure that NASS' message about the census was continually in the media, including print and online publications, a variety of social media, radio, and some television programs. Media outlets included both those specializing in agriculture and more general outlets.

Paid Media

Even with increasingly limited budgets and resources, NASS was able to apply a small portion of funds toward paid media. For the 2017 Census of Agriculture, NASS strategically advertised in regional print publications, online, and with national agriculture news services (i.e. TV, radio) to bolster reach both in general and within geographically-specific, previously under-represented populations and lower response areas.

DATA COLLECTION

Method of Enumeration

Data collection was accomplished primarily by mail, Computer-Assisted Self Interview (CASI) on the Internet, and personal enumeration for special classes of records in the census operations. Personal enumeration (interviewing) involved the use of both Computer-Assisted Telephone Interview (CATI) and Computer-Assisted Personal Interview (CAPI) data collection instruments. Enumerators at the five NASS Data Collection Centers conducted CATI data collection. In addition, enumerators under contract with NASS through the National Association of State Departments of Agriculture (NASDA) conducted phone and personal interviews with respondents. For the 2017 Census of Agriculture, NASS implemented a pre-notification strategy in an effort to increase awareness, improve overall responses, and encourage respondents to report early to avoid continued correspondence. All records with an e-mail address received an e-mail message marketing the improved web form and announcing the census mail packets were coming.

Report Forms

Four versions of report forms were used for the 2017 Census of Agriculture:

- General form (17-A100)
- Short form (17-A200)
- Hawaii form (17-A101)
- American Indian form (17-A300)

The general form facilitated reporting crops and livestock most commonly grown and raised in the U.S. The short form expedited reporting specific crops or livestock for pre-identified farms and ranches in the U.S. The Hawaii form targeted crops and

livestock specifically grown or raised on farms and ranches in Hawaii. The American Indian form focused on crops and livestock for farms and ranches on reservations in Arizona, New Mexico, and Utah. All of the report forms allowed respondents to write in specific commodities that were not prelisted on their report form.

Report Form Mailings

Pre-notification of census data collection began on November 17, 2017. Approximately 600,000 producers with an active e-mail address on the census mail list received a message informing them of the upcoming census data collection period and encouraging them to utilize the new census web form. Between November 27 and November 30, 2017, approximately 1 million producers received a letter with their survey code and instructions for completing their census online. The letter encouraged producers to report online early to avoid receiving mail and phone follow-up. Approximately 3 million mail packets were mailed in December 2017 and January 2018. Each packet contained a cover letter, instruction sheet, a labeled report form, and a return envelope. The Census Bureau's National Processing Center (NPC) in Jeffersonville, IN was contracted to perform mail packet preparation, initial mailout, and two follow-up mailings to nonrespondents.

The initial mailout was followed by a thank-you reminder postcard that was delivered in January 2018 to all operations that received mail packets. First follow-up mail packets were mailed in mid-February 2018 to approximately 1.5 million nonrespondents. Second follow-up mail packets were mailed in mid-March 2018 to approximately 1 million nonrespondents.

Nonresponse Follow-up

Operating concurrently with NPC's mail data collection efforts, NASS Data Collection Centers targeted selected groups of census nonrespondents for telephone enumeration. NASS regional field offices targeted selected groups of census nonrespondents for in-person enumeration. These efforts were referred to as:

- Must Case Follow-up
- American Indian Producer Follow-up
- National Nonresponse Follow-up
- Not on Mail List (NML) Follow-up

Must Case Follow-up. Must cases are known large or unique operations, the absence of which could have significantly affected the accuracy of census results. For the 2017 Census of Agriculture, 125,697 records were categorized as Must cases. Each active Must operation was accounted for by mail receipt, phone interview, or personal enumeration; if an operation was no longer in business, its nonfarm status was documented. Call centers conducted CATI calling of nonrespondent Must cases from March 2018 through May 2018, after the initial and first follow-up mailings. Following the CATI calling, the remaining nonresponse Must cases were assigned to regional field offices for personal enumeration. Because of the potential importance of Must cases, they were all accounted for and therefore not eligible for nonresponse weighting adjustment.

American Indian Producer Follow-up. The American Indian report form (17-A300) was mailed to all operations in Arizona, New Mexico and Utah thought to have an American Indian producer. It was included in the initial mailout, but due to poor mail response, a personal enumeration data collection strategy was utilized with no additional mail follow-up. A concerted effort was made to get individual reports from every American Indian farm producer in the country. If this was not possible within a reservation, a single reservation-level census report was obtained from knowledgeable reservation officials. These reports covered agricultural activity on the entire reservation. NASS staff reviewed these data and removed any duplicate data reported by American Indian producers from that reservation who responded on an individual census report form. Additionally NASS obtained, from knowledgeable reservation officials, the count of American Indian farm producers (on the reservations) who were not counted through individual census report forms, but whose agricultural activity was included in the reservation-level report form.

National Nonresponse Follow-up (Excludes Must Records). The National Nonresponse follow-up activity was designed to focus nonresponse follow-up in a manner that would both reflect the characteristics

of the nonresponders and increase response rates. In April 2018, a sample of 249,521 nonrespondents was selected from the remaining 864,260 nonrespondents using a stratified random design. The strata were based on State, county, size of farm, type of farm, producer race, and propensity to respond. Beginning in mid-April 2018 and continuing through July 2018, extensive efforts were made to collect data for the sampled records, including an additional CASI push, autodial calls, CATI, and CAPI. Records in the same stratum received the same set of collection methods. Of the 80,504 responses, 51,846 records were identified as being in-scope, resulting in a weighted farm count of 143,847 from the sample.

Not-on-the-Mail List (NML) Follow-up. To account for farming operations not on the CML, NASS used its 2017 JAS sample from the NASS area frame, augmented with the ACES segments. Because the NASS area frame covers all land in the U.S. with the exception of Alaska, it includes all farms. As previously described, NASS conducted a record linkage operation between the CML records and the records from the 2017 JAS/ACES. Those 2017 JAS records that did not match records on the CML were designated as "Not-on-the-Mail List" (NML) records. These records were mailed a yellow census form so that it could be differentiated from the green forms mailed to CML records. The NML records were mailed at the same time as the census mailing and received the same follow-up procedures as the census mailing through the first follow-up in mid-February 2018. Beginning in March 2018, CATI was used for nonresponse follow-up for NML nonrespondents.

REPORT FORM PROCESSING

Data Capture

The Census Bureau's National Processing Center (NPC) in Jeffersonville, IN was contracted to process returned mail packets. NASS staff on site at the NPC provided technical guidance and monitored NPC processing activities. All report forms returned to the NPC were immediately checked in, using bar codes printed on the mailing label, and removed from follow-up report form mailings. All forms with any data were scanned and an image was made of each page of a report form. Optical Mark Recognition (OMR) was used to capture categorical responses and to identify the other answer zones in which some type of mark was present.

Data entry operators keyed data from the scanned images using OMR results that highlighted the areas of the report forms with respondent entries. The keyer evaluated the contents and captured pertinent responses. Ten percent of the captured data were keyed a second time for quality control. If differences existed between the first keyed value and the second, an adjudicator handled resolution. The decision of the adjudicator was used to grade the performance of the keyers, who were required to maintain a certain accuracy level.

The images and the captured data were transferred to NASS's centralized network and became available to NASS analysts on a flow basis. The images were available for use in all stages of review.

Editing Data

Captured data were processed through a computer formatting program that verified that records were valid – that the record ID number was on the list of census records, that the reported counties of operation and production were valid, and other related criteria. Rejected records were referred to analysts for correction. Accepted records were sent to a complex computer batch edit process. Each execution of the computer edit in batch mode consisted of records from only one State and flowed as the data were received from NPC, the NASS Computer-Assisted Self Interview (CASI), or the Computer-Assisted Telephone Interview (CATI) applications.

The computer edit determined whether a reporting operation met the qualifying criteria to be counted as a farm (in-scope). The edit examined each in-scope record for reasonableness and completeness and determined whether to accept the recorded value for each data item or take corrective action. Such corrective actions included removing erroneously reported values, replacing an unreasonable value with one consistent with other reported data, or providing a value for an item omitted by the respondent. To the extent possible, the computer edit determined a replacement value. Strategies for determining replacement values are discussed in the next section. Operations failing to meet the qualifying criteria for being classified as a farm were categorized as out-of-scope for the census. Records that NASS had reason

to believe might have been erroneously classified as out-of-scope (indications of recent and/or significant agricultural activity reported on NASS surveys, for example) were referred to analysts for verification.

The edit systematically checked reported data section-by-section with the overall objective of achieving an internally consistent and complete report. NASS subject-matter experts had previously defined the criteria for acceptable data. Problems that could not be resolved within the edit were referred to an analyst for intervention. Prior to the census mail-out, NASS established a group of analysts in a Census Editing Unit in the National Operations Center in St. Louis, MO who examined the scanned images, consulted additional sources of information, and determined an appropriate action. Regional field office analysts also participated using an interactive version of the edit program to submit corrected data and immediately re-edit the record to ensure a satisfactory solution.

Short Form Editing

From the CML, 400,000 records were selected to receive a short form; this short form was derived from the full census report form by reducing a number of sections to a 'total' question – for example, instead of asking the respondent to report the acreage for each specific type of fruit or vegetable, the short form only asked for total fruit acreage or total vegetable acreage. In some cases, the same questions were asked on the general form, in which case the edit treated the short form responses as though they were incomplete general forms, as described in the previous paragraphs. In other cases, several items on the general form were collapsed – for example, total acres of Christmas trees and short rotation woody crops were asked as a single item on the short form, instead of separately as on the general form. In such cases, different approaches were taken in the edit to create a general form item or items from the short-form specific items. Any short form record that reported values above a certain threshold (in practice this threshold was 0 for almost all items) for these short-form-specific questions was 'flagged' by the edit; these records were later called back and the respondent asked for additional information about the items reported – for example, a producer reporting 10 acres of fruit on the short form was called back and asked for the total, bearing, and nonbearing acres for each type of fruit grown, as was asked on the general form. If the producer was successfully contacted and these additional data collected, the information was added to the record as additional reported data, and the edit was 'reset to original' – that is, the effects of the previous edit were undone – and the record was reedited with the new additional information. A flag was passed to the edit so that the short form record was not flagged for callback in such cases. In many cases, of course, it was not possible to recontact the respondent. In such cases, a flag was passed to the edit system, and the record was unlocked and available for review.

Imputing Data

The edit determined the best value to impute for reported responses that were deemed unreasonable and for required responses that were absent. If an item could not be calculated directly from other current responses, the edit determined whether acreage, production, or inventory items had been reported for that farm on a recent NASS crop or livestock survey. For producers who had not changed in five years, demographics such as race and gender were taken from the previous census. Administrative data from the Farm Service Agency were used for a few items, such as Conservation Reserve Program acreage. When deterministic edit logic and previously-reported data sources were unable to provide a current value, data from a reporting farm of similar type, size, and location were considered. In cases where automated imputation was unable to provide a consistent report, the record was referred to an analyst for resolution.

Separate system processes were established to efficiently provide data from a similar farm to the edit when donor imputation was required. The farm characteristics used to define similarity between a recipient record and its donor record were determined dynamically by the edit logic. Euclidean distance was used for similarity computations, with each contributing similarity characteristic scaled appropriately. The most similar farm based on this criterion (the "nearest neighbor") was identified and returned to the edit for use as a donor. The calculated distance between the centroids of the principal counties of production of the donor and recipient was always included as one of the measures of similarity.

