



# Farms and Land in Farms Methodology and Quality Measures

ISSN: 2167-132X

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Released April 18, 2019, by the National Agricultural Statistics Service (NASS), Agricultural Statistics Board, United States Department of Agriculture (USDA).

## Survey Methodology for Farms and Land in Farms

**Scope and Purpose:** Farms and land in farms are estimated annually in February. Estimates made for this program include the number of farms, land in farms, and average farm size. Estimates are published for the United States and by state and economic sales class.

The data are collected as part of the June Area Survey, a multipurpose survey used to estimate crop acreages and measure incompleteness of the NASS list frame for numerous other surveys. The June Area Survey is conducted every year in all states except Alaska and Hawaii.

**Survey Timeline:** Some pre-survey screening is done in May to identify farm operators to be interviewed. Data collection is conducted by personal interview from the end of May through mid-June. The reference date for the June Area Survey is June 1. Regional Field Offices (RFOs) conduct the first round of editing and analysis over a three-week period, ending in late June. An additional two weeks of editing and analysis occur in July. Once editing is complete, the data are summarized. Following summarization, RFOs review the survey results and submit state-level recommendations to NASS headquarters. A national review is completed and national estimates are established. The farms and land in farms estimates are published annually in mid-February.

**Sampling:** The target population for the farms and land in farms estimates is all farms and ranches with \$1,000 or more in agricultural sales (or potential sales). The June Area Survey utilizes an area sampling frame. The area frame consists of all land in all states, except Alaska, and thus represents all farms and ranches. Although Hawaii has an area frame, NASS does not conduct the June Area Survey in Hawaii. The frame in each state is divided into segments of land. For more intense agricultural regions, segments are about one square mile in size. An optimal sample is selected in each state with a national sample size of about 11,000. The cost of building the frame and preparing materials for enumeration is significant, so sampled segments are in the survey for five consecutive years. About 20 percent of the segments are rotated out and replaced with new ones each year.

Through personal interviews, field enumerators divide the segments into tracts, each tract representing a unique operating arrangement. Some of the tracts do not qualify under the farm definition and screen out; the remaining agricultural tracts become the sample for farm numbers.

**Data Collection:** Each enumerator is responsible for several segments of land. Enumerators must account for all operations and land contained in their assigned segments. All respondents are contacted in person by an enumerator, and a personal interview is conducted. Survey questionnaires are returned to the RFOs where they are visually reviewed and key entered.

Questionnaire content and format are evaluated annually through a specifications process where requests for changes are evaluated and approved or disapproved. Input may vary from question wording or formatting to a program change involving the deletion or modification of current questions or addition of new ones. If there are significant changes to either the content or format proposed, a NASS survey methodologist will pre-test the changes for usability.

All federal data collections require approval by the Office of Management and Budget (OMB). NASS must document the public need for the data, show that the design applies sound statistical practice, and ensure that the data do not already exist elsewhere and that the public is not excessively burdened. The June Area questionnaire must display an active OMB

number that gives NASS the authority to conduct the survey, a statement of the purpose of the survey and the use of the data being collected, a response burden statement that gives an estimate of the time required to complete the form, a confidentiality statement that the respondent's information will only be used for statistical purposes in combination with other producers, and a statement saying that response to the survey is voluntary and not required by law.

**Survey Edit:** As survey data are collected and captured, data are edited for consistency and reasonableness using automated systems. Reported data are edited as a batch of data when first captured. The edit logic ensures the coding of administrative data follows the methodological rules associated with the survey design. Relationships between data items (i.e. responses to individual questions) on the current survey are verified. Some data items in the current survey are compared to data items from earlier surveys to ensure certain relationships are logical. The edit will determine the status of each record to be either "dirty" or "clean" (i.e. failing or passing the edit requirements for consistency and reasonableness). Records that fail edit requirements must be updated or must be certified by an analyst to be exempt from the failed edit requirement. Only records that pass edit requirements are eligible for final summary.

