Sheep and Goats Methodology and Quality Measures

Scope and Purpose: The January Sheep and Goats Survey is conducted annually and targets sheep and goat producers in the United States. The survey collects data for total sheep and goat inventories and components of that total, including breeding animals, market inventory, market lambs by weight group, goat inventory by type, lamb and kid crops, and wool and mohair production and value. In addition, data are collected for death loss from previous year, on farm slaughter, and breeding and market animal values. Every five years a Sheep and Lamb Predator and Non-Predator Loss Survey is conducted nationally and incorporated as part of the January Sheep and Goats Survey. Sheep estimates are published for 32 states and New England and goat estimates are published for 32 states and New England.

Survey Timeline: The reference date for the January Sheep and Goats Survey is January 1, with a data collection period of approximately 15 calendar days. Regional Field Offices (RFOs) may begin data collection one day prior to the reference date. Data collection continues until a scheduled ending date and RFOs have about 4 or 5 business days to complete editing and analysis, execute the summary, and interpret survey results. The Agricultural Statistics Board must perform the national review, reconcile state estimates to the national estimates, and prepare official estimates for release in 5 or 6 business days. The estimates are released to the public on the last business day in January.

Sampling: The target population for the Sheep and Goats Survey is all agricultural establishments with one or more sheep or goats owned by the operation. NASS uses a dual frame approach, consisting of list frame and area frame components, to provide complete coverage of this target population. The Sheep and Goats Survey is conducted in every state.

The list frame includes all known agricultural establishments. Livestock inventory numbers of each establishment are maintained on the list frame to allow NASS to define list frame sampling populations for specific surveys and to employ efficient sampling designs. Only list frame records with positive sheep or goat inventory data are included in the list frame population. The list frame for sheep and goat population covers approximately 89 percent of sheep inventory and 82 percent of goat inventory in the United States.

The area frame contains all land in the state and, as such, is complete. The land is stratified according to intensity of agriculture using satellite imagery. The land in each stratum is divided into segments of roughly one square mile. Segments are optimally allocated and sampled to effectively measure crops and livestock. The sampled segments are fully enumerated in June. All farms and ranches found operating tracts in these segments are checked to see if they are included in the list frame sheep and goat population. The farms and ranches that are not included in the list frame sheep and goat population, called nonoverlap tracts, are sampled for the January Sheep and Goats Survey so that the target population is completely represented. The area frame for sheep and goat population covers approximately 11 percent of sheep inventory and 18 percent of goat inventory in the United States.

The Sheep and Goats Survey list frame sample is selected using a hierarchical stratified sampling design with strata defined by total sheep and goats. The sample is designed to achieve a National standard error of 2 percent of the point estimate for total sheep and 4 percent for total goats and kids. The Sheep and Goats Survey nonoverlap sample uses a stratified sample design based on data collected in the June Area Frame Survey. Each sampling unit from the list and area frames is assigned a sampling weight which is used to create the survey estimates.

Data Collection and Editing: For consistency across modes, the paper version is considered the master questionnaire and the Computer Assisted Telephone Interview (CATI), Computed Assisted Self Interview (CASI), and Mobile Computer Assisted Personal Interview (mCAPI) instruments are built to model the paper instrument. 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. Prior to the start of data collection, all modes of instruments are reviewed and the paper, mCAPI, CASI and CATI instruments are thoroughly tested.

All federal data collections require approval by the Office of Management and Budget (OMB). NASS must document the public need for the data, apply sound statistical practice, prove the data do not already exist elsewhere, and ensure the public is not excessively burdened. The 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.

In addition to asking the specific sheep and goat items, all instruments collect information to verify the sampled unit, determine any changes in the name or address, identify any partners to detect possible duplication, verify the farm still qualifies for the target population, and identify any additional operations operated by the sampled operator.