To provide donors to the automated edit, a pool of successfully edited records was maintained for each section of the report form. These donor pools began with 2012 census data, reconfigured to emulate 2017 data and then edited using 2017 logic. Data from the 2015 Census Content Test were similarly remapped and edited before being added to the original donor pools. As 2017 records were successfully processed, they were added to the donor pools, which maintained the most recent data for each farm. Donor pools were updated approximately every other week, as determined by edit processing schedules. After several updates, all initial data records were dropped, leaving only 2017 records in the donor pools. After each update, donor pool records were grouped into strata containing farms in the same State of similar type and size, using a data-driven algorithm to define strata. Certain American Indian farms were treated as a separate group, effectively having their own donor pool.

In response to each donor request issued by the edit, a dedicated system process would search the appropriate stratum and respond with the most similar donor, while giving preference to more recent donors. In relatively rare instances where it was unable to provide a donor, the donor selection process issued an appropriate failure message to the edit. Imputation failures occurred for several different reasons. The requirement that an imputed value be positive could have ruled out all available donors, as could have the necessity for the donor record to satisfy a particular constraint – say, that the donor record has cattle, but no milk cows. In general, an imputation failure occurred if there were no satisfactory donors in the same profile as the report being edited. Records with imputation failures were either held until more records were available in the donor pool or referred to an analyst. In addition, when such a failure occurred in finding a donor for expenditure data, donor pool averages were provided in lieu of an individual donor, wherever possible. This "failover" utility was first introduced for the 2012 census imputation process, and significantly reduced the number of imputation failures among the expenditure and labor variables. During the early stages of editing, records requiring imputation for production (and hence yields) of field crops or hay, land values, or certain expenditure variables, were set aside or "parked." These records were edited when the donor pools contained only 2017 records, ensuring that 2017 data were used in the imputations for the variables.

After receiving a donor's data, the edit substituted the values into the edited record. In many cases, the donor record's data value was scaled using another data field specified in the edit logic. In such cases, the size of the auxiliary field's value in the edited record, relative to its value in the donor record, was used to appropriately scale the donor record's value for the field to be imputed. The imputed data were then validated by the same edit logic to which reported data were subject. Since imputation was conducted independently for each occurrence, reports requiring multiple imputations may have drawn from multiple donors.

Substantial changes were introduced to the Personal Characteristics section of the form in 2017. Information on an additional (fourth) producer was collected, and several new questions were added for each producer – specifically, whether or not the person was considered a "principal producer," whether the person was a spouse of a principal producer, and whether the person was involved in any of five types of decisions with respect to the operation. These changes necessitated a new imputation process for records reporting three or more persons as producers. Records with one or two persons reported as producers had these data edited and imputed using the decision logic table edit and donor pool imputation process. Records with three or more persons reported as producers, and for which it was determined that these data were inconsistent or missing, had these data imputed using a fully conditional specification method. During the edit for records reporting three or more producers, the items needing imputation were marked, and the record was flagged. Periodically the data for these records (both the items needing to be imputed and the other variables needed by the model) were pulled and run through the imputation program. The resulting imputed values were loaded back to the records, and the records were made available for review. This process was conducted 19 times for the CML, and 6 times for the NML, during census production editing.

Data Analysis

The complex edit ensured the full internal consistency of the record. Successfully completing the edit did not provide insight as to whether the report was

reasonable compared to other reports in the county. Analysts were provided an additional set of tools, in the form of listings and graphs, to review record-level data across farms. These examinations revealed extreme outliers, large and small, or unique data distribution patterns that were possibly a result of reporting, recording, or handling errors. Potential problems were investigated and, when necessary, corrections were made and the record interactively edited again.

When NASS summarizes data from the census of agriculture, each individual report is typically assigned to a single "principal" county. The principal county is the county in which the majority of an operation's agricultural products are produced, as reported by the producer. For large operations that have significant production in multiple counties, their reports may be broken up into multiple source counties to more accurately summarize the data. Similarly, for large farms operating in more than one State, separate report forms are completed by State in order to assign the proper portion of the farm's total agricultural production to each State in which the farm operates.

ACCOUNTING FOR UNDERCOVERAGE, NONRESPONSE, AND MISCLASSIFICATION

Although much effort was expended making the CML as complete as possible, the CML did not include all U.S. farms, resulting in list undercoverage. Some farm producers who were on the CML did not respond to the census, despite numerous attempts to contact them. In addition, although each operation was classified as a farm or a nonfarm based on the responses to the census report form, some were misclassified; that is, some nonfarms were classified as farms and some farms were classified as nonfarms. NASS's goal was to produce agricultural census totals for publication at the county level that were fully adjusted for list undercoverage, nonresponse, and misclassification.

In 2012 NASS used capture-recapture methodology to adjust for undercoverage, nonresponse, and misclassification. This same methodology was implemented for the 2017 Census of Agriculture. To implement capture-recapture methods, two independent surveys were required. The 2017 Census of Agriculture (based on the CML) and the 2017 JAS (based on the area frame) were those two surveys. Historically, NASS has been careful to maintain the independence of these two surveys.

A second assumption was that the proportion of JAS farms with a given set of characteristics captured by the census was equal to the proportion of U.S. farms with those same characteristics captured by the census.

For a farm to be identified as a farm, and thus captured by the census, it must be on the CML, respond to the census report form and, based on the census response, be classified as a farm. Only those nonrespondents included in the nonresponse sample had an opportunity to be captured and had a probability π_S of being included in the sample; respondents prior to drawing the nonresponse sample had $\pi_S = 1$. Thus, the capture probability π_C is of interest:

$$\pi_C = \pi(\text{CML, Responded, Farm on Census}|\text{Farm})\ \pi_S$$

Two types of classification error can occur. First, a farm can be misclassified as a nonfarm. This type of misclassification is accounted for in determining the probability of capture π_C. The second type of classification error results when a response to the census is classified as a farm operation when it does not meet the definition of a farm. That is, some farms on the CML may be misclassified from their census report response and may be nonfarms. To account for the misclassification of nonfarms as farms, the probability of a farm on the census being classified correctly must be estimated; that is,

$$\pi_{CCFC} = \pi(\text{Farm} \mid \text{Farm on Census})$$

where *CCFC* represents Correct Census Farm Classification. To adjust for undercoverage, nonresponse, and misclassification, each CML record classified as a farm based on its response to the census report form was given a weight of the ratio of the estimated probability of correct classification of a farm on the census and the estimated probability of capture ($\hat{\pi}_{CCFC}/\hat{\pi}_C$ where the hat symbol ($\hat{}$) denotes an estimate). To estimate the number of farms with a given set of characteristics, the weights of CML records responding as farms on the census and having that set of characteristics were summed. This

estimator is referred to as the capture-recapture estimator (*CR*):

$$CR = \sum_{i \in F} \frac{\hat{\pi}_{CCFC,i}}{\hat{\pi}_{C,i}}$$

where *F* is the set of all CML records classified as farms based on their responses to the census report form.

To estimate the capture and correct census farm classification probabilities, a matched dataset consisting of JAS records and census records was created. Records in the 2017 JAS sample were matched to the 2017 census using probabilistic record linkage. The CML records that matched with JAS tracts represent the Census Sample.

Note: The Census Sample is a subset of the CML records and includes only those records matching a JAS tract. Both agricultural and non-agricultural tracts were included in the matched dataset.

Resolving Farm Status

The farm status based on census responses to either the CML or NML census data collection and the JAS agreed in most cases; these records are referred to as having resolved farm status. However, in other cases, a record was identified as a farm (nonfarm) on the JAS and as a nonfarm (farm) by the census through either the CML or the NML. Such records are said to have conflicting or unresolved farm status. An operation identified as a farm is referred to as in-scope; an operation identified as a nonfarm is referred to as out-of-scope. From the set of matched records, two groups with conflicting farm status were identified: 1) in-scope JAS records that were out-of-scope on the census and 2) census in-scope and JAS out-of-scope records. The records with conflicting farm status were sent to NASS regional field offices for review. In each case, efforts were made to determine whether (1) the status had changed between June and December when the census was conducted, (2) the JAS farm status was correct, (3) the census farm status was correct, (4) the records were incorrectly matched, or (5) the farm status could not be resolved. Not all of the records with conflicting farm status could be resolved. In 2017, 8.1 percent of the records in the Census Sample had unresolved farm status.

The probability an operation is a farm was estimated for the records with unresolved farm status. Using the 2017 matched dataset, a logistic model of the probability an operation is a farm based on the records with resolved farm status was developed; that is, the operations where the farm (or nonfarm) status agreed between the JAS and the census were used to develop a missing data model, which was then used to resolve farm status. The final missing data model was used to impute the probability that each of the agricultural operations with unresolved farm status is a farm. For the resolved farms and nonfarms, the probability of the operation being a farm was 1 and 0, respectively. Five-fold cross-validation was used to develop and to compare competing models. The accuracy of the model was thereby not overstated due to fitting and evaluating the model on the same set of data. To ensure that each of the cross-validation samples covered the U.S., the five cross-validation samples of JAS segments were drawn within State-stratum combinations. Characteristics of the JAS tracts were considered as potential covariates in the model. Because limited information is available for JAS nonfarm tracts, other covariates considered included county-level socio-demographic variables from the most recent U.S. population census, segment-level data from the Cropland Data Layer, the county-level rural-urban code, state-level response rates, an indicator for records that are thought to be out-of-business, and an indicator for records in the national nonresponse sample. The sample weight associated with each JAS tract was multiplied by the probability of being a farm. This adjusted weight was used in all subsequent modeling.

Capture Probabilities

Recall that, for a farm to be identified as a farm, and thus captured, by the census, it must be on the CML, respond to the census report form and, based on the census response, be classified as a farm. These adjustments are dependent. Further, those nonrespondents at the time the nonresponse sample was drawn had a known probability π_S of being included in the sample; respondents before the sample was drawn had $\pi_S = 1$. Therefore, the probability of capture π_C may be written as

$\pi_C = \pi$(CML, Responded, Farm on Census|Farm) π_S = π(CML|Farm)π(Responded|CML, Farm)π(Farm on Census|CML, Responded, Farm) π_S

The probability of being included in the sample π_S is known for all responding farms. The other terms in the probability of capturing a farm depend on the characteristics of the farm. Using five-fold cross-validation, three logistic models were developed based on the matched dataset. The first model estimated the probability of a farm being on the CML. The second model estimated the probability that a farm on the CML responded to the census report form. The final model estimated the probability that a farm that was on the CML and responded to the census was identified as a farm based on its response. The probability that a farm is captured by the census of agriculture is then the product of the three conditional probabilities that a farm is on the CML, responds, and is identified as a farm.

Note 1: Responses were required for Must cases. These operations were only excluded in modeling the probability of a farm responding given that it was on the CML.

Note 2: Because Alaska is not included in the JAS and thus has no area frame, the Alaskan agricultural operations were not included in the capture-recapture process. No adjustments were made for undercoverage or misclassification. To account for nonresponse, the CML records were divided into three groups: (1) the Must records, (2) the Criteria Records, and (3) the remaining CML records. The must records received a weight of one, thereby receiving no adjustment for nonresponse. The probability of response for each of the other two groups was the proportion of responders within the group. Each record within the group was then given a weight equal to the reciprocal of the probability of response.

Misclassification

An operation is misclassified if: (1) it meets the definition of a farm, but is classified as a nonfarm on the census or (2) it does not meet the definition of a farm, but is classified as a farm on the census. The first type of misclassification is accounted for when modeling the probability of capture. An adjustment is still needed for the misclassification of nonfarms as farms. As with farm status and capture, the probability of this misclassification depends on an operation's characteristics. Thus, a final logistic model was developed. Given that an operation was classified as a farm on the CML, the probability of its being a farm was modeled based on its characteristics. Five-fold cross-validation was used to ensure that the model was not over-fitted.