**Analysis Tools:** Edited June Area data are processed through an interactive analysis tool which displays data for all reports by item. The tool provides scatter plots, tables, charts, and special tabulations that allow the analyst to compare an individual record to similar records. Atypical responses and unusual data relationships become evident and Regional Field Office staff review them to determine if they are correct. The tool allows comparison to an agricultural operation's previously reported data to detect large changes in the operation. Data found to be in error are corrected, while accepted data are retained.

**Non-sampling Errors:** Non-sampling errors are present in any survey process. These errors include reporting, recording, and editing errors. Steps are taken to minimize these errors, such as comprehensive interviewer training, validation, and verification of processing systems, application of detailed computer edits, and evaluation of the data via the analysis tools.

**Non-response Adjustment:** Response to the June Area Survey is voluntary. Some producers refuse to participate in the survey, others cannot be located during the data collection period, and some submit incomplete reports. These non-respondents must be accounted for if accurate estimates of farm numbers are to be made. The non-response data items and sampling units are manually imputed by Regional Field Office statisticians, largely by observation. The weights for data items from reporting farms and ranches are not adjusted.

**Estimators:** The primary estimators used to set farms and land in farms estimates are the area frame direct expansion and ratio estimators. The direct expansion generates a total for the current year. It is calculated by summing the June Area Survey data multiplied by the proportion of the farm residing inside the segment and weighted by the original segment sampling weight. The ratio estimator measures the change from year to year and is the ratio of the current year's and previous year's direct expansions for comparable segments. The sampling weights are adjusted to account for those segments that are not comparable.

A multiple frame direct expansion is also generated for farms and land in farms. It is the sum of direct expansion from the June Agricultural Survey data, a NASS list only survey, and the non-overlap (NOL) portion of the direct expansion from the June Area Survey data. The NOL portion of the June Area Survey refers to those operations identified on the area frame that are not matched to an operation eligible for sampling for the June Agricultural Survey.

**Estimation:** The number of farms and land in farms data are summarized from the June Area dataset. Since all RFOs conduct identical surveys, the state data can be summarized and national survey point estimates, or indications, computed. RFOs are responsible for performing a detailed review of the survey data. Any irregularities revealed by the analysis must be investigated and, if necessary, resolved. The summary results provide multiple direct and ratio indications for each data series being estimated. It also provides information used to assess the performance of the current survey and evaluate the quality of the survey indications. RFOs interpret the survey indications and submit state recommendations to NASS headquarters, providing justification in cases where recommendations deviate from survey results.

For the national estimates, NASS assembles a panel of statisticians to serve as the Agricultural Statistics Board which reviews the national results and establishes the national estimates. Since larger sample sizes yield more precise results, NASS employs the "top-down" approach by determining the national estimates first and reconciling the state

recommendations to the national number for total number of farms and land in farms, as well as each of the economic sales classes. The Board also enjoys an advantage in being able to examine results across states, and compare the state recommendations. The same estimators used in the state summaries are produced by the national summary. The Board follows the same approach the states do in determining the national estimate. The historical relationship of the survey estimates to the official estimate is evaluated to determine accuracy and bias using tables and graphs. Each Board member completes an independent interpretation of the survey results which is shared with the other members and a consensus is reached. Often the state recommendations do not sum to the national estimate. Board members must reexamine the state results and revise some states to make the sum of the state estimates agree with the national estimate.

## Quality Metrics for Farms and Land in Farms

**Purpose and Definitions:** Under the guidance of the Statistical Policy Office of the Office of Management and Budget (OMB), the United States Department of Agriculture's National Agricultural Statistics Service (NASS) provides data users with quality metrics for its published data series. The metrics tables in this document describe the performance data for the survey contributing to the publication. The accuracy of data products may be evaluated through sampling and non-sampling error. The measurement of error due to sampling in the current period is evaluated by the coefficient of variation for each estimated item. Non-sampling error is evaluated by response rates.

**Farm Tract** is a portion of a sampled segment that represents a unique operating arrangement that meets the definition of a farm.

**Sample Size** is the total number of farm tracts found in the sample segments in the June Area Survey.

**Response rates** measure the proportion of total farm tracts responding to the June Area Survey.

**Coefficient of Variation** provides a measure of the size of the standard error relative to the point estimate and is used to measure the precision of the results of a survey estimator.

