

---

# Appendix A.

## Statistical Methodology

---

### THE SURVEY POPULATION

The target population for the 2019 Organic Survey was all U.S. farms and ranches certified for meeting the standards of the National Organic Program (NOP) administered by the USDA's Agricultural Marketing Service (AMS). (NOP standards are available on the internet at [www.ams.usda.gov/nop](http://www.ams.usda.gov/nop).) Only data from operations certified by an AMS approved agent are published.

To ensure that all certified organic farms and ranches were provided the opportunity to complete the survey, the list of farms and ranches contacted for this survey included producers identified as certified organic or to organic certification in NASS' List Frame and the AMS NOP List. The final census count included 22,729 producers that met the criteria.

The census count is the number of records from the mail list that had certified organic production in 2019 or whose operational status was unknown. The census count for the U.S. was 16,589.

### DATA COLLECTION

#### Method of Enumeration

The 2019 Organic Survey was conducted using multiple data collection strategies. Data were collected primarily by mail, and was supplemented with Electronic Data Reporting (EDR) via the Internet, telephone calls, and personal enumeration. Enumeration methods were similar to those used in the 2014 Organic Survey.

#### Report Form

A 16-page report form was designed to collect information about certified organic production of field crops, vegetables, fruits, tree nuts, berries, horticulture, livestock, and poultry, as well as expenses, practices, and marketing questions. Seven

cognitive interviews of the form were conducted in California, Iowa, Minnesota, Ohio, Washington, and Wisconsin with farms and ranches in the target population. See Appendix B for a copy of the final report form and instruction sheet.

#### Report Form Mailings and Respondent Follow-up

A pre-survey postcard was mailed to all respondents in early December with instructions on how to complete the survey online. The initial mailout occurred in late-December 2019. The initial mail packets included a labeled report form, an instruction sheet, a letter that requested a prompt response and included instructions for compiling the form via Internet, and a postage-paid return envelope. One follow-up mailout to nonrespondents occurred in late February 2020. Printing, mail packet preparations, and mailouts were managed by the U.S. Census Bureau's National Processing Center (NPC) in Jeffersonville, IN. Additional telephone follow-up interviews occurred by NASS Data Collection Centers and in person by National Association of State Departments of Agriculture (NASDA) staff from February 2020 through May 2020.

Data were collected for a select group of producers by NASS field offices. To minimize the number of agency contacts, operations included in this group were flagged for contact by NASS staff in the Regional Field Offices (RFO) or by NASDA staff for other agricultural surveys. RFO and NASDA staff collected data by personal enumeration or by phone from February 2020 through May 2020.

### REPORT FORM PROCESSING

#### Data Capture

All report forms returned to the NPC were immediately checked in, using bar codes printed on the mailing label, and removed from the follow-up mailout. All forms with any data were scanned and an

image was created for each page of a report form. After the images were created, the data were keyed as reported from the paper form received. Any inconsistencies and respondent remarks were reviewed by statisticians in the RFOs and corrected, if necessary, during data editing and analysis.

### **Data Editing and Analysis**

Data from each report form were processed through a computer edit which flagged missing or inconsistent entries. Each report with a flagged entry was reviewed by regional field office and/or headquarters statisticians. Action was required for any record with reported data that were clearly incorrect, for example, in some cases, respondents may have failed to provide all of the information requested, only indicating the presence of an item but not the amount. These items were tagged for machine imputation. After the initial edit, an imputation program supplied missing data and made adjustments based on responses of similarly sized farms within the same geographic area. Data entries by the computer edit process were reviewed and verified by analysts. Instances where imputed data failed edit checks were referred to statisticians for corrective action. The computer edit ensured the data on a report form were internally consistent.

Prior to publication, tabulated totals were reviewed to identify and resolve remaining irregularities. Comparisons were made with 2017 census data, 2016 Certified Organic Survey data, and other available check data. The data were processed through a disclosure program to prevent data from being published that could be sourced back to an individual operation.

### **Imputation**

For item level nonresponse in the 2019 Organic Survey multivariate sequential regression approach was used to impute for missing values. Records were grouped by state, region or strata for a better selection of covariates going into the regression model. This technique preserved the relationships within the data and allowed for comparable distributions post and pre imputation. Categorical variable imputations were performed using the multivariate sequential regression approach however taking into consideration the distribution of reported data.