CALIBRATION

Each operation identified as being in-scope on the CML was given a weight equal to the probability of misclassification divided by the probability of capture. This weight accounted for undercoverage, nonresponse, both types of misclassification, and the nonresponse sample.

The record weighting processes were initially applied at the State level to produce adjusted estimates of farm numbers and land in farms for 63 different categories of 8 characteristics of the farm operation or the farm producer -- value of agricultural sales (9); age (2); female; race (3); Hispanic origin of principal farm producer; 4 sales categories for each of 10 major commodities (40); and farm type groups (7). The State-level number of farms and land in farms were two additional adjusted estimates, resulting in 65 categories. To reduce the intercensal variation at the State level, the State targets were smoothed by averaging the 2017 estimates from capture-recapture and the published 2012 State estimates with the restrictions that the smoothed targets were within two standard errors of the capture-recapture estimates. The smoothed State targets were rescaled so that they summed to the national capture-recapture estimates.

These State estimates were general purpose in that they did not provide any control over expected levels of commodity production of the individual farm operation. As a result of this limitation, the procedures could have over-adjusted or under-adjusted for commodity production. To address this, a second set of variables, known as commodity targets, was added to the calibration algorithm. These targets were commodity totals from administrative sources or from NASS surveys of nonfarm populations (e.g. USDA Farm Service Agency program data, Agricultural Marketing Service market orders, livestock slaughter data, cotton ginning data). The introduction of these

commodity coverage targets strengthened the overall adjustment procedure by ensuring that major commodity totals remained within reasonable bounds of established benchmarks.

Each State was calibrated separately. The calibration algorithm addressed commodity coverage. The algorithm was controlled by the 65 State farm operation coverage targets and the State commodity coverage targets. Because calibration targets are estimates subject to uncertainty, NASS allowed some tolerance in the determination of the adjusted weights. Rather than forcing the total for each calibration variable computed using the adjusted weights to equal a specific amount, NASS allowed the estimated total to fall within a tolerance range.

Tolerance ranges for the farm operation coverage targets were determined differently from the commodity targets. The tolerance range for the 65 State farm operation coverage targets was the estimated smoothed State total for the variable plus or minus one standard error of the capture-recapture estimate. This choice limited the cumulative deviation from the estimated total for a variable when State totals were summed to a U.S. total. Commodity coverage targets with acceptable ranges were established based on the administrative source for each State. Ranges were not necessarily symmetric around the target value.

To ensure that all subdomains for which NASS publishes summed to their grand total, integer weights were produced by a discrete calibration algorithm. This eliminated the need for rounding individual cell values and ensured that marginal totals always added correctly to the grand total. If a weight was initially not in the interval [1,6], it was trimmed so that in was in that interval. That is, adjusted weights less than 1 were set to 1, and those greater than 6 were set to 6. The remaining non-integer weights were then rounded sequentially to reduce the distance of the estimated totals from the targets.

Calibration adjustments began with the computation of a priority index for each record. The priority index was the absolute value of the gradient of the relative error associated with increasing or decreasing a record's weight by one. The record with the highest priority index was then selected as a candidate to increase or decrease its weight by one to reduce the cumulative distance from the targets as measured by the relative error. If the new value produced an improvement and satisfied the range restrictions, the weight was updated and new priorities were assigned; otherwise, the record with the next highest priority index was processed. This process was iteratively performed until convergence was attained. Because census data collection was assumed to be complete for very large and unique farms, their weights were controlled to 1 during the calibration adjustment process. For all other farms, the final census record weights were forced to be an integer number in the interval [1, 6]. The calibration process considered all targets simultaneously through the priority index. Although calibration was seldom able to adjust weights so that all State targets were met, all targets were brought collectively as close to the targets as possible.

The proportions of selected census data items that were due to coverage, response, and classification adjustments are displayed in Tables A and C.

DISCLOSURE REVIEW

After tabulation and review of the aggregates, a comprehensive disclosure review was conducted. NASS is obligated to withhold, under Title 7, U.S. Code, any total that would reveal an individual's information or allow it to be closely estimated by the public. Farm counts are not considered sensitive and are not subject to disclosure controls. Cell suppression was used to protect the cells that were determined to be sensitive to a disclosure of information.

Based on agency standards, data cells were determined to be sensitive to a disclosure of information if they failed either of two rules. The threshold rule failed if the data cell contained less than three operations. For example, if only one farmer produced turkeys in a county, NASS could not publish the county total for turkey inventory without disclosing that individual's information. The dominance rule failed if the distribution of the data within the cell allowed a data user to estimate any respondent's data too closely. For example, if there are many farmers producing turkeys in a county and some of them were large enough to dominate the cell total, NASS could not publish the county total for turkey inventory without risking disclosing an individual respondent's data. In both of these

situations, the data were suppressed and a "(D)" was placed in the cell in the census publication table. These data cells are referred to as primary suppressions.

Since most items were summed to marginal totals, primary suppressions within these summation relationships were protected by ensuring that there were additional suppressions within the linear relationship that provided adequate protection for the primary. A detailed computer routine selected additional data cells for suppression to ensure all primary suppressions were properly protected. These data cells are referred to as complementary suppressions. These cells are not themselves sensitive to a disclosure of information but were suppressed to protect other primary suppressions. A "(D)" was also placed in the cell of the census publication table to indicate a complementary suppression. A data user cannot determine whether a cell with a (D) represents a primary or a complementary suppression.

Regional field office analysts reviewed all complementary suppressions to ensure no cells had been withheld that were vital to the data users. In instances where complementary suppressions were deemed critically important to a State or county, analysts requested an override and a different complementary cell was chosen.

CENSUS QUALITY

The purpose of the census of agriculture is to account for "any place from which $1,000 or more of agricultural products were produced and sold, or normally would have been sold, during the census year." To accomplish this, NASS develops a CML that contains identifying information for operations that have an indication of meeting the census definition, develops procedures to collect agricultural information from those records, establishes criteria for analyst review of the data, creates computer routines to correct or complete the requested information, and provides census estimates of the characteristics of farms and farm producers with associated measures of uncertainty.

It is not likely that either the CML includes all operations that meet the definition of a farm or that all those that do meet the definition of a farm respond to the census inquiry. The goal is to publish data with a high level of quality. The quality of a census may be measured in many ways. One of the first indicators used is a measure of the response to the census data collection as it has generally been thought that a high response rate indicates more complete coverage of the population of interest. This is a valid assumption if the enumeration list, the CML here, has complete coverage of the population of interest. In the case of the census of agriculture, the definition requiring advance knowledge of sales makes achieving a high level of coverage difficult. To ensure that the census of agriculture is as complete as possible, records are included that might not meet the census definition of a farm – in fact, almost 50 percent more records than the anticipated number of qualifying farm operations were included in the 2017 CML. A second indicator of quality then is the coverage of the farm population by the CML. Other indicators of quality relate to the accuracy and completeness of the data, and the validity of the procedures used in processing the data.

In some cases, NASS was able to produce measures of quality – such as the response rate to the data collection, the coverage of the census mail list, and the variability of the final adjusted estimates. In other cases, measures were not produced but descriptions of procedures that NASS used to reduce errors from the procedures were subsequently provided.

Census Response Rate

The response rate is one indicator of the quality of a data collection. It is generally assumed that if a response rate is close to a full participation level of 100 percent, the potential for nonresponse bias is small, although this has been questioned in the literature. The response rate for the 2017 Census of Agriculture CML was 71.8 percent, as compared with the 2012 Census of Agriculture's response rate of 74.6 percent and 78.2 percent for the 2007 Census of Agriculture.

The 2017 Census of Agriculture's response rate used the fourth response rate formula (RR4) from the American Association of Public Opinion Research's Response Rate Standard Definitions manual:

$$RR4 = \frac{C_{adj}}{C_{adj} + R + NC + O + Replicated + e(U)}(100)$$

where

C_{adj} = number of fully and partially completed records, excluding replicated records
R = number of explicit refusals
NC = number of non-contacted operations known to be eligible
O = number of other types of nonrespondents
Replicated = number of replicated records
U = number of operations of unknown eligibility
$e(U)$ = estimated number of operations of unknown eligibility assumed to be eligible

Records were classified into the above variables based on the combination of their active status (AS) codes, in-scope status, and replication status. Active status refers to the eligibility status of records for selection on the CML. All replicated records were considered to be a form of nonresponse and were classified into other nonrespondents; in-scope status was considered immaterial.

Certain active status classifications indicated records of unknown agricultural status. These classifications included records to be removed from the CML but had data from outside sources indicating agricultural activity, new records from outside data sources, nonrespondents and refusals to the NACS, records for regional office handling only, and records with Farm Service Agency or Conservation Reserve Program data on operations that are not owned by the principal producer. These records were stratified (grouped) based on their probabilities of being in-scope had they responded. The estimated number of in-scope nonrespondents was calculated for the *h*th stratum (group) by the following formula:

$$e(U_h) = \left(\frac{C_{in-scope,h}}{C_h} \right) U_h$$

where

$e(U_h)$ = estimated number of operations of unknown eligibility assumed to be eligible in the *h*th group
$C_{in\text{-}scope,h}$ = the number of completed and in-scope census records in the *h*th group
C_h = the number of completed census records in the *h*th group
U_h = number of operations of unknown eligibility in the *h*th group

Census Coverage

As a side-product of the statistical adjustment used to account for undercoverage, nonresponse of farms on the CML, and misclassification of responses to the census, the proportion of the adjustments due to each of those factors can be derived. The percentages of final census estimates due to adjustments for undercoverage, nonresponse, and misclassification as well as the total percent adjustment for selected items are displayed in Tables A and C.

MEASURED ERRORS IN THE CENSUS PROCESS

Although the census of agriculture does not inherently rely on a sample, NASS used a national nonresponse sample as part of its follow-up efforts in 2017. In addition to the uncertainty introduced by the nonresponse sample, NASS uses statistical procedures in compiling the CML, in its data collection procedures, in data editing and processing, and in compiling the final data. Additionally, it uses statistical procedures to both measure errors in the various processes and in making adjustments for those errors in the final data. One example is the statistical process used to account for undercoverage, nonresponse of farms on the CML, and misclassification of responses to the census. The basis of the undercoverage adjustment is the capture-recapture procedure that uses the area sample enumeration from the JAS. The largest contributors to error in the census estimates are due to the adjustments for nonresponse, undercoverage, misclassification, calibration, and integerization.

Variability in Census Estimates due to Statistical Adjustment

In conducting the 2017 Census of Agriculture, efforts were initiated to measure error associated with the adjustments for farm operations that were not on the CML, for farm operations that were on the CML but did not respond to the census report form, and for farms and nonfarms that were misclassified as nonfarms and farms, respectively, for calibration. These error measurements were developed from the standard error of the estimates at the national, State, and county levels and were expressed as coefficients of variation (CVs) at the national and State levels and

as generalized coefficients of variation (GCVs) at the county levels.