**June Area Survey Farms and Land in Farms Sample Size and Response Rates:** To assist in evaluating the performance of the estimates in the *Farms and Land in Farms* report, the sample size and response rates are displayed. The sample size changes from year to year as the number of farm tracts identified within the sampled segments varies.

## Farms and Land in Farms Sample Size and Response Rate – States and United States: 2017-2018

State	Sample size		Response rate	
	2017 (number)	2018 (number)	2017 (percent)	2018 (percent)
Alabama .....	692	495	83.5	83.4
Alaska .....	(NA)	(NA)	(NA)	(NA)
Arizona .....	294	232	72.1	80.2
Arkansas .....	932	677	80.9	85.5
California .....	804	540	70.9	73.3
Colorado .....	691	539	52.8	62.3
Connecticut .....	29	23	82.8	69.6
Delaware .....	75	51	58.7	60.8
Florida .....	238	202	61.3	67.8
Georgia .....	760	463	57.0	62.6
Hawaii .....	(NA)	(NA)	(NA)	(NA)
Idaho .....	530	431	65.1	70.3
Illinois .....	1,744	1,356	67.9	70.8
Indiana .....	1,012	815	62.1	68.7
Iowa .....	1,929	1,520	71.7	77.6
Kansas .....	1,526	1,257	40.7	50.0
Kentucky .....	735	541	70.5	69.5
Louisiana .....	663	481	82.1	86.3
Maine .....	67	70	68.7	68.6
Maryland .....	202	154	68.8	75.3
Massachusetts .....	48	51	68.8	62.7
Michigan .....	724	587	65.6	72.1
Minnesota .....	1,664	1,340	75.2	78.7
Mississippi .....	702	543	88.0	87.5
Missouri .....	1,614	1,352	55.3	57.6
Montana .....	968	742	78.6	78.7
Nebraska .....	1,534	1,166	57.2	63.6
Nevada .....	22	19	81.8	89.5
New Hampshire .....	27	27	74.1	66.7
New Jersey .....	192	130	77.6	68.5
New Mexico .....	349	254	73.4	55.1
New York .....	316	270	69.3	69.3
North Carolina .....	938	668	70.3	73.4
North Dakota .....	1,531	1,238	58.7	67.6
Ohio .....	990	810	79.2	86.4
Oklahoma .....	1,116	888	54.5	59.2
Oregon .....	505	391	70.9	72.4
Pennsylvania .....	624	437	69.2	76.2
Rhode Island .....	27	25	25.9	44.0
South Carolina .....	317	224	80.1	73.2
South Dakota .....	1,138	871	47.4	60.0
Tennessee .....	1,101	872	79.7	81.1
Texas .....	3,746	2,970	75.2	78.7
Utah .....	275	269	79.3	82.9
Vermont .....	102	100	72.5	80.0
Virginia .....	513	355	72.3	72.1
Washington .....	639	449	58.2	65.0
West Virginia .....	251	184	84.5	94.6
Wisconsin .....	940	794	69.8	78.2
Wyoming .....	161	160	63.4	61.3
United States .....	35,997	28,033	67.6	71.9

(NA) Not available.

