
Appendix A.

Census of Agriculture Methodology

INTRODUCTION

The purpose of the Census of Agriculture is to enumerate all members of a population with a defined characteristic. For the Census of Agriculture of the Commonwealth of the Northern Mariana Islands (CNMI), 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.”

As in the previous censuses of the CNMI, a direct enumeration procedure was used in the 2018 Census of Agriculture. Enumeration was based on a list of farm operators compiled by the CNMI Department of Commerce, Central Statistics Division. The statistics on this report were collected during the spring of 2019.

THE CENSUS POPULATION

For the 2018 CNMI Census of Agriculture, a list of farm operators was compiled by the CNMI Department of Commerce. The core of this list was a compilation of all persons having a business license to sell agricultural products. The enumerators contacted all persons or operations on the list and completed a census report form for all farm operations that met the farm definition. If the person on the list was not operating a farm, the enumerator recorded whether the land had been sold or rented to someone else and was still being used for agriculture. If the land was sold or rented out, the enumerator obtained the name of the new operator and contacted that person, to ensure that he/she was included in the census.

DATA COLLECTION OUTREACH AND PROMOTIONAL EFFORTS

The Public Affairs Office (PAO) developed a communication plan largely based on promotional materials that were shared with local outreach

partners, including but not limited to the CNMI Department of Commerce, the Northern Marianas College and its Cooperative Research Extension, and local USDA agencies. The goal with these promotional materials included:

- Encouraging participation in the Census of Agriculture
- Communicating how the census will provide much needed data that are used by federal and local decision makers
- Explaining that response to the Census of Agriculture is required and that reported information is protected by federal law
- Increasing general awareness and perceived value of NASS, its products, and services

Partnership and Local-Level Outreach

NASS officials met with leaders from agricultural organizations, the CNMI Department of Commerce, the Northern Marianas College and its Cooperative Research Extension and other USDA agencies to successfully secure their support in promoting the census among their constituencies. Stakeholders partnered with NASS to promote the 2018 CNMI Census of Agriculture through publications (e.g. newsletters), special mailings, speeches, social media, websites, and other communications. Through grassroots-level outreach and efforts, NASS partnered with a number of community-based organizations to reach all farmers and ranchers. Among the highlights of these partnership efforts was the participation of local government officials on radio public service announcements promoting the importance of the 2018 CNMI Census of Agriculture.

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. The materials included, but were not limited to: a press release/stakeholder notice, a public service announcement, flyers and posters, and a Frequently Asked Questions (FAQs) document; which were drafted for local media and other stakeholder distribution. These materials were available both electronically and in hard copy. Other outreach tools included items such as pens and notepads.

DATA COLLECTION

Method of Enumeration

Personal enumeration was used in the 2018 CNMI Census of Agriculture, and in the 2007 CNMI Census of Agriculture, enumeration was based on a list of farm operators compiled by the CNMI Department of Commerce, Central Statistics Division. The enumerators contacted all persons or operations engaged in agriculture in their assigned area and completed a census report form for all farm operations that met the farm definition. If the person on the list was not operating a farm, the enumerator recorded whether the land had been sold or rented to someone else and was still being used for agriculture. If the land was sold or rented out, the enumerator obtained the name of the new operator and contacted that person, to ensure that he/she was included in the census.

Report Form

Prior to each agriculture census, the content of all census report forms is reviewed to eliminate inquiries no longer needed, to identify new items necessary to meet user needs, and to better describe the agricultural situation in the CNMI. Data requests are solicited from farm organizations, land-grant colleges and universities, State and Federal agencies, State Department of Agriculture, agribusinesses, and other users. Each respondent is asked to identify and justify its specific data needs.

A single version of the report form for the 2018 CNMI Census of Agriculture was prepared by NASS, in cooperation with the CNMI Department of Commerce, the Northern Marianas College and its Cooperative Research Extension; and various USDA agencies. Based on their comments, the content of the 2018 census report form remained almost unchanged from the previous census.

Training Program

The project manager, and enumerators employed for the census in the CNMI received special training in accordance with instructions prepared by NASS. The training included an overview of the census of agriculture program, and a detailed discussion of the enumerator's instructions manual and the census report form.

REPORT FORM PROCESSING

Data Capture

The Census Bureau's National Processing Center (NPC) in Jeffersonville, IN was contracted to print, label, and ship the questionnaires to the CNMI. Completed questionnaires were then returned to NPC for data capture and scanning.

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. With the small survey universe, it was determined that a key from paper application would be most economical. All forms keyed were then scanned and loaded into the Feith file cabinet. The images were available for analytical review of the data as well as for archive purposes.