The standard error of an estimate is an estimate of the standard deviation of the sampling distribution of the estimator. Because Alaska was modeled separately from the other States, the variances of a national-level data item for this State was computed separately and added to the variance of that data item for the rest of the U.S. The standard error was then the square root of the total variance. In each case, standard errors were computed using an approach based on a combination of group jackknife and bootstrap methodologies. To conduct the jackknifing, k = 10 mutually exclusive and exhaustive groups of JAS segments were formed. The groups were selected using a stratified random design so that each group reflected the survey design, including State and agricultural strata within a State. The weight of record i in jackknife group j is $CR_i^{(j)}$ for j = 1, 2, …, k. Based on these weights, a group jackknife estimator to estimate the variance would account for the uncertainty associated with modeling the capture-recapture probabilities. To account for the additional uncertainty due to calibration, the weights within each jackknife group were transformed through bootstrap simulation; these transformed weights are called calibration-adjusted-jackknife weights. The full dataset, which is composed of the records of all responding farms on the CML, is calibrated as described in the Calibration section, and the final calibration-adjusted weight of record i is denoted by $\hat{w}_i$. For each record i in jackknife group k, the calibration-adjusted-jackknife weights of that record can be approximated as $w_i^{(j)}=a_i^{(j)}CR_i^{(j)}$ where $a_i^{(j)} \sim N(1,(\hat{w}_i-1)/\hat{w}_i)$. The bootstrap process simulated the value of the adjustment $a_i^{(j)}$ for each record on the CML to obtain the calibration-adjusted-jackknife weights. For a given data item, such as the number of farms, the estimate $T^{(j)}$ was computed at the specified geographical level, such as nation, State, or county, using the (k – 1) groups remaining after deleting the calibration-adjusted jackknife group j. Estimates of the variance and standard error associated with the estimator T_i are then, respectively,

$$\sigma_i^2 = \frac{k-1}{k}\sum_{j=1}^{k}\left(T_i^{(j)} - \sum_{l=1}^{k}\frac{T_i^{(l)}}{k}\right)^2; \quad SE\left(T_i\right) = \sqrt{\sigma_i^2}$$

Increasing k improves the estimate of the variance but, as k increases, the observations become too sparse to reflect the survey design and to provide countrywide coverage. Ten (10) calibration-adjusted jackknife groups were used to provide standard errors for 2017 State and national estimates. For the estimate of the number of farms with a given set of characteristics, only the CML records with those characteristics were used to obtain the overall estimate as well as the estimates from each calibration-adjusted jackknife group.

Note that the calibrated jackknife groups were only constructed once, and different subsets of the records were used to compute estimates and standard errors for the data items.

The CV is a measure of the relative amount of error associated with the sample estimate:

$$\mathrm{CV}_i = \frac{SE\left(T_i\right)}{T_i}100\%$$

where $SE(T_i)$ is the standard error of the capture-recapture estimate for data item i. This relative measure allows the reliability of a range of estimates to be compared. For example, the standard error is often larger for large population estimates than for small population estimates, but the large population estimates may have a smaller CV, indicating a more reliable estimate. For county-level estimates, a generalized coefficient of variation (GCV) was determined for each estimate within a State. A generalized variance function relates a function of the variance of an estimator to a function of the estimator. Within a State, the standard error of an estimate for a data item was often found to be linearly related to the estimate of that item with an intercept of zero. Based on this modeled relationship, the GCV is the slope of the line relating the standard error to the estimate, multiplied times 100 to represent the GCV as a percentage.

The standard error is the product of the CV (or GCV for county estimates) and the estimate divided by 100. As an example, if the GCV for a State is 25 percent and a county's estimate is 4, then the standard error is 25(4)/100 = 1. The standard error of an estimated data item from the census provides a measure of the error variation in the value of that estimated data item based on the possible outcomes of the census collection,

including variants as to who was on the CML, who returned a census form, who was misclassified either as a farm or as a nonfarm, and the uncertainty associated with calibration and integerization. With 95 percent confidence, an estimate is within two standard errors of the true value being estimated. For this example, with 95 percent confidence, the estimate of 4 is within 2(1) = 2 of the true county value.

Table B presents the fully adjusted estimates with the coefficient of variation for selected items.

NONMEASURED ERRORS IN THE CENSUS PROCESS

As noted in the previous section, sampling errors can be introduced from the coverage, nonresponse and misclassification adjustment procedures. This error is measureable. However, nonsampling errors are imbedded in the census process that cannot be directly measured as part of the design of the census but must be contained to ensure an accurate count. Extensive efforts were made to compile a complete and accurate mail list for the census, to elicit response to the census, to design an understandable report form with clear instructions, to minimize processing errors through the use of quality control measures, to reduce matching error associated with the capture-recapture estimation process, and to minimize error associated with identification of a respondent as a farm operation (referred to as classification error). The weight adjustment and tabulation processes recognize the presence of nonsampling errors; however, it is assumed that these errors are small and that, in total, the net effect is zero. In other words, the positive errors cancel the negative errors.

Respondent and Enumerator Error

Incorrect or incomplete responses to the census report form or to the questions posed by an enumerator can introduce error into the census data. Steps were taken in the design and execution of the census of agriculture to reduce errors from respondent reporting. Poor instructions and ambiguous definitions lead to misreporting. Respondents may not remember accurately, may estimate responses, or may record an item in the wrong cell. To reduce reporting and recording errors, the report form was tested prior to the census using industry accepted cognitive testing procedures. Detailed instructions for completing the report form were provided to each respondent. Questions were phrased as clearly as possible based on previous tests of the report form. Computer-assisted telephone interviewing software included immediate integrity checks of recorded responses so suspect data could be verified or corrected. In addition, each respondent's answers were checked for completeness and consistency by the complex edit and imputation system.

Processing Error

Processing of each census report form was another potential source of nonsampling error. All mail returns that included multiple reports, respondent remarks, or that were marked out of business and report forms with no reported data were sent to an analyst for verification and appropriate action. Integrity checks were performed by the imaging system and data transfer functions. Standard quality control procedures were in place that required that randomly selected batches of data keyed from image be re-entered by a different operator to verify the work and evaluate key entry operators. All systems and programs were thoroughly tested before going on-line and were monitored throughout the processing period.

Developing accurate processing methods is complicated by the complex structure of agriculture. Among the complexities are the many places to be included, the variety of arrangements under which farms are operated, the continuing changes in the relationship of producers to the farm operated, the expiration of leases and the initiation or renewal of leases, the problem of obtaining a complete list of agriculture operations, the difficulty of contacting and identifying some types of contractor/contractee relationships, the producer's absence from the farm during the data collection period, and the producer's opinion that part or all of the operation does not qualify and should not be included in the census. During data collection and processing of the census, all operations underwent a number of quality control checks to ensure results were as accurate as possible.

Item Nonresponse

All item nonresponse actions provide another opportunity to introduce measurement errors. Regardless of whether it was previously reported data, administrative data, the nearest neighbor algorithm,

the fully conditional specification method, or manually imputed by an analyst, some risk exists that the imputed value does not equal the actual value. Previously reported and administrative data were used only when they related to the census reference period. A new nearest neighbor was randomly selected for each incident to eliminate the chance of a consistent bias.

Record Matching Error

The process of building and expanding the CML involves finding new list sources and checking for names not on the list. An automated processing system compared each new name to the existing CML names and "linked" like records for the purpose of preventing duplication. New names with strong links to a CML name were discarded and those with no links were added as potential farms. Names with weak links, possible matches, were reviewed by staff to determine whether the new name should be added. Despite this thorough review, some new names may have been erroneously added or deleted. Additions could contribute to duplication (overcoverage) whereas deletions could contribute to undercoverage. As a result, some names received more than one report form, and some farm producers did not receive a report form. Respondents were instructed to complete one form and return all forms so the duplication could be removed.

Another chance for error came when comparing June Area Survey tract producer names to the CML. Area producers whose names were not found on the CML were part of the measure of list incompleteness, or NML. Mistakes in determining overlap status resulted in overcounts (including a tract whose producer was on the CML) or undercounts (excluding a tract whose producer was not on the CML). All tracts determined to not be on the list were triple checked to eliminate, or at least minimize, any error. NML tract producers were mailed a report form printed in a different color. In order to attempt to identify duplication, all respondents who received multiple report forms were instructed to complete the CML version and return all forms so duplication could be removed.

Records in the 2017 JAS were matched to the 2017 census using probabilistic record linkage. The records of operations with differing farm status were sent out to be reviewed by NASS regional field offices. If farm status could not be resolved, the probability of an operation being a farm was imputed using a missing data model. The uncertainty associated with this estimate, with the exception of model uncertainty, was accounted for, but errors not found through this process were not.

Table A. **Summary of State Coverage, Nonresponse, and Misclassification Adjustments: 2017**

[For meaning of abbreviations and symbols, see introductory text.]

