Milk Production Methodology and Quality Measures

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Scope and Purpose: The Milk Production Survey, conducted in all states in January, April, July, and October, collects data for the number of all milk cows in the herd, number of cows milked on the first day of the survey month, and total milk produced on the first day of the survey month. In addition, milk cow replacement prices are collected each quarter and heifer replacement prices are collected in January. In April and October, producers are asked to report the amount of milk used on the farm for food or drink and the amount fed to calves.

Survey Timeline: The reference date for the Milk Production Survey is the 1st day of each quarter (January, April, July, and October), 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 four to five business days to complete editing and analysis, execute the summary, and interpret the survey results. The National milk production statistician must review the State estimates and prepare the official estimates for release in about four business days. *Milk Production*, usually released around the 18th or 19th of each month, includes monthly estimates of milk production, milk per cow, and number of milk cows for the 24 major States. Quarterly estimates of milk production and number of milk cows are published for all states in the January, April, July, and October *Milk Production* publications. Annual milk production revisions are published for all states in February.

Sampling: The target population for the Milk Production Survey is all agricultural establishments with one or more head of milk cows on the land operated. The Milk Production Survey is conducted in every state.

NASS uses the list frame for the Milk Production Survey. The list frame includes all known agricultural establishments. Livestock inventory of each establishment is 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 milk cow inventory data are included in the Milk Production list frame population.

The sample size for the Milk Production Survey is approximately 11,000, though some operations will be found to be out of business or not to have the item of interest. The sample is selected using a stratified sampling design with strata defined by the total number of milk cows. The sample is first used in the January survey quarter or the “base” survey quarter, which is the initial quarter of the survey year. The “follow-on” quarters in the survey year use the same “base” sample. New milk operations found during the survey year can be added to the sample if the new operation qualifies for a stratum with a probability of selection equal to 1.

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 does 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. Also, 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 must be on the questionnaire.

Sampled farms and ranches receive a presurvey letter explaining the survey and 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 (CASI). All modes of data collection are utilized for the Milk Production Survey. 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 CATI by individual RFOs and Data Collection Centers. 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. 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 make sure certain 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 previously reported data to detect large changes in the operation. Data found to be in error are corrected, while accepted data are retained.

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 evaluation of the data via the analysis tool.

Estimators: Each milk cow farm and ranch in the sample has an initial sampling weight. This weight is the inverse of the sampling fraction. For example, if a milk cow 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.

Response to the Milk Production Survey is voluntary. Some producers refuse to participate in the survey. Others cannot be contacted during the data collection period, and some submit incomplete reports. These nonrespondents must be accounted for if accurate estimates of milk are to be made. For the Milk Production 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 milk cow farms. The adjustment is also performed for each individual item (total milk cows, cows milked, milk production) because sometimes only a partial report is obtained. Using the previous example, if 160 of the original 200 respond, the weights of the 160 will be adjusted to 1,000 divided by 160, or 6.25. The largest stratum is unbounded and is made up of operations with a large number of milk cows. Nonrespondents in the unbounded stratum must be manually estimated by RFO statisticians, and their stratum sampling weights are not adjusted.

Two estimators are used to compute direct measures of the milk 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 reported and estimated reports. The nonresponse weight adjustment for the adjusted estimator uses an additional piece of information, based on the presence/absence of milk cows. When a sampled farm refuses to cooperate, interviewers can probe to determine the presence of milk cows even though the number of milk cows is not known. Also, automated edit logic that is based on historic and administrative data ensures the coding of the presence indicator value. 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 weight and summing to a stratum total. A variance estimate is also computed at the stratum level. 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, milk yield is estimated as a ratio of milk production to total milk cows. 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: Indicators from the quarterly Milk Production Survey, along with external information (administrative data) from various sources, provide data for estimating number of milk cows and milk production on a monthly and quarterly basis. To be considered, these administrative data must be deemed to be reliable and come from unbiased sources. The most common administrative data are Federal Milk Marketing Order statistics.

When all Milk Production Survey samples are accounted for, all responses fully edited, and the analysis material is reviewed, each RFO executes a 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 point estimates and precision measures for each item 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 must interpret the survey results and submit recommended estimates to Headquarters for all milk cows, milk production, and milk per cow. The data are viewed in tabular and graphical form. RFOs see their survey results only and do not have access to other states' results.