Sampled farms and ranches receive a pre-survey letter explaining the survey and informing them that they will be contacted for survey purposes only. The letter provides the questions to be asked to allow respondents to prepare in advance and also provides a pass code they can use to complete the survey on the internet. All modes of data collection are utilized for sheep and goat surveys. RFOs are given the option of conducting a mail out/mail back phase. While mail is the least costly mode of collection, the short data collection period and the uncertainty of postal delivery times limit its effectiveness. Most of the data are collected by computer-assisted telephone interviews (CATI) by individual RFOs and Data Collection Centers. Limited personal interviewing is done, generally for large operations or those with special handling arrangements. A program is run to determine if any sampled farms are in multiple on-going surveys, so data collection can be coordinated.

Survey Edit: As survey data are collected and captured, they are edited for consistency and reasonableness using automated systems. The edit logic ensures the coding of administrative data follows the methodological rules associated with the survey design. Relationships between data items on the current survey are verified and, in certain situations, those items may be compared to data from earlier surveys to ensure relationships are logical. The edit will determine the status of each record to be either "dirty" or "clean." Dirty records must be updated and reedited or certified by an analyst to be clean. If updates are needed, they are reedited interactively. Only clean records are eligible for analysis and summary.

Analysis Tools: Edited 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 other similar records within their state. Outliers and unusual data relationships become evident and RFO staff will review them to determine if they are correct. The tool also allows comparison to a farm's previously reported data to detect large changes in the operation. Suspect data found to be in error are corrected, while data found to be correct are kept.

Nonsampling Errors: Nonsampling errors are present in any survey process. These errors include reporting, recording, editing, and imputation errors. Steps are taken to minimize the impact of these errors, such as questionnaire testing, comprehensive interviewer training, validation and verification of processing systems, detailed computer edits, and the analysis tool.

Estimators: Each farm and ranch in the sample has an initial sampling weight. This is the inverse of the sampling fraction. For example, if a stratum has 1,000 farms in the population and 200 are sampled for this survey, each sampled farm has a weight of 5. In other words, each sampled farm represents 5 farms. The nonoverlap tracts sampled to measure the sheep and goats not accounted for by the list have a weight determined by adjusting their original area frame weight by any second stage sampling weight.

Response to the January Sheep and Goats 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 nonrespondents must be

accounted for if accurate estimates of sheep and goats are to be made. For the Sheep and Goats Survey, nonrespondents are accounted for by adjusting the weights of the respondents. The adjustment occurs by stratum as the bounded strata represent homogeneous groupings of similar sized farms. The adjustment is also performed by individual item on the questionnaire (total sheep, total goats, sheep death loss, etc.) so adjustments for item nonresponse (partial reports) and unit nonresponse (refusals and inaccessibles) are done in a single calculation. Using the previous example, if 180 of the original 200 respond, the weights of the 180 will be adjusted to 1,000 divided by 180, or 5.56. The largest stratum is unbounded and consists of large and, often unique, farms. Nonrespondents in this stratum and the nonoverlap tracts must be manually imputed by RFO statisticians, and their weights are not adjusted.

Two estimators are used to compute direct measures of the sheep and goat items. The "reweighted" estimator and the "adjusted" estimator are computationally identical except in how the nonresponse adjustments are made. The reweighted estimator uses a global weight adjustment across all usable reports. The nonresponse weight adjustment for the adjusted estimator uses an additional piece of information. When a sampled farm refuses to cooperate, interviewers will probe to determine the presence of sheep and/or goats even though the number is not known. This presence/absence indicator is used in the weight adjustment.

Point estimates, called direct expansions, for both estimators are calculated by multiplying the reported value by the nonresponse adjusted weight and summing to a stratum total. A variance estimate is also computed at the stratum level. The nonoverlap tracts are treated as an additional stratum. Totals and variances are additive across strata to form a state estimate and states are additive to a national estimate.

Ratio estimates are also computed for many items. For example, market lambs can be estimated as a percent of total market sheep and lamb inventory. Ratio estimates use the reweighted estimator described above for the numerator and denominator. Both the numerator and denominator must be complete for that record to be included in the ratio estimator.