Items that were imputed:

- Crop production, utilization and gross value of sales;
- Livestock moved/sold and gross value of sales;
- Crop Insurance; and
- Production expenses.

### **ESTIMATION**

NASS's goal was to produce certified and transitional organic agricultural totals for the publication that were fully adjusted for list undercoverage and nonresponse. Although much effort was expended making the 2019 Organic Survey list as complete as possible, it did not include all U.S. certified and transitional organic farms and ranches, resulting in list undercoverage. Some organic producers did not respond to the survey, despite numerous attempts to contact them.

Nonrespondents were accounted for in the final data by increasing the survey weights of the respondents inversely to the proportion of nonrespondents. Record-level list frame control data and 2016 Certified Organic Survey state-level number of organic farms and ranches were used to define weighting cells (strata) comprised of farms and ranches of similar size or production. The counts of survey respondents and nonrespondents were used to compute the adjustment factor for the weighting cell. The methodology assumed nonresponse was random. For example, a weighting cell has 100 farms and ranches of which 80 responded and 20 did not. Every respondent would have its original weight of 1 increased to 1.25 (100/80) to represent the farms and ranches not responding.

The 2017 Census of Agriculture (CoA) was used to adjust for undercoverage. The records of respondents to the 2019 Organic Survey were matched to the records responding on the 2017 CoA organic production section. For the records that responded as having organic production on both the 2019 survey and on the 2017 CoA, the undercoverage component was derived by multiplying the percent of adjustment of undercoverage for organics records with the calibrated CoA weight and then applied to the 2019 survey response. These records were used to build a regression model of undercoverage weights using

2019 survey responses. For each 2019 survey response that did not match to a 2017 CoA record, the estimated weight from the regression model was that record's undercoverage weight.

## DATA COMPARABILITY

The 2019 Organic Survey publishes data from producers that were certified organic and transitioning to organic certification. The weighting methodology for the survey includes weight adjustments for nonresponse and undercoverage. Comparisons with other NASS publications and other non-NASS sources must allow for differences in list sources, report form design, reference periods, organic definitions, and weighting adjustments.

## RESPONDENT CONFIDENTIALITY

In keeping with the provisions of Title 7 of the United States Code, no data are published that would disclose information about the operations of an individual farm or ranch. All tabulated data are subjected to an extensive disclosure review prior to publication. Any tabulated item that identifies data reported by a respondent or allows a respondent's data to be accurately estimated or derived, was suppressed and coded with a 'D'. However, the number of farms reporting an item is not considered confidential information and is provided even though other information is withheld.

## MEASURES OF SURVEY QUALITY

Results of the 2019 Organic Survey are subject to nonsampling errors. Sources of nonsampling errors include respondent reporting errors, recording errors, errors in data capture, or errors in action taken during editing and imputation. Extensive efforts were made to minimize these types of errors. Table A provides statistical precision estimates for the number of farms and ranches and acres and the total value of sales for the United States and for each state.

### Survey Response Rate

The response rate is an indicator of the quality of data collection. It is generally assumed that if a response rate was close to 100 percent, the potential for nonresponse bias is small. Because this survey contains both farm and nonfarm records, the response rate is an indicator of replying to the survey data

collection effort, but does not reflect whether those responding met the farm definition or had the items of interest for the survey. The response rate for the 2019 Organic Survey is 74 percent. This compares to 63 percent for the 2014 Organic Survey.

## MEASURES OF PRECISION

Under the guidance of the Statistical Policy Office of the Office of Management and Budget (OMB), the U.S. Department of Agriculture's National Agricultural Statistics Service (NASS) provides data users with quality metrics for its published data series. The accuracy of data products may be evaluated through sampling and nonsampling error. The measurement of error due to sampling in the current period is evaluated by the coefficient of variation (CV) for each estimated item. Nonsampling error is evaluated by response rates and the percent of the estimate from respondents.

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 2019 Organic Survey has a corresponding CV published with it. NASS has identified the following index to use when evaluating coefficient of variation for the 2019 Organic Survey. The coefficient of variation is used as an indicator of the precision in the survey estimates and is reported for major survey items in Table A.