## Quality Metrics for Farms and Land in Farms – States and United States: 2017-2018

State	Coefficient of variation			
	Number of farms		Land in farms	
	2017	2018	2017	2018
	(number)	(number)	(number)	(number)
Alabama .....	11.1	9.9	7.7	8.7
Alaska .....	(NA)	(NA)	(NA)	(NA)
Arizona .....	18.0	18.4	8.8	10.0
Arkansas .....	11.0	12.0	5.0	5.9
California .....	21.2	22.0	11.1	11.1
Colorado .....	16.6	19.1	6.8	6.0
Connecticut .....	30.2	43.2	28.4	41.6
Delaware .....	19.2	17.7	9.7	13.9
Florida .....	15.0	18.2	13.3	20.7
Georgia .....	10.1	15.0	6.8	8.2
Hawaii .....	(NA)	(NA)	(NA)	(NA)
Idaho .....	10.7	12.3	14.4	11.5
Illinois .....	4.3	4.9	1.1	1.3
Indiana .....	5.5	8.4	1.9	1.9
Iowa .....	3.3	3.7	0.6	0.9
Kansas .....	5.9	5.9	1.5	1.5
Kentucky .....	7.9	9.7	4.2	5.5
Louisiana .....	9.7	15.8	5.9	8.6
Maine .....	23.8	37.5	22.4	25.6
Maryland .....	10.3	13.5	7.7	7.5
Massachusetts .....	26.1	27.0	31.1	30.0
Michigan .....	6.9	7.6	3.7	4.7
Minnesota .....	5.1	5.7	2.5	2.0
Mississippi .....	8.3	10.2	3.9	4.8
Missouri .....	6.8	8.0	3.9	3.9
Montana .....	9.5	9.5	4.2	5.1
Nebraska .....	4.1	4.6	1.2	1.6
Nevada .....	49.0	50.5	59.6	61.8
New Hampshire .....	31.8	37.0	38.8	39.8
New Jersey .....	17.4	20.3	8.6	11.1
New Mexico .....	14.3	13.1	5.5	5.5
New York .....	9.4	9.7	7.8	7.6
North Carolina .....	17.4	22.2	7.9	10.3
North Dakota .....	4.6	5.6	2.5	3.1
Ohio .....	6.3	7.7	2.8	3.1
Oklahoma .....	7.9	9.4	2.5	2.8
Oregon .....	18.6	21.9	10.2	12.0
Pennsylvania .....	6.9	7.8	5.4	5.9
Rhode Island .....	25.0	28.5	33.1	28.4
South Carolina .....	13.9	20.0	7.7	10.2
South Dakota .....	5.6	6.0	2.0	2.3
Tennessee .....	5.3	6.2	3.4	4.0
Texas .....	4.5	4.7	12.7	13.0
Utah .....	18.2	17.0	34.7	35.2
Vermont .....	19.4	14.1	17.0	19.1
Virginia .....	9.0	11.2	6.5	9.9
Washington .....	13.1	19.0	6.8	10.0
West Virginia .....	13.9	17.3	12.2	18.5
Wisconsin .....	7.0	7.1	4.4	5.0
Wyoming .....	21.2	22.4	31.8	29.9
United States .....	1.7	1.9	2.2	2.2

(NA) Not available.

## Quality Metrics for Farms and Land in Farms by Economics Sales Class – United States: 2017-2018

Economic sales class	Coefficient of variation			
	Number of farms		Land in farms	
	2017	2018	2017	2018
	(number)	(number)	(number)	(number)
\$1,000 - \$9,999 .....	2.9	3.3	4.8	4.2
\$10,000 - \$99,999 .....	2.2	2.5	2.8	3.2
\$100,000 - \$249,999 .....	3.5	3.8	3.7	11.5
\$250,000 - \$499,999 .....	3.0	3.1	11.5	4.8
\$500,000 - \$999,999 .....	3.1	4.2	7.4	8.4
\$1,000,000 or more .....	6.2	6.4	2.3	3.2
Total .....	1.7	1.9	2.2	2.2

## Information Contacts

Process	Unit	Telephone	Email
Estimation .....	Environmental Economics and Demographics	(202) 720-6146	HQ_SD_EEDB-EDS@nass.usda.gov
Data Collection .....	Survey Administration Branch	(202) 720-3895	HQ_CSD_SAB@nass.usda.gov
Questionnaires .....	Data Collection Branch	(202) 720-6201	HQ_CSD_DCB@nass.usda.gov
Sampling and Editing .....	Sampling Editing and Imputation Methodology Branch	(202) 690-8141	HQ_MD_SEIMB-Staff@nass.usda.gov
Summary and Estimators .....	Summary Estimation and Disclosure Methodology Branch	(202) 690-8141	HQ_MD_SEIMB-Staff@nass.usda.gov
Dissemination .....	Data Dissemination Office	(202) 720-3400	HQOAPAO@nass.usda.gov
Media Contact and Webmaster .....	Public Affairs Office	(202) 692-0045	HQOAPAO@nass.usda.gov

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