Estimation: When all samples are accounted for, all responses fully edited, and the analysis material is reviewed, each RFO executes the summary for their state. When all RFOs have run summaries, Headquarters executes the National summary. Since all states conduct identical surveys, the samples can be pooled, and National survey results computed. The summary results provide multiple point estimates and their standard errors 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 estimates, such as strata level expansions, response rates, and percent of the expansion from usable reports.

RFOs are responsible for performing a detailed review of their survey results. Any irregularities revealed by the summary must be investigated and, if necessary, resolved. Using the historical relationship of the survey estimates to the official estimate, RFOs interpret the survey results and submit a recommended estimate to Headquarters. The data are viewed in tabular and graphical form and a consensus estimate is established. RFOs see their survey results only and do not have access to other states' results. For some data series, information from other sources is also utilized in the process of establishing estimates.

For the National estimates, NASS assembles a panel of statisticians to serve as the Agricultural Statistics Board (ASB) 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 estimates to the National number for sheep and goat inventories, lamb and kid crops, and wool and mohair production. The ASB has the advantage in being able to examine results across states, compare the state recommendations, and utilize administrative data available only at the National level. The same estimators used in the state summaries are produced by the National summary. The ASB 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 over time to determine accuracy and bias using tables and graphs. Every five years NASS conducts the Census of Agriculture, which is an exhaustive data collection effort for all known farm operations across the United States. The information gathered from the Census of Agriculture is used to establish benchmark levels by which the survey estimators can be compared, and bias determined. Survey based estimators can also be impacted by "outliers" - individual reports that have "excessive influence" on the results due to either improper classification or extremely unusual data for a given operation (i.e., operation is not representative of other operations). NASS thoroughly reviews the survey data to identify these situations and consider their impact on the survey results when establishing the official estimates.

External information (administrative data) is also utilized in the process of setting estimates. To be considered, these data must be deemed to be reliable and come from unbiased sources. The most common administrative data is commercial slaughter. NASS employs a balance sheet approach whenever possible to ensure that estimates are as accurate as possible. This approach typically is limited to National-level estimates. A balance sheet and its components are reviewed when the inventory numbers are established. Commercial slaughter is an important element of the balance sheet at the National level since its high degree of reliability is based on a near-actual count of animals slaughtered. Live U.S. imports and exports to other countries are also considered.

Subtracting the disposition components of the balance sheet from supply components should, theoretically, give the current inventory. However, each component of the balance sheet has varying degrees of possible estimation error. To be most useful as an indication of inventory, therefore, each component should be estimated based on all available information. The supply components of the National balance sheet are the beginning inventory, births, and imports (inshipments for State balance sheets). From this supply, the disposition components - commercial slaughter (marketings at State level), farm slaughter, deaths, and exports - are subtracted. The result is the indicated number on hand at the end of the period or year.

Quality Metrics for Sheep and Goats

Purpose and Definitions: Under the guidance of the Statistical Policy Office of the Office of Management and Budget, the United States Department of Agriculture's National Agricultural Statistics Service provides data users with quality metrics for its published data series. The metrics tables below describe the performance data for all surveys 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. Nonsampling error is evaluated by response rates and the weighted item response rates.

> **Sample size** is the number of observations selected from the population to represent a characteristic of the population. Operations that did not have the item of interest or were out of business at the time of data collection have been excluded.
> **Response rate** is the proportion of the above sample that completed the survey.
> **Weighted item response rate** is a ratio of reported survey data expanded by the original sampling weight compared to final nonresponse adjusted summary totals.
> **Coefficient of variation** provides a measure of the size for the standard error relative to the point estimate and is used to measure the precision of the results of a survey estimator.

Sheep and Goats Survey Sample Size and Response Rates: To assist in evaluating the performance of the estimates in the sheep and goats report, the sample size and response rates are displayed.