The keying staff evaluated the contents and captured pertinent responses. An independent quality control process occurs after initial keying where ten percent of the captured data is keyed a second time. 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 or receive additional training. The measured error rate for the entire survey was 0.39%. 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. The program verified that record identifiers were valid and checked the basic integrity

of the data fields. Rejected records were referred to analysts for correction. Accepted records were sent to a computer batch edit process. Each execution of the computer batch edit flowed as the data were received from the National Processing Center (NPC).

All census records were passed through a complex computer edit. The edit determined whether a reporting operation met the minimum criteria to be counted as a qualifying 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. Actions included removing erroneously reported values, replacing an unreasonable value with one consistent with other reported data. Strategies for determining replacement values are discussed in the next section.

Imputing Data

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 defined the criteria for acceptable data. Problems that could not be resolved within the edit were referred to an analyst for intervention. Analysts used additional information sources, examined the scanned image, and determined an appropriate action.

Data Analysis

Once keyed, the data from each report form were available to NASS analysts in Washington, DC, via electronic media, for computer editing and analysis. Data from each report were subjected to a detailed item-by-item computer edit. The edit performed comprehensive checks for consistency and reasonableness, corrected erroneous or inconsistent data; supplied missing data based on similar farms, and assigned farm classification codes necessary for tabulating the data.

Prior to publication, tabulated totals were reviewed by statisticians to identify inconsistencies and potential coverage problems. Comparisons were made with previous census data, as well as other available data. Tallies of all selected data items for various sets of criteria which included, but were not limited to, geographic levels, farm types, and sales levels were

reviewed. When necessary, data inconsistencies were resolved.

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. Cell suppression will be used to protect the cells that are 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. First, the threshold rule failed if the data cell contained less than three operations. For example, if only one farmer produced hogs on the island, NASS could not publish the island total for hog inventory without disclosing the individuals' information. Second, 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. A (p)-percent rule will be used to determine dominance. Under this rule, if the two largest contributing farms' values to the county total are subtracted from the estimated total, the remainder must exceed a specified (p)-percent of the largest contributed value. If the remainder fails to exceed the specified percentage, the value is not published. For example, if there are many farmers producing hogs on the island and some of them were large enough to dominate the cell total, NASS could not publish the county total for hog 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 are properly protected in all linear relationships in all tables. 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 complementary suppression.

NASS analysts reviewed all complementary suppressions to ensure no cells had been withheld that were vital to the data users. In instances where complimentary suppressions were deemed critically important to the Island, analysts requested an override and a different complement cell was chosen.

MEASURED ERRORS IN THE CENSUS PROCESS

Uncertainty is introduced into the data in compiling the list of farm operators, in NASS' data collection procedures, in data editing and processing, and in compiling the final data. Additionally, NASS uses statistical procedures to both measure errors in the various processes and in making adjustments for those errors in the final data.

Variability in Census Estimates due to Statistical Adjustment

In conducting the 2018 CNMI Census of Agriculture, efforts were initiated to measure error associated with the adjustments for farm operations that were on the list of farm operators but did not respond to the census, report form. This error measurement was developed from the standard error of the estimates at the island level, where appropriate, and were expressed as coefficients of variation (CVs) at the island level. Coefficients of variation are displayed in the Quick Stats database.

Coefficient of variation is a measure of the relative amount of error associated with a sample estimate. Specifically, it is the standard error of a point estimate divided by that estimate, generally multiplied times 100 so that it can be reported as a percentage. 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. Every estimate for the 2018 CNMI Census of Agriculture has a corresponding CV published with it. NASS has identified the following index to use when evaluating coefficient of variation for the 2018 CNMI Census of Agriculture.

- **Low Reliability Estimate.** Coefficient of Variation (CV) 30 percent or higher. Caution should be used when using this estimate in any form. Please consult NASS for more information or guidance.
- **Medium Reliability Estimate.** Coefficient of Variation (CV) between 15 percent and 29.9 percent.
- **High Reliability Estimate.** Coefficient of Variation (CV) less than 15 percent.

NONMEASURED ERRORS IN THE CENSUS PROCESS

As noted in the previous section, sampling errors can be introduced from the nonresponse adjustment procedure. 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 list of farmers for the census, to design an understandable report form with clear instructions, to train enumerators on how to ask the questions and record the answers on the report form, and to minimize processing errors through the use of quality control measures. 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 reporting errors. Poor instructions and ambiguous definitions lead to misreporting. Respondents may not remember

accurately, may estimate responses, or enumerators may record an item in the wrong cell. To reduce reporting and recording errors, detailed instructions for completing the report form were provided to each enumerator, and questions were phrased as clearly as possible. In addition, each respondent's answers were checked for completeness and consistency by the complex edit and imputation system.

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.