Item	Total	Standard error	Adjustment as percent of total	Percent of total adjustment from coverage	Percent of total adjustment from nonresponse	Percent of total adjustment from misclassification
Farms ..... number	43,225	1,037	39.0	17.2	12.2	9.6
Land in farms ..... acres	7,797,979	145,486	26.5	8.7	10.8	7.1
Farms by size:						
1 to 9 acres ..... farms	4,595	1,123	58.0	28.9	15.3	13.8
acres	23,169	5,636	58.9	28.8	14.9	15.2
10 to 49 acres ..... farms	13,631	868	44.0	21.4	12.1	10.5
acres	351,954	22,235	43.0	20.3	11.6	11.1
50 to 69 acres ..... farms	3,892	271	38.8	17.7	12.8	8.3
acres	226,722	16,158	38.8	17.7	12.6	8.4
70 to 99 acres ..... farms	4,064	202	35.7	15.1	11.4	9.1
acres	337,648	17,055	35.6	15.1	11.3	9.2
100 to 139 acres ..... farms	4,147	233	33.2	10.8	12.3	10.1
acres	481,525	27,517	33.4	10.9	12.3	10.2
140 to 179 acres ..... farms	2,697	238	34.9	11.4	11.8	11.7
acres	424,924	36,839	34.9	11.4	11.8	11.7
180 to 219 acres ..... farms	1,737	171	30.5	9.4	15.5	5.6
acres	344,106	33,553	30.5	9.5	15.4	5.6
220 to 259 acres ..... farms	1,330	154	28.4	11.3	10.8	6.2
acres	316,043	37,296	28.2	11.3	10.8	6.2
260 to 499 acres ..... farms	3,665	266	30.2	9.1	13.7	7.5
acres	1,292,714	94,854	30.6	9.1	13.9	7.6
500 to 999 acres ..... farms	2,127	105	30.1	9.2	15.2	5.7
acres	1,448,611	76,771	30.5	9.2	15.5	5.9
1,000 to 1,999 acres ..... farms	966	89	25.4	4.9	9.5	11.0
acres	1,306,951	113,260	24.8	5.1	8.6	11.1
2,000 acres or more ..... farms	374	21	2.1	0.7	1.1	0.3
acres	1,243,612	149,164	2.6	0.7	1.4	0.4
Irrigated land use:						
Harvested cropland ..... farms	1,980	274	33.9	14.6	14.4	4.9
acres	61,532	7,565	12.3	2.7	7.7	2.0
Pastureland and other land ..... farms	85	75	36.2	9.9	15.8	10.6
acres	1,901	(H)	36.2	2.7	26.3	7.2
Market value of agricultural products sold (see text) $1,000	3,960,501	86,812	13.1	3.6	6.4	3.0
Farms by value of sales:						
Less than $1,000 (see text) ..... farms	11,562	1,087	60.1	27.4	15.3	17.4
$1,000	2,219	365	63.6	29.4	16.4	17.8
$1,000 to $2,499 ..... farms	4,789	370	38.4	20.8	10.4	7.2
$1,000	7,904	617	38.6	20.9	10.3	7.3
$2,500 to $4,999 ..... farms	4,725	232	37.4	19.6	10.4	7.4
$1,000	16,989	846	37.3	19.3	10.6	7.4
$5,000 to $9,999 ..... farms	5,927	274	37.0	16.2	12.6	8.2
$1,000	42,215	1,923	36.8	16.0	12.7	8.1
$10,000 to $19,999 ..... farms	4,809	237	22.3	9.1	7.7	5.5
$1,000	68,385	3,318	22.3	9.0	7.8	5.5
$20,000 to $24,999 ..... farms	1,405	130	29.0	9.4	13.2	6.3
$1,000	31,085	2,827	28.8	9.4	13.0	6.3
$25,000 to $39,999 ..... farms	2,454	217	25.4	7.8	11.6	5.9
$1,000	77,202	6,537	25.8	7.9	11.9	6.0
$40,000 to $49,999 ..... farms	1,005	114	30.2	8.7	15.3	6.3
$1,000	44,661	5,274	30.3	8.6	15.5	6.3
$50,000 to $99,999 ..... farms	2,119	123	29.1	7.1	16.4	5.7
$1,000	146,217	7,220	29.1	7.2	16.3	5.7
$100,000 to $249,999 ..... farms	1,704	119	31.9	3.9	19.9	8.1
$1,000	270,289	24,137	33.1	3.9	20.8	8.4
$250,000 to $499,999 ..... farms	967	62	32.3	4.7	21.0	6.6
$1,000	346,899	17,708	32.8	4.9	21.3	6.6
$500,000 to $999,999 ..... farms	870	42	23.3	3.6	16.3	3.4
$1,000	626,265	26,747	24.5	4.1	16.7	3.7
$1,000,000 or more ..... farms	889	24	3.4	1.2	1.3	0.9
$1,000	2,280,171	66,619	1.5	0.6	0.5	0.4
Legal status for tax purposes (see text):						
Family or individual ..... farms	37,362	958	39.8	17.8	12.2	9.8
acres	5,456,763	108,663	29.2	10.0	11.4	7.7
Partnership ..... farms	2,529	213	34.0	12.8	13.4	7.9
acres	1,058,601	47,377	21.0	6.0	9.1	6.0
Corporation:						
Family held ..... farms	2,428	218	33.4	12.2	12.6	8.6
acres	962,825	35,579	17.9	5.0	7.7	5.1
Other than family held ..... farms	336	53	36.5	17.4	11.6	7.6
acres	114,854	(H)	38.4	5.4	28.5	4.6
Other - estate or trust, prison farm, grazing association, American Indian Reservation, etc ..... farms	570	123	31.9	14.6	9.5	7.9
acres	204,936	31,461	18.8	9.0	4.0	5.7
Tenure:						
Full owners ..... farms	30,128	817	41.6	19.2	11.7	10.6
acres	3,175,388	151,689	32.1	12.8	9.9	9.3
Part owners ..... farms	10,823	246	31.4	10.8	13.3	7.3
acres	4,174,138	71,121	22.6	5.3	11.6	5.6
Tenants ..... farms	2,274	507	41.0	15.6	18.7	6.7
acres	448,453	42,123	24.2	7.1	13.8	3.3
All principal producer characteristics by [1]-						
Sex of operator:						
Male ..... farms	37,027	947	37.3	16.3	12.5	8.5
acres	7,185,269	134,998	25.8	8.1	11.1	6.5
Female ..... farms	16,456	711	43.6	19.0	13.0	11.6
acres	2,043,877	84,546	32.3	11.0	12.0	9.2
Primary occupation:						
Farming ..... farms	24,737	1,122	34.5	13.8	11.5	9.1
Other ..... farms	32,467	1,590	42.5	18.5	13.9	10.1

See footnote(s) at end of table.

--continued

Table A. **Summary of State Coverage, Nonresponse, and Misclassification Adjustments: 2017** (continued)

[For meaning of abbreviations and symbols, see introductory text.]

Item		Total	Standard error	Adjustment as percent of total	Percent of total adjustment from coverage	Percent of total adjustment from nonresponse	Percent of total adjustment from misclassification
All principal producer characteristics by [1] - - Con.							
Hispanic, Latino, or Spanish origin (see text)	farms	602	224	55.2	23.7	20.4	11.1
	acres	97,653	48,424	45.0	11.8	21.6	11.6
Race:							
American Indian or Alaska Native	farms	133	45	50.1	31.1	8.7	10.3
	acres	13,191	1,915	28.2	17.8	3.1	7.3
Asian	farms	167	(H)	51.2	15.5	15.9	19.7
	acres	12,722	(H)	40.6	6.6	14.8	19.2
Black or African American	farms	1,251	193	58.5	17.7	26.1	14.7
	acres	141,186	28,454	52.0	10.5	27.2	14.2
Native Hawaiian or Other Pacific Islander	farms	23	(H)	18.7	12.7	2.4	3.6
	acres	1,108	(H)	1.8	1.1	0.2	0.4
White	farms	41,672	1,115	38.4	17.1	11.9	9.4
	acres	7,622,996	148,162	26.0	8.7	10.5	6.8
More than one race reported	farms	262	105	43.7	17.3	12.8	13.6
	acres	28,358	6,295	49.9	10.8	23.1	16.0
Military service (see text):							
Never served	producers	48,859	1,382	39.1	16.5	13.1	9.6
Served	producers	8,345	608	38.5	17.2	11.2	10.1
All producers by age group [1]:							
Under 25 years	farms	1,086	226	39.7	15.9	15.2	8.6
25 to 34 years	farms	4,344	1,222	51.5	17.6	21.4	12.5
35 to 44 years	farms	7,152	890	45.3	19.3	19.0	7.0
45 to 54 years	farms	12,238	600	41.8	17.0	15.3	9.5
55 to 64 years	farms	19,760	968	37.3	17.7	10.9	8.7
65 to 74 years	farms	16,812	620	35.9	16.1	8.2	11.6
75 years and over	farms	9,202	252	34.1	13.7	9.0	11.4
Net cash farm income of operations (see text):							
Farms with gains of [2]-							
Less than $1,000	farms	1,726	112	36.7	19.1	9.4	8.2
	$1,000	815	70	35.7	18.0	10.1	7.6
$1,000 to $4,999	farms	3,957	392	32.2	13.7	10.9	7.6
	$1,000	10,713	920	32.0	13.2	11.4	7.4
$5,000 to $9,999	farms	2,337	164	29.0	12.8	9.3	6.8
	$1,000	16,866	1,165	28.8	12.7	9.3	6.8
$10,000 to $24,999	farms	3,070	315	27.3	9.0	11.7	6.5
	$1,000	49,637	4,469	27.1	9.1	11.5	6.5
$25,000 to $49,999	farms	1,785	96	28.2	7.6	14.4	6.3
	$1,000	63,468	3,375	28.8	7.6	14.7	6.4
$50,000 or more	farms	3,681	112	23.0	5.4	12.2	5.4
	$1,000	1,122,084	17,156	13.0	3.7	6.1	3.2
Farms with losses of -							
Less than $1,000	farms	2,461	201	41.2	21.5	10.1	9.6
	$1,000	1,263	104	40.6	21.2	9.9	9.5
$1,000 to $4,999	farms	8,770	739	46.5	21.0	13.2	12.3
	$1,000	25,026	2,606	47.0	20.5	13.6	12.8
$5,000 to $9,999	farms	6,040	624	47.5	23.3	12.5	11.7
	$1,000	43,741	4,215	47.4	23.2	12.6	11.7
$10,000 to $24,999	farms	5,700	419	44.5	20.2	13.3	10.9
	$1,000	88,275	6,580	44.3	20.0	13.3	10.9
$25,000 to $49,999	farms	2,085	259	43.4	18.8	14.8	9.9
	$1,000	71,169	8,455	43.5	18.9	14.7	9.9
$50,000 or more	farms	1,613	170	42.3	15.6	15.7	10.9
	$1,000	199,587	42,736	32.6	12.6	11.3	8.7
Livestock and poultry:							
Cattle and calves inventory	farms	21,880	640	33.5	13.3	13.5	6.8
	number	1,482,888	43,550	27.6	6.3	14.1	7.2
Beef cows inventory	farms	18,453	472	29.7	11.8	11.5	6.3
	number	638,418	17,971	21.6	5.3	10.5	5.8
Milk cows inventory	farms	1,048	193	31.2	11.2	16.5	3.5
	number	87,322	5,135	13.2	2.2	9.5	1.5
Hog and pigs inventory	farms	1,461	489	45.8	15.1	19.1	11.6
	number	249,231	13,680	3.7	1.4	0.4	1.8
Layers inventory	farms	5,729	392	49.6	22.6	17.3	9.6
	number	2,447,718	89,921	4.9	1.6	2.3	1.0
Broilers sold	farms	1,080	199	41.4	15.9	17.2	8.2
	number	261,649,137	21,171,670	12.9	5.1	4.3	3.5
Aquaculture sold	farms	274	56	32.5	18.9	9.0	4.5
	$1,000	90,226	8,453	2.3	0.7	1.1	0.4
Selected crops harvested:							
Corn for grain	farms	2,548	229	24.4	4.7	14.7	5.0
	acres	378,073	22,819	13.3	2.5	8.1	2.6
Durum wheat for grain	farms	-	-	-	-	-	-
	acres	-	-	-	-	-	-
Other spring wheat for grain (see text)	farms	-	-	-	-	-	-
	acres	-	-	-	-	-	-
Winter wheat for grain	farms	1,009	109	19.6	4.1	11.7	3.9
	acres	151,869	8,838	9.7	2.5	5.0	2.2
Sorghum for grain	farms	113	55	23.9	2.3	18.2	3.3
	acres	8,393	2,703	18.6	1.4	15.0	2.2
Soybeans for beans	farms	2,438	272	23.9	4.4	14.8	4.6
	acres	600,310	30,802	14.1	2.6	8.7	2.8
Rice	farms	-	-	-	-	-	-
	acres	-	-	-	-	-	-
Cotton	farms	247	128	32.1	2.3	23.7	6.1
	acres	87,242	15,658	26.7	2.4	18.6	5.7
Peanuts	farms	189	92	31.3	2.4	20.6	8.3
	acres	28,510	7,906	29.2	2.3	19.4	7.5

See footnote(s) at end of table.

--continued

Table A. **Summary of State Coverage, Nonresponse, and Misclassification Adjustments: 2017** (continued)

[For meaning of abbreviations and symbols, see introductory text.]

Item		Total	Standard error	Adjustment as percent of total	Percent of total adjustment from coverage	Percent of total adjustment from nonresponse	Percent of total adjustment from misclassification
Selected crops harvested: - Con.							
Barley	farms	251	14	19.9	6.3	7.6	6.0
	acres	13,605	442	8.2	3.0	2.9	2.2
Oats	farms	73	12	28.6	10.1	12.9	5.6
	acres	2,241	287	11.6	4.8	2.7	4.2
Forage - land used for all hay and all haylage, grass silage, and greenchop (see text)	farms	23,888	848	34.4	14.1	10.8	9.5
	acres	1,247,300	38,802	28.2	9.3	11.5	7.4
Land in vegetables (see text)	farms	1,803	261	34.9	15.1	15.0	4.8
	acres	20,808	2,894	12.1	2.6	8.0	1.6
Potatoes	farms	535	89	33.3	19.4	9.1	4.8
	acres	4,213	650	11.1	5.9	1.9	3.3
Tomatoes in the open	farms	870	156	34.6	16.9	13.2	4.5
	acres	2,514	198	7.1	2.4	3.6	1.1
Sweet corn	farms	416	86	30.2	11.4	14.8	4.0
	acres	4,369	587	6.2	1.5	3.9	0.8
Lettuce	farms	307	181	36.0	12.0	19.3	4.7
	acres	102	91	37.4	8.2	24.7	4.5
Land in orchards (see text)	farms	1,537	150	36.0	18.3	12.1	5.5
	acres	18,396	2,075	10.2	4.0	4.4	1.8
Apples	farms	687	112	36.4	18.8	12.0	5.7
	acres	10,879	505	6.7	3.8	1.4	1.6
Grapes	farms	688	133	33.4	16.6	11.9	4.9
	acres	4,967	2,036	12.3	3.6	6.9	1.8
Oranges	farms	-	-	-	-	-	-
	acres	-	-	-	-	-	-
Almonds	farms	11	(H)	29.5	24.7	3.5	1.4
	acres	8	(H)	40.1	35.6	2.7	1.7
Land in berries	farms	903	167	40.6	19.9	14.8	5.9
	acres	1,357	307	24.8	9.9	11.3	3.6

[1] Data were collected for a maximum of four producers per farm.
[2] Farms with total production expenses equal to market value of agricultural products sold, government payments, and farm-related income are included as farms with gains of less than $1,000.