Sheep and Goats Survey Sample Size and Response Rate – United States: January 1, 2024-2025

	Sample size		Response rate	
	2024	2025	2024	2025
	(number)	(number)	(percent)	(percent)
United States	21,773	23,528	50.3	49.4

Sheep and Goats Survey Quality Metrics – United States: January 1, 2024-2025

	Weighted item response rate		Coefficient of variation	
	2024	2025	2024	2025
	(percent)	(percent)	(percent)	(percent)
All sheep and lambs	57.5	51.1	3.6	2.7
Breeding sheep and lambs	58.9	51.7	3.9	2.4
Market sheep and lambs	53.3	49.6	3.8	4.5
Lamb crop	58.6	51.7	4.3	3.0
Wool production	42.0	38.5	5.9	1.9
All goats and kids	61.3	52.7	4.0	3.8
Angora goats and kids	59.2	53.2	13.7	15.8
Milk goats and kids	51.0	50.3	6.3	6.6
Meat and other goats and kids	63.8	53.3	4.5	4.4
Kid crop	61.6	52.1	4.9	4.7
Mohair Production	40.0	39.4	15.3	19.8

Sheep and Goats Survey Sample Size and Response Rates – States and United States: January 1, 2024-2025

	Sample size		Response rate	
	2024	2025	2024	2025
	(number)	(number)	(percent)	(percent)
Alabama	459	511	48.4	45.2
Arizona	172	201	43.0	71.6
Arkansas	308	330	45.8	46.1
California	930	1,013	25.9	26.3
Colorado	745	785	39.5	47.4
Florida	377	383	39.0	43.1
Georgia	465	510	44.5	43.3
Idaho	399	440	46.4	45.2
Illinois	452	477	48.2	48.6
Indiana	478	520	50.2	43.3
Iowa	723	817	49.7	46.1
Kansas	446	484	49.3	41.1
Kentucky	511	565	66.3	59.8
Louisiana	267	(NA)	51.7	(NA)
Michigan	481	503	46.4	49.1
Minnesota	588	651	50.7	40.7
Mississippi	313	374	49.2	50.3
Missouri	588	619	44.7	41.0
Montana	542	552	53.9	54.9
Nebraska	418	461	58.6	48.8
Nevada	149	169	33.6	32.5
New England [1]	579	668	49.1	61.1
New Mexico	307	339	47.2	42.5
New York	338	401	48.5	45.4
North Carolina	524	565	65.5	57.0
North Dakota	232	258	51.7	43.0
Ohio	722	776	44.7	44.1
Oklahoma	611	666	57.6	63.1
Oregon	589	640	54.0	52.3
Pennsylvania	514	592	44.7	52.0
South Carolina	352	370	41.5	46.5
South Dakota	724	745	50.6	36.0
Tennessee	622	696	64.1	53.3
Texas	1,842	1,921	55.6	58.8
Utah	716	757	65.6	65.3
Virginia	532	584	53.0	50.9
Washington	336	357	47.3	43.4
West Virginia	338	369	77.2	69.9
Wisconsin	535	589	51.0	42.3
Wyoming	852	825	54.7	67.2
Other States [2]	697	1,045	39.7	42.4
United States	21,773	23,528	50.3	49.4

(NA) Not available.
  [1] New England includes Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.
  [2] Individual state estimates not available for states not shown but are included in Other States.