- **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.

**Table A. Coefficient of Variation: 2019**

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

Geographic area	Farms		Acres		Value of sales	
	Farms	Coefficient of variation (percent)	Acres	Coefficient of variation (percent)	Value of sales (\$1,000)	Coefficient of variation (percent)
United States .....	16,585	1.3	5,495,274	14.5	9,925,911	6.3
Alabama .....	11	8.7	2,172	36.2	(D)	(D)
Alaska .....	8	3.8	(D)	(D)	(D)	(D)
Arizona .....	62	5.7	26,698	21.4	202,506	25.4
Arkansas .....	67	8.7	21,009	36.2	55,331	14.7
California .....	3,012	2.1	965,257	19.6	3,596,923	12.0
Colorado .....	238	2.1	167,500	10.2	184,119	25.9
Connecticut .....	63	4.9	1,800	9.2	6,152	11.7
Delaware .....	12	4.9	531	9.2	13,564	11.7
Florida .....	126	8.7	17,912	36.2	86,458	14.7
Georgia .....	102	8.7	7,120	36.2	52,212	14.7
Hawaii .....	129	5.7	2,790	21.4	17,283	25.4
Idaho .....	240	3.8	180,732	61.9	205,968	31.9
Illinois .....	258	1.6	60,688	6.2	72,702	18.6
Indiana .....	595	1.6	(D)	(D)	180,951	18.6
Iowa .....	779	2.4	133,691	6.9	144,596	9.9
Kansas .....	110	8.2	85,660	19.3	69,048	29.5
Kentucky .....	185	4.6	19,499	11.8	38,459	11.5
Louisiana .....	10	8.7	3,342	36.2	14,333	14.7
Maine .....	456	4.9	55,261	9.2	63,820	11.7
Maryland .....	121	4.9	17,196	9.2	50,080	11.7
Massachusetts .....	133	4.9	8,170	9.2	32,895	11.7
Michigan .....	541	1.6	122,253	6.2	230,955	18.6
Minnesota .....	635	2.7	172,968	6.1	113,606	6.0
Mississippi .....	29	8.7	8,887	36.2	29,527	14.7
Missouri .....	355	1.6	51,171	6.2	113,880	18.6
Montana .....	208	2.1	355,723	10.2	65,467	25.9
Nebraska .....	238	8.2	231,833	19.3	184,634	29.5
Nevada .....	40	2.1	97,868	10.2	66,803	25.9
New Hampshire .....	80	4.9	11,708	9.2	11,274	11.7
New Jersey .....	68	4.9	3,937	9.2	26,246	11.7
New Mexico .....	101	2.1	39,045	10.2	70,772	25.9
New York .....	1,321	3.0	323,081	7.1	298,420	9.6
North Carolina .....	347	4.6	42,740	11.8	369,768	11.5
North Dakota .....	117	8.2	113,502	19.3	26,598	29.5
Ohio .....	785	3.0	111,920	5.9	116,999	13.2
Oklahoma .....	34	7.8	16,063	18.8	10,152	34.7
Oregon .....	456	3.8	196,045	61.9	454,406	31.9
Pennsylvania .....	1,048	2.2	107,550	6.2	741,764	14.6
Rhode Island .....	20	4.9	148	9.2	2,179	11.7
South Carolina .....	39	8.7	4,806	36.2	21,680	14.7
South Dakota .....	68	8.2	73,153	19.3	14,420	29.5
Tennessee .....	38	4.6	4,997	11.8	9,031	11.5
Texas .....	233	7.8	246,307	18.8	424,303	34.7
Utah .....	49	2.1	94,591	10.2	26,903	25.9
Vermont .....	655	4.7	203,002	15.6	159,742	21.1
Virginia .....	163	4.6	28,347	11.8	62,791	11.5
Washington .....	745	3.4	111,930	12.5	885,970	24.4
West Virginia .....	27	4.6	3,054	11.8	13,354	11.5
Wisconsin .....	1,364	3.1	250,940	3.5	268,921	11.4
Wyoming .....	64	2.1	130,067	10.2	15,639	25.9