Table B. **Reliability Estimates of State Totals: 2017**

[For meaning of abbreviations and symbols, see introductory text.]

Item	Total	Coefficient of variation (percent)
Farms ..... number	43,225	2.4
Land in farms ..... acres	7,797,979	1.9
Farms by size:		
1 to 9 acres ..... farms	4,595	24.4
acres	23,169	24.3
10 to 49 acres ..... farms	13,631	6.4
acres	351,954	6.3
50 to 69 acres ..... farms	3,892	7.0
acres	226,722	7.1
70 to 99 acres ..... farms	4,064	5.0
acres	337,648	5.1
100 to 139 acres ..... farms	4,147	5.6
acres	481,525	5.7
140 to 179 acres ..... farms	2,697	8.8
acres	424,924	8.7
180 to 219 acres ..... farms	1,737	9.9
acres	344,106	9.8
220 to 259 acres ..... farms	1,330	11.6
acres	316,043	11.8
260 to 499 acres ..... farms	3,665	7.3
acres	1,292,714	7.3
500 to 999 acres ..... farms	2,127	4.9
acres	1,448,611	5.3
1,000 to 1,999 acres ..... farms	966	9.3
acres	1,306,951	8.7
2,000 acres or more ..... farms	374	5.5
acres	1,243,612	12.0
Irrigated land use:		
Harvested cropland ..... farms	1,980	13.9
acres	61,532	12.3
Pastureland and other land ..... farms	85	88.7
acres	1,901	(H)
Market value of agricultural products sold (see text) $1,000	3,960,501	2.2
Farms by value of sales:		
Less than $1,000 (see text) ..... farms	11,562	9.4
$1,000	2,219	16.5
$1,000 to $2,499 ..... farms	4,789	7.7
$1,000	7,904	7.8
$2,500 to $4,999 ..... farms	4,725	4.9
$1,000	16,989	5.0
$5,000 to $9,999 ..... farms	5,927	4.6
$1,000	42,215	4.6
$10,000 to $19,999 ..... farms	4,809	4.9
$1,000	68,385	4.9
$20,000 to $24,999 ..... farms	1,405	9.3
$1,000	31,085	9.1
$25,000 to $39,999 ..... farms	2,454	8.8
$1,000	77,202	8.5
$40,000 to $49,999 ..... farms	1,005	11.4
$1,000	44,661	11.8
$50,000 to $99,999 ..... farms	2,119	5.8
$1,000	146,217	4.9
$100,000 to $249,999 ..... farms	1,704	7.0
$1,000	270,289	8.9
$250,000 to $499,999 ..... farms	967	6.4
$1,000	346,899	5.1
$500,000 to $999,999 ..... farms	870	4.9
$1,000	626,265	4.3
$1,000,000 or more ..... farms	889	2.7
$1,000	2,280,171	2.9
Legal status for tax purposes (see text):		
Family or individual ..... farms	37,362	2.6
acres	5,456,763	2.0
Partnership ..... farms	2,529	8.4
acres	1,058,601	4.5
Corporation:		
Family held ..... farms	2,428	9.0
acres	962,825	3.7
Other than family held ..... farms	336	15.9
acres	114,854	(H)
Other - estate or trust, prison farm, grazing association, American Indian Reservation, etc ..... farms	570	21.6
acres	204,936	15.4
Tenure:		
Full owners ..... farms	30,128	2.7
acres	3,175,388	4.8
Part owners ..... farms	10,823	2.3
acres	4,174,138	1.7
Tenants ..... farms	2,274	22.3
acres	448,453	9.4
All principal producer characteristics by [1]-		
Sex of operator:		
Male ..... farms	37,027	2.6
acres	7,185,269	1.9
Female ..... farms	16,456	4.3
acres	2,043,877	4.1
Primary occupation:		
Farming ..... farms	24,737	4.5
Other ..... farms	32,467	4.9

Item	Total	Coefficient of variation (percent)
All principal producer characteristics by [1]- - Con.		
Hispanic, Latino, or Spanish origin (see text) ..... farms	602	37.2
acres	97,653	49.6
Race:		
American Indian or Alaska Native ..... farms	133	34.0
acres	13,191	14.5
Asian ..... farms	167	(H)
acres	12,722	(H)
Black or African American ..... farms	1,251	15.4
acres	141,186	20.2
Native Hawaiian or Other Pacific Islander ..... farms	23	(H)
acres	1,108	(H)
White ..... farms	41,672	2.7
acres	7,622,996	1.9
More than one race reported ..... farms	262	40.0
acres	28,358	22.2
Military service (see text):		
Never served ..... producers	48,859	2.8
Served ..... producers	8,345	7.3
All producers by age group [1]:		
Under 25 years ..... farms	1,086	20.8
25 to 34 years ..... farms	4,344	28.1
35 to 44 years ..... farms	7,152	12.4
45 to 54 years ..... farms	12,238	4.9
55 to 64 years ..... farms	19,760	4.9
65 to 74 years ..... farms	16,812	3.7
75 years and over ..... farms	9,202	2.7
Net cash farm income of operations (see text):		
Farms with gains of [2]-		
Less than $1,000 ..... farms	1,726	6.5
$1,000	815	8.5
$1,000 to $4,999 ..... farms	3,957	9.9
$1,000	10,713	8.6
$5,000 to $9,999 ..... farms	2,337	7.0
$1,000	16,866	6.9
$10,000 to $24,999 ..... farms	3,070	10.2
$1,000	49,637	9.0
$25,000 to $49,999 ..... farms	1,785	5.4
$1,000	63,468	5.3
$50,000 or more ..... farms	3,681	3.0
$1,000	1,122,084	1.5
Farms with losses of -		
Less than $1,000 ..... farms	2,461	8.2
$1,000	1,263	8.2
$1,000 to $4,999 ..... farms	8,770	8.4
$1,000	25,026	10.4
$5,000 to $9,999 ..... farms	6,040	10.3
$1,000	43,741	9.6
$10,000 to $24,999 ..... farms	5,700	7.4
$1,000	88,275	7.5
$25,000 to $49,999 ..... farms	2,085	12.4
$1,000	71,169	11.9
$50,000 or more ..... farms	1,613	10.5
$1,000	199,587	21.4
Livestock and poultry:		
Cattle and calves inventory ..... farms	21,880	2.9
number	1,482,888	2.9
Beef cows inventory ..... farms	18,453	2.6
number	638,418	2.8
Milk cows inventory ..... farms	1,048	18.4
number	87,322	5.9
Hog and pigs inventory ..... farms	1,461	33.5
number	249,231	5.5
Layers inventory ..... farms	5,729	6.8
number	2,447,718	3.7
Broilers sold ..... farms	1,080	18.5
number	261,649,137	8.1
Aquaculture sold ..... farms	274	20.4
$1,000	90,226	9.4
Selected crops harvested:		
Corn for grain ..... farms	2,548	9.0
acres	378,073	6.0
Durum wheat for grain ..... farms	-	-
acres	-	-
Other spring wheat for grain (see text) ..... farms	-	-
acres	-	-
Winter wheat for grain ..... farms	1,009	10.8
acres	151,869	5.8
Sorghum for grain ..... farms	113	48.6
acres	8,393	32.2
Soybeans for beans ..... farms	2,438	11.2
acres	600,310	5.1
Rice ..... farms	-	-
acres	-	-
Cotton ..... farms	247	51.9
acres	87,242	17.9

See footnote(s) at end of table.

--continued

Table B. **Reliability Estimates of State Totals: 2017** (continued)

[For meaning of abbreviations and symbols, see introductory text.]

Item		Total	Coefficient of variation (percent)
Selected crops harvested: - Con.			
Peanuts	farms	189	48.4
	acres	28,510	27.7
Barley	farms	251	5.7
	acres	13,605	3.2
Oats	farms	73	17.0
	acres	2,241	12.8
Forage - land used for all hay and all haylage, grass silage, and greenchop (see text)	farms	23,888	3.6
	acres	1,247,300	3.1
Land in vegetables (see text)	farms	1,803	14.5
	acres	20,808	13.9
Potatoes	farms	535	16.6
	acres	4,213	15.4
Tomatoes in the open	farms	870	18.0
	acres	2,514	7.9
Selected crops harvested: - Con. Land in vegetables (see text) - Con.			
Sweet corn	farms	416	20.8
	acres	4,369	13.4
Lettuce	farms	307	59.1
	acres	102	89.4
Land in orchards (see text)	farms	1,537	9.8
	acres	18,396	11.3
Apples	farms	687	16.4
	acres	10,879	4.6
Grapes	farms	688	19.3
	acres	4,967	41.0
Oranges	farms	-	-
	acres	-	-
Almonds	farms	11	(H)
	acres	8	(H)
Land in berries	farms	903	18.5
	acres	1,357	22.6

[1] Data were collected for a maximum of four producers per farm.
[2] Farms with total production expenses equal to market value of agricultural products sold, government payments, and farm-related income are included as farms with gains of less than $1,000.

Table C. **Summary of Coverage, Nonresponse, and Misclassification Adjustments by County: 2017**

[For meaning of abbreviations and symbols, see introductory text.]