Quality Metrics for All Sheep and Lambs – States and United States: January 1, 2024-2025

	Weighted item response rate		Coefficient of variation	
	2024	2025	2024	2025
	(percent)	(percent)	(percent)	(percent)
Arizona	58.0	75.9	21.1	17.2
California	33.6	23.0	6.3	21.3
Colorado	39.8	55.1	6.4	4.7
Idaho	39.5	58.9	4.7	5.3
Illinois	49.4	55.3	11.1	17.9
Indiana	51.2	36.8	40.9	29.9
Iowa	60.7	51.7	13.4	10.7
Kansas	52.7	48.2	8.5	7.9
Kentucky	78.5	66.8	17.2	12.6
Michigan	55.4	39.3	11.2	24.7
Minnesota	65.0	46.8	13.5	11.5
Missouri	60.8	45.8	25.7	19.2
Montana	63.0	56.3	4.7	4.8
Nebraska	39.2	46.0	43.1	12.1
Nevada	73.4	22.2	2.0	0.7
New England [1]	62.3	67.1	15.2	11.5
New Mexico	67.7	33.2	8.8	8.0
New York	70.7	58.7	8.8	9.1
North Carolina	78.5	60.2	14.3	13.6
North Dakota	75.2	42.3	33.4	14.0
Ohio	64.9	42.1	23.8	20.2
Oklahoma	64.4	68.9	18.5	9.1
Oregon	79.6	52.4	44.9	9.4
Pennsylvania	51.0	60.7	10.8	18.3
South Dakota	43.7	29.3	4.7	4.7
Tennessee	76.1	59.0	28.3	9.0
Texas	68.3	63.9	5.3	4.8
Utah	68.5	67.3	4.6	7.5
Virginia	74.3	54.2	38.3	7.9
Washington	62.4	40.1	34.1	29.7
West Virginia	85.2	71.2	18.8	16.0
Wisconsin	58.3	49.5	8.1	11.2
Wyoming	47.5	57.6	7.4	4.0
Other States [2]	53.4	48.8	9.2	7.9
United States	57.5	51.1	3.6	2.7

[1] New England includes Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.
[2] Individual state estimates not available for states not shown but are included in Other States.

Quality Metrics for Angora Goats – States and United States: January 1, 2024-2025

	Weighted item response rate		Coefficient of variation	
	2024	2025	2024	2025
	(percent)	(percent)	(percent)	(percent)
Arizona	59.4	77.2	35.4	32.6
New Mexico	54.8	52.5	34.5	66.2
Texas	60.3	53.8	13.9	20.4
Other States[1]	59.8	48.8	30.1	15.1
United States	59.2	53.2	13.7	15.8

[1] Individual state estimates not available for states not shown but are included in Other States.

Quality Metrics for Milk Goats – States and United States: January 1, 2024-2025

	Weighted item response rate		Coefficient of variation	
	2024	2025	2024	2025
	(percent)	(percent)	(percent)	(percent)
Alabama	56.4	43.7	34.3	22.7
Arkansas	64.0	45.2	33.4	32.4
California	10.4	37.7	19.8	11.7
Colorado	26.4	36.8	44.8	42.0
Florida	32.7	44.1	32.8	17.0
Georgia	51.1	46.6	29.0	32.9
Idaho	37.9	66.2	29.9	26.8
Illinois	39.4	25.0	25.0	40.9
Indiana	51.2	38.8	15.9	14.7
Iowa	46.6	45.7	10.8	13.7
Kansas	57.9	45.3	26.4	25.2
Kentucky	73.1	59.1	32.2	32.5
Michigan	48.3	55.7	18.9	15.3
Minnesota	42.0	53.2	27.2	18.2
Missouri	53.0	37.1	36.8	34.3
Nebraska	64.6	55.9	21.2	23.6
Nevada	(NA)	88.3	(NA)	4.8
New England[1]	63.1	73.7	14.0	14.1
New York	62.9	57.4	25.8	27.1
North Carolina	65.3	46.5	20.7	18.4
Ohio	75.6	29.5	53.7	39.4
Oklahoma	86.1	66.4	56.6	22.5
Oregon	79.7	47.4	39.8	33.1
Pennsylvania	84.2	19.1	60.9	64.3
South Carolina	50.0	54.5	37.2	22.1
Tennessee	80.2	51.2	34.4	25.6
Texas	58.3	65.9	23.5	30.5
Virginia	74.2	67.4	43.5	41.6
Washington	66.5	55.4	35.2	24.0
Wisconsin	29.2	57.8	7.4	16.7
Other States[2]	76.5	61.6	19.7	17.0
United States	51.0	50.3	6.3	6.6

(NA) Not available.
[1] New England includes Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.
[2] Individual state estimates not available for states not shown but are included in Other States.