Geographic area	Total (number)	Standard error	Adjustment as percent of total	Percent of total adjustment from coverage	Percent of total adjustment from nonresponse	Percent of total adjustment from misclassification
ALL FARMS (NUMBER)						
State Total						
Virginia	43,225	1,037	39.0	17.2	12.2	9.6
Counties						
Accomack	239	34	27.4	17.0	4.7	5.7
Albemarle	913	147	43.1	17.0	15.4	10.6
Alleghany	165	44	40.4	20.4	10.3	9.7
Amelia	370	151	33.5	12.6	8.7	12.3
Amherst	369	74	38.1	21.7	7.5	8.9
Appomattox	412	44	42.3	16.6	15.7	10.1
Arlington	5	(H)	40.0	36.9	0.4	2.7
Augusta	1,665	230	34.2	16.0	11.0	7.2
Bath	110	24	38.7	17.1	10.5	11.0
Bedford	1,418	127	41.8	19.4	12.3	10.1
Bland	339	65	35.4	17.5	7.9	10.0
Botetourt	551	67	39.1	14.4	15.3	9.4
Brunswick	242	61	34.9	17.1	7.7	10.1
Buchanan	89	26	39.4	21.6	8.7	9.0
Buckingham	408	141	36.7	12.4	16.2	8.0
Campbell	702	161	39.6	16.2	11.5	11.9
Caroline	222	53	43.9	18.7	11.2	14.1
Carroll	900	74	38.4	15.6	13.4	9.4
Charles City	77	27	36.4	17.1	12.3	7.0
Charlotte	460	88	41.2	18.5	14.1	8.6
Chesterfield	210	77	53.7	27.7	13.3	12.7
Clarke	427	86	40.1	20.9	10.5	8.7
Craig	179	27	36.8	18.2	10.5	8.1
Culpeper	682	140	41.1	17.4	14.2	9.4
Cumberland	264	(H)	40.7	9.9	15.8	15.0
Dickenson	128	30	49.8	22.8	16.2	10.7
Dinwiddie	358	92	41.3	14.5	16.7	10.1
Essex	88	25	29.2	16.3	6.2	6.7
Fairfax	117	15	50.8	36.2	5.5	9.1
Fauquier	1,154	117	40.7	19.6	11.3	9.8
Floyd	741	40	37.9	21.6	7.2	9.0
Fluvanna	273	48	42.8	26.3	6.2	10.4
Franklin	1,019	173	42.7	19.4	13.3	10.1
Frederick	762	211	44.3	17.5	16.0	10.8
Giles	389	91	40.8	16.9	11.3	12.6
Gloucester	166	80	46.6	21.8	11.0	13.8
Goochland	355	51	45.1	25.4	9.4	10.3
Grayson	716	122	41.3	18.0	13.8	9.5
Greene	214	67	43.6	13.7	16.2	13.6
Greensville	150	136	42.5	6.3	26.1	10.1
Halifax	895	279	43.4	14.1	17.0	12.3
Hanover	567	134	41.9	19.9	11.8	10.2
Henrico	99	31	42.0	26.6	8.2	7.2
Henry	212	43	36.6	19.7	5.7	11.2
Highland	275	91	32.3	10.9	10.4	10.9
Isle of Wight	237	59	39.7	17.5	13.8	8.4
James City	72	33	44.3	29.4	7.4	7.6
King and Queen	151	55	47.4	17.2	20.1	10.1
King George	141	27	30.2	18.3	3.4	8.5
King William	90	14	27.5	19.8	2.3	5.4
Lancaster	80	30	46.2	21.3	14.9	9.9
Lee	830	181	37.5	14.7	13.5	9.3
Loudoun	1,259	181	38.8	20.0	9.0	9.7
Louisa	431	99	39.2	17.0	13.6	8.7
Lunenburg	335	82	42.8	16.4	16.2	10.2
Madison	533	73	38.0	16.1	13.8	8.1
Mathews	43	8	18.6	12.3	2.1	4.2
Mecklenburg	512	191	43.3	13.3	19.8	10.1
Middlesex	79	29	41.7	20.8	11.6	9.3
Montgomery	584	128	38.3	18.4	9.8	10.1
Nelson	409	52	36.7	21.5	7.2	8.0
New Kent	138	109	58.0	21.0	24.4	12.5
Northampton	142	55	29.3	15.8	9.3	4.2
Northumberland	134	44	41.7	27.3	3.1	11.3
Nottoway	311	61	32.7	20.1	5.5	7.1
Orange	417	75	36.1	17.4	9.0	9.7
Page	519	112	33.1	15.1	10.0	8.0
Patrick	483	57	38.0	19.5	9.1	9.3
Pittsylvania	1,157	116	34.4	17.9	7.2	9.4
Powhatan	263	102	44.8	24.4	8.9	11.4
Prince Edward	341	54	32.3	13.8	11.9	6.6
Prince George	164	44	42.2	18.9	12.4	11.0
Prince William	304	79	47.5	25.5	11.7	10.3
Pulaski	394	76	37.8	20.4	5.5	11.9
Rappahannock	439	100	42.6	15.6	18.0	9.0
Richmond	98	(H)	37.2	6.6	18.4	12.1
Roanoke	262	60	44.5	26.3	5.4	12.8
Rockbridge	752	70	36.2	17.2	10.6	8.4
Rockingham	2,026	566	34.9	11.0	13.9	10.0
Russell	918	196	30.4	13.3	9.7	7.5
Scott	1,138	131	38.7	18.2	11.4	9.0
Shenandoah	965	128	33.7	16.2	9.7	7.8
Smyth	663	129	39.2	15.1	15.6	8.5
Southampton	257	34	28.3	10.2	12.3	5.8

--continued

Table C. **Summary of Coverage, Nonresponse, and Misclassification Adjustments by County: 2017** (continued)

[For meaning of abbreviations and symbols, see introductory text.]

Geographic area	Total (number)	Standard error	Adjustment as percent of total	Percent of total adjustment from coverage	Percent of total adjustment from nonresponse	Percent of total adjustment from misclassification
ALL FARMS (NUMBER) - Con.						
Counties - Con.						
Spotsylvania	338	130	44.5	18.4	16.8	9.3
Stafford	243	102	52.3	26.0	13.3	13.0
Surry	111	45	48.2	13.2	26.3	8.7
Sussex	124	117	34.1	6.8	17.8	9.5
Tazewell	512	127	41.1	15.5	15.9	9.7
Warren	321	70	44.8	27.0	8.3	9.5
Washington	1,506	105	37.5	20.7	7.8	9.1
Westmoreland	183	44	35.6	11.7	16.0	7.9
Wise	147	88	41.2	13.5	15.8	11.9
Wythe	819	108	35.0	17.4	8.8	8.8
York	40	19	35.0	24.7	4.1	6.2
Chesapeake City	248	178	50.8	15.4	25.6	9.8
Suffolk	270	60	44.3	21.1	13.5	9.7
Virginia Beach City	196	58	47.9	19.9	18.2	9.8
LAND IN FARMS (ACRES)						
State Total						
Virginia	7,797,979	145,486	26.5	8.7	10.8	7.1
Counties						
Accomack	76,761	3,988	-0.3	-0.2	-0.1	-0.1
Albemarle	182,781	30,220	34.7	13.6	10.9	10.2
Alleghany	30,857	7,023	34.6	20.6	6.7	7.3
Amelia	102,690	18,196	25.1	7.6	6.2	11.3
Amherst	78,812	11,519	25.7	14.0	2.9	8.8
Appomattox	75,739	8,133	24.4	8.1	8.8	7.5
Arlington	5	(H)	40.0	36.9	0.4	2.7
Augusta	290,911	41,993	26.6	7.8	12.0	6.7
Bath	47,854	8,953	33.4	13.5	10.1	9.8
Bedford	211,087	14,258	35.4	16.1	9.1	10.2
Bland	70,295	19,036	26.8	9.3	6.9	10.6
Botetourt	88,842	14,587	34.2	4.9	20.5	8.8
Brunswick	66,398	13,410	21.2	9.4	5.2	6.6
Buchanan	11,043	5,995	38.4	26.0	4.3	8.1
Buckingham	79,245	12,014	27.6	9.5	10.9	7.2
Campbell	131,716	13,649	30.4	10.3	12.0	8.1
Caroline	61,831	20,644	16.9	5.9	6.6	4.5
Carroll	118,986	10,139	33.7	8.0	16.2	9.5
Charles City	31,392	3,644	7.8	3.8	1.7	2.3
Charlotte	121,667	39,090	30.7	8.3	16.0	6.4
Chesterfield	18,013	5,052	40.4	16.3	10.6	13.5
Clarke	66,641	13,253	32.1	13.2	10.3	8.6
Craig	43,431	6,030	31.0	11.4	13.4	6.1
Culpeper	124,390	32,685	24.8	6.7	11.8	6.2
Cumberland	52,635	14,030	27.0	9.9	8.2	9.0
Dickenson	11,169	2,071	23.4	9.9	7.3	6.2
Dinwiddie	92,841	11,532	24.7	6.5	11.9	6.3
Essex	58,702	13,344	16.1	4.2	8.4	3.5
Fairfax	5,937	2,279	35.8	22.6	4.0	9.2
Fauquier	216,666	22,146	25.4	9.9	8.7	6.7
Floyd	110,297	17,715	29.5	12.9	8.5	8.1
Fluvanna	44,414	9,990	36.4	18.7	9.5	8.2
Franklin	156,254	43,435	33.6	9.5	15.5	8.6
Frederick	109,907	32,041	23.7	8.6	7.5	7.6
Giles	65,387	7,085	29.2	12.4	5.2	11.6
Gloucester	26,014	7,454	24.3	13.8	3.5	7.0
Goochland	56,739	9,172	33.7	13.8	11.3	8.5
Grayson	119,340	14,615	28.1	7.6	14.2	6.3
Greene	28,518	6,087	38.5	9.6	19.0	9.8
Greensville	54,544	30,891	30.3	2.6	20.4	7.3
Halifax	208,967	31,467	31.6	11.1	11.9	8.6
Hanover	89,186	15,211	19.9	6.7	8.4	4.8
Henrico	9,820	1,178	20.8	10.4	4.0	6.3
Henry	45,527	9,047	38.1	20.4	5.2	12.4
Highland	92,950	14,650	25.4	6.6	10.6	8.2
Isle of Wight	80,672	16,742	18.9	3.7	11.3	3.8
James City	6,630	2,526	45.1	17.0	19.7	8.4
King and Queen	48,246	22,224	19.5	3.0	12.8	3.7
King George	26,337	6,454	14.9	9.6	1.7	3.6
King William	47,456	4,357	6.3	3.9	0.4	2.0
Lancaster	16,238	13,530	40.3	8.1	25.9	6.3
Lee	94,904	23,903	28.3	10.0	10.4	7.9
Loudoun	121,932	18,079	17.7	6.4	6.7	4.5
Louisa	68,499	10,213	24.5	9.6	9.2	5.7
Lunenburg	72,851	10,921	28.7	12.1	6.6	10.1
Madison	106,908	16,031	27.8	7.6	12.5	7.6
Mathews	6,584	3,327	19.1	10.9	3.1	5.1
Mecklenburg	141,142	30,253	31.5	7.8	16.5	7.2
Middlesex	19,512	838	8.7	4.7	1.3	2.7
Montgomery	101,672	12,434	26.5	9.9	8.5	8.1
Nelson	67,841	5,960	28.7	15.8	5.2	7.7
New Kent	18,335	4,929	32.7	9.0	15.4	8.2
Northampton	48,279	8,813	8.2	2.2	4.7	1.2
Northumberland	43,480	3,970	9.5	5.3	0.7	3.4
Nottoway	50,390	5,378	20.9	11.4	3.6	5.9
Orange	95,246	12,695	27.2	10.6	9.1	7.5

--continued

Table C. **Summary of Coverage, Nonresponse, and Misclassification Adjustments by County: 2017** (continued)

[For meaning of abbreviations and symbols, see introductory text.]