Quality Metrics for Meat and Other Goats – States and United States: January 1, 2024-2025

	Weighted item response rate		Coefficient of variation	
	2024	2025	2024	2025
	(percent)	(percent)	(percent)	(percent)
Alabama	67.7	69.1	22.0	25.4
Arizona	60.2	78.2	25.3	27.5
Arkansas	69.8	47.0	32.1	22.5
California	29.0	16.4	11.3	9.9
Colorado	41.2	41.7	12.3	9.1
Florida	51.7	42.9	16.9	13.8
Georgia	50.6	50.7	13.2	12.5
Illinois	43.7	31.2	24.7	20.5
Indiana	61.0	39.8	34.1	18.8
Iowa	68.0	41.5	23.3	21.2
Kansas	44.7	45.1	13.8	11.4
Kentucky	56.7	66.1	22.7	19.8
Louisiana	63.4	(NA)	27.0	(NA)
Minnesota	72.1	48.8	35.7	12.2
Mississippi	74.5	53.2	22.1	17.7
Missouri	53.6	24.8	25.2	27.6
Nebraska	(NA)	56.0	(NA)	18.7
New York	67.8	(NA)	37.2	(NA)
North Carolina	72.4	63.4	10.2	15.1
Ohio	71.5	24.8	43.5	43.6
Oklahoma	78.6	70.3	19.6	9.7
Oregon	52.6	45.1	23.8	24.7
Pennsylvania	70.7	43.4	45.4	30.9
South Carolina	49.0	50.9	12.5	9.7
Tennessee	71.4	52.5	10.3	9.2
Texas	67.8	62.2	8.8	9.6
Virginia	74.7	70.1	30.6	36.6
Washington	49.9	(NA)	19.4	(NA)
West Virginia	87.1	(NA)	32.7	(NA)
Wisconsin	(NA)	26.1	(NA)	31.2
Other States[1]	62.1	53.6	8.8	9.0
United States	63.8	53.3	4.5	4.4

(NA) Not available.

[1] Individual state estimates not available for states not shown but are included in Other States.

Information Contacts

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Estimation	Livestock Branch	(202) 720-3570	HQ_SD_LB@usda.gov
Data Collection	Survey Administration Branch	(202) 720-3895	HQ_CSD_SAB@usda.gov
Questionnaires	Data Collection Branch	(202) 720-6201	HQ_CSD_DCB@usda.gov
Sampling and Editing	Sampling Editing and Imputation Methodology Branch	(202) 690-8141	HQ_CSD_SB@usda.gov
Summary and Estimators	Summary Estimation and Disclosure Methodology Branch	(202) 690-8141	HQ_SD_SMB@usda.gov
Dissemination	Data Dissemination Office	(202) 720-3869	HQSDOD@usda.gov
Media Contact and Webmaster	Public Affairs Office	(202) 720-2639	HQOAPAO@usda.gov

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➢ Cornell's Mann Library has launched a new website housing NASS's and other agency's archived reports. The new website, https://usda.library.cornell.edu. All email subscriptions containing reports will be sent from the new website, https://usda.library.cornell.edu. To continue receiving the reports via e-mail, you will have to go to the new website, create a new account and re-subscribe to the reports. If you need instructions to set up an account or subscribe, they are located at: https://usda.library.cornell.edu/help. You should whitelist notifications@usda-esmis.library.cornell.edu in your email client to avoid the emails going into spam/junk folders.

For more information on NASS surveys and reports, call the NASS Agricultural Statistics Hotline at (800) 727-9540, 7:30 a.m. to 4:00 p.m. ET, or e-mail: nass@usda.gov.