Geographic area	Total (number)	Standard error	Adjustment as percent of total	Percent of total adjustment from coverage	Percent of total adjustment from nonresponse	Percent of total adjustment from misclassification
LAND IN FARMS (ACRES) - Con.						
Counties - Con.						
Page	72,041	11,478	33.2	12.2	12.8	8.1
Patrick	91,252	(H)	39.9	4.5	31.2	4.2
Pittsylvania	246,322	27,657	25.7	10.6	6.6	8.5
Powhatan	34,585	7,284	25.7	13.1	5.4	7.1
Prince Edward	69,531	21,919	26.2	9.8	10.9	5.5
Prince George	39,630	7,929	21.4	9.1	3.5	8.8
Prince William	22,874	5,624	28.3	9.0	13.7	5.6
Pulaski	77,504	12,320	33.2	10.3	12.1	10.7
Rappahannock	70,182	12,952	38.5	10.7	19.2	8.5
Richmond	31,952	5,498	19.6	8.9	3.8	6.9
Roanoke	26,114	7,578	37.5	20.9	3.1	13.5
Rockbridge	134,789	16,439	24.3	8.5	9.3	6.5
Rockingham	228,542	23,452	24.2	5.5	13.0	5.7
Russell	170,285	34,310	11.8	3.4	5.0	3.4
Scott	125,354	13,789	31.2	13.7	9.0	8.5
Shenandoah	130,659	15,170	25.8	10.0	8.5	7.2
Smyth	123,214	13,349	24.0	4.9	13.5	5.6
Southampton	141,942	14,929	19.8	5.4	10.8	3.6
Spotsylvania	41,674	5,340	36.5	17.4	8.0	11.2
Stafford	17,253	4,666	48.2	20.9	13.4	14.0
Surry	42,062	10,182	23.2	4.2	14.7	4.4
Sussex	66,257	9,914	13.5	3.9	5.3	4.3
Tazewell	137,943	18,326	26.4	9.5	7.6	9.3
Warren	38,697	7,462	31.4	17.0	6.5	7.8
Washington	176,344	24,117	28.7	12.7	8.0	8.0
Westmoreland	52,619	8,160	13.1	4.7	5.0	3.3
Wise	26,345	6,049	40.3	12.4	20.8	7.2
Wythe	151,563	16,927	24.1	8.3	8.6	7.2
York	914	732	35.0	20.3	2.8	11.9
Chesapeake City	36,796	9,301	17.3	3.9	8.9	4.5
Suffolk	79,035	24,340	31.8	4.5	22.5	4.8
Virginia Beach City	23,350	8,158	17.3	5.1	8.4	3.8
SALES ($1,000)						
State Total						
Virginia	3,960,501	86,812	13.1	3.6	6.4	3.0
Counties						
Accomack	163,269	13,418	7.5	3.4	2.0	2.2
Albemarle	29,647	1,931	17.8	5.8	7.5	4.5
Alleghany	2,742	509	22.5	9.3	7.9	5.3
Amelia	86,577	13,373	9.9	5.2	2.4	2.3
Amherst	8,143	967	15.8	7.0	2.7	6.2
Appomattox	9,978	1,959	22.1	6.2	8.0	7.9
Arlington	7	5	17.4	16.0	0.1	1.3
Augusta	292,547	21,198	15.4	4.5	7.4	3.5
Bath	6,747	1,212	28.2	10.7	9.5	8.1
Bedford	26,470	1,748	31.0	12.1	10.0	8.8
Bland	8,782	8,061	24.4	3.3	14.4	6.7
Botetourt	14,055	1,846	19.9	1.9	12.9	5.1
Brunswick	23,096	4,349	18.2	9.3	4.3	4.6
Buchanan	434	65	18.3	11.8	2.1	4.4
Buckingham	43,445	3,955	8.5	3.7	1.3	3.6
Campbell	25,398	2,574	16.3	5.3	6.8	4.2
Caroline	22,908	10,887	10.5	3.8	4.7	1.9
Carroll	44,539	6,093	26.0	2.9	19.1	4.0
Charles City	16,186	1,659	4.4	2.2	0.5	1.8
Charlotte	25,976	9,175	14.6	2.6	9.7	2.2
Chesterfield	4,511	2,172	23.5	7.0	12.4	4.0
Clarke	16,386	1,694	19.3	8.1	3.9	7.3
Craig	4,658	483	30.4	11.4	12.9	6.2
Culpeper	48,542	8,974	10.8	3.2	5.5	2.1
Cumberland	39,806	4,372	13.5	7.4	1.4	4.7
Dickenson	560	164	28.5	10.5	11.1	6.9
Dinwiddie	25,705	5,105	16.2	3.8	8.0	4.4
Essex	21,046	4,401	11.8	2.7	6.6	2.5
Fairfax	1,243	586	37.4	21.2	8.7	7.5
Fauquier	54,812	8,326	12.2	3.7	5.3	3.2
Floyd	33,724	4,753	18.9	5.5	9.5	3.9
Fluvanna	6,126	2,334	34.6	11.6	16.7	6.3
Franklin	69,199	11,452	24.0	4.2	16.4	3.4
Frederick	33,775	2,637	10.9	4.0	3.5	3.4
Giles	9,675	2,510	40.4	13.6	5.9	20.9
Gloucester	11,700	586	6.7	3.8	0.9	2.1
Goochland	11,740	1,680	17.8	5.7	8.4	3.6
Grayson	40,820	5,360	16.7	3.1	10.2	3.4
Greene	7,614	2,957	21.6	3.5	13.4	4.6
Greensville	19,448	15,331	42.1	1.1	31.5	9.5
Halifax	31,878	7,260	23.3	4.8	13.4	5.1
Hanover	49,254	4,476	12.2	3.7	5.9	2.6
Henrico	7,286	197	2.0	1.1	0.4	0.5
Henry	14,124	1,225	8.5	4.8	0.8	2.8
Highland	26,120	2,381	20.7	4.0	10.6	6.2
Isle of Wight	64,223	5,896	10.2	3.5	3.5	3.1
James City	2,049	946	44.8	14.1	21.9	8.8
King and Queen	18,374	4,700	7.3	1.5	4.6	1.2

--continued

Table C. **Summary of Coverage, Nonresponse, and Misclassification Adjustments by County: 2017** (continued)

[For meaning of abbreviations and symbols, see introductory text.]

Geographic area	Total (number)	Standard error	Adjustment as percent of total	Percent of total adjustment from coverage	Percent of total adjustment from nonresponse	Percent of total adjustment from misclassification
SALES ($1,000) - Con.						
Counties - Con.						
King George	11,921	2,506	4.5	1.9	0.3	2.3
King William	14,167	389	1.7	1.0	0.1	0.6
Lancaster	5,550	(H)	37.6	3.9	29.4	4.2
Lee	15,266	3,925	36.6	8.6	16.6	11.4
Loudoun	43,990	8,946	10.4	2.9	5.3	2.2
Louisa	14,971	1,830	11.3	3.3	5.6	2.4
Lunenburg	17,154	7,523	27.4	4.8	15.4	7.2
Madison	28,389	2,090	21.2	5.4	8.6	7.2
Mathews	3,776	1,255	8.9	3.7	4.3	1.0
Mecklenburg	49,966	7,125	26.5	3.7	18.5	4.3
Middlesex	8,818	378	4.0	2.0	0.7	1.3
Montgomery	24,296	3,260	16.7	4.5	8.3	3.9
Nelson	26,719	1,335	10.3	5.9	1.7	2.7
New Kent	5,128	1,447	26.1	8.5	11.7	5.8
Northampton	95,991	3,972	1.8	0.9	0.6	0.3
Northumberland	20,052	1,150	5.2	2.7	0.8	1.7
Nottoway	50,533	1,472	1.8	1.0	0.1	0.6
Orange	113,069	3,376	1.9	1.0	0.2	0.7
Page	150,125	12,690	8.6	3.4	2.8	2.4
Patrick	17,273	3,314	13.0	4.3	5.9	2.8
Pittsylvania	72,678	10,069	10.9	3.5	3.9	3.5
Powhatan	11,249	671	6.9	4.1	0.7	2.1
Prince Edward	23,791	2,174	4.3	0.9	2.4	0.9
Prince George	9,284	2,368	23.0	4.9	11.9	6.2
Prince William	11,612	1,354	14.1	4.5	6.5	3.2
Pulaski	32,984	2,911	15.4	5.3	6.2	3.9
Rappahannock	10,145	1,804	33.2	8.5	19.1	5.6
Richmond	16,814	2,056	15.1	6.0	4.6	4.4
Roanoke	2,539	298	17.4	9.7	2.5	5.3
Rockbridge	30,983	9,270	11.9	0.7	9.9	1.4
Rockingham	795,919	85,751	8.9	2.5	4.6	1.8
Russell	23,204	2,778	13.7	3.1	5.7	4.8
Scott	15,558	6,485	31.7	5.9	19.6	6.2
Shenandoah	142,825	9,711	11.2	5.0	2.8	3.4
Smyth	37,561	4,729	22.5	2.6	14.7	5.2
Southampton	75,062	6,546	19.9	5.4	10.3	4.3
Spotsylvania	9,011	2,799	33.6	8.0	18.4	7.2
Stafford	6,125	1,310	55.8	31.7	8.2	15.8
Surry	23,899	1,483	6.8	2.5	2.6	1.7
Sussex	42,178	4,932	7.3	2.0	1.8	3.5
Tazewell	24,636	2,492	22.9	7.1	5.8	10.0
Warren	5,892	921	21.5	11.1	4.2	6.3
Washington	69,006	9,134	26.1	6.4	12.4	7.3
Westmoreland	57,092	3,077	2.9	1.1	0.6	1.1
Wise	2,352	1,115	44.4	7.3	28.3	8.8
Wythe	65,534	2,719	17.8	6.3	6.0	5.5
York	1,512	209	10.2	5.1	3.4	1.7
Chesapeake City	31,137	8,806	13.6	1.8	8.8	3.0
Suffolk	53,741	10,615	23.0	3.5	15.9	3.6
Virginia Beach City	13,680	10,758	14.0	2.1	10.2	1.7

Table D. **American Indian or Alaska Native Producers: 2017**

[For meaning of abbreviations and symbols, see introductory text.]

Geographic area	American Indian or Alaska Native farm producers		
	Total	Individually reported [1]	Other [2]
State Total			
Virginia	440	440	-
Counties			
Accomack	1	1	-
Alleghany	3	3	-
Amelia	1	1	-
Amherst	2	2	-
Appomattox	2	2	-
Augusta	5	5	-
Bedford	30	30	-
Bland	1	1	-
Botetourt	7	7	-
Buckingham	1	1	-
Campbell	4	4	-
Caroline	7	7	-
Carroll	6	6	-
Clarke	6	6	-
Craig	1	1	-
Culpeper	8	8	-
Cumberland	5	5	-
Dickenson	2	2	-
Dinwiddie	3	3	-
Essex	3	3	-
Fauquier	13	13	-
Floyd	7	7	-
Franklin	17	17	-
Frederick	2	2	-
Giles	5	5	-
Gloucester	13	13	-
Goochland	11	11	-
Grayson	1	1	-
Greensville	4	4	-
Halifax	20	20	-
Henry	2	2	-
Isle of Wight	9	9	-
King and Queen	4	4	-
King George	4	4	-

Geographic area	American Indian or Alaska Native farm producers		
	Total	Individually reported [1]	Other [2]
Counties - Con.			
King William	3	3	-
Lancaster	2	2	-
Lee	9	9	-
Loudoun	8	8	-
Louisa	9	9	-
Lunenburg	6	6	-
Madison	6	6	-
Mathews	3	3	-
Mecklenburg	3	3	-
Montgomery	2	2	-
Nelson	2	2	-
New Kent	3	3	-
Northampton	1	1	-
Northumberland	1	1	-
Nottoway	1	1	-
Orange	9	9	-
Patrick	11	11	-
Pittsylvania	7	7	-
Powhatan	3	3	-
Prince Edward	5	5	-
Prince William	6	6	-
Rappahannock	13	13	-
Rockbridge	5	5	-
Rockingham	14	14	-
Russell	3	3	-
Scott	6	6	-
Smyth	5	5	-
Southampton	1	1	-
Spotsylvania	21	21	-
Stafford	17	17	-
Sussex	1	1	-
Tazewell	2	2	-
Warren	2	2	-
Washington	19	19	-
Westmoreland	10	10	-
Wythe	9	9	-
Chesapeake City	2	2	-

[1] Data were collected for a maximum of four producers per farm.
[2] Data represent American Indian or Alaska Native farm or ranch producers on reservations who did not report individually. Data obtained by reservation officials.