The National estimates are determined using the "bottom-up" approach. After the RFOs submit the recommended estimates for each state, the National milk production statistician reviews the individual state estimates for reasonableness. When analyzing the state estimates, the National statistician has an advantage in being able to examine results across states and compare the state recommendations. When the review of the individual state estimates is complete, the National estimates are determined by summing the estimates for each state. The Agricultural Statistics Board reviews the National estimates for reasonableness.

Milk production, milk per cow, and number of milk cows are subject to revision the following month after initial publication for monthly states or the following quarter for the quarterly states. Normally, administrative data from Federal Market Orders, State Departments of Agriculture, or other sources are the main basis for revisions. However, administrative data for all states may not be available in time for these revisions. Estimates are again subject to revision in February each year based on additional administrative data. In the event that additional changes are necessary, a third revision is possible in February the following year.

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. Estimates are thoroughly reviewed for possible revision after data from the Census of Agriculture are available. 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.

Quality Metrics for Milk Production

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 below describe the performance data for all surveys contributing to the publication. 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 for each estimated item. Nonsampling error is evaluated by response rates and the weighted item response rate.

> **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.

Milk Production Survey Sample Size and Response Rate: To assist in evaluating the performance of the estimates in the quarterly milk production report, the sample size and response rate are displayed.

Milk Production Survey Sample Size and Response Rate – States and United States: January 1, 2025-2026

State	Sample size		Response rate	
	2025	2026	2025	2026
	(number)	(number)	(percent)	(percent)
Arizona	34	41	47.1	26.8
California	488	498	62.3	31.9
Colorado	91	99	46.2	32.3
Florida	61	54	23.0	25.9
Georgia	83	75	43.4	50.7
Idaho	278	263	39.9	26.2
Illinois	197	206	54.3	31.6
Indiana	299	307	44.8	45.0
Iowa	357	347	40.1	33.7
Kansas	106	98	37.7	22.4
Kentucky	186	193	55.4	49.2
Maine	97	105	50.5	40.0
Maryland	194	186	34.5	43.5
Michigan	570	560	39.8	34.8
Minnesota	840	828	36.3	33.0
Missouri	190	191	40.0	31.4
Nebraska	67	63	29.9	23.8
Nevada	30	25	16.7	16.0
New Mexico	86	70	25.6	15.7
New York	1,372	1,267	41.2	43.7
North Carolina	88	91	65.9	52.7
Ohio	487	493	43.5	44.2
Oklahoma	53	71	20.8	33.8
Oregon	89	87	47.2	23.0
Pennsylvania	1,102	1,109	50.4	47.7
South Dakota	106	101	50.9	35.6
Tennessee	92	91	29.3	36.3
Texas	270	249	33.0	24.1
Utah	90	92	74.4	55.4
Vermont	235	242	57.9	54.1
Virginia	164	159	48.2	56.0
Washington	172	174	47.1	33.9
Wisconsin	1,468	1,529	43.5	38.7
Other States [1]	617	601	44.9	41.9
United States	10,659	10,565	44.2	39.2

[1] Includes data for states not published in this table.

Quality Metrics for Milk Production Survey - States and United States: January 1, 2025-2026

State	Milk production				Milk cows			
	Weighted item response rate		Coefficient of variation		Weighted item response rate		Coefficient of variation	
	2025	2026	2025	2026	2025	2026	2025	2026
	(percent)	(percent)	(percent)	(percent)	(percent)	(percent)	(percent)	(percent)
Arizona	61.5	41.6	2.5	0.6	58.2	39.4	2.0	0.1
California	70.3	35.1	1.8	2.1	70.3	35.0	1.6	1.8
Colorado	59.8	47.0	0.4	0.8	60.5	46.3	0.7	0.9
Florida	19.8	46.0	2.0	3.6	22.2	46.5	2.9	3.5
Georgia	72.2	64.6	1.2	2.5	64.3	60.1	2.6	1.9
Idaho	39.7	24.2	0.6	2.7	40.5	24.1	0.4	4.0
Illinois	61.9	36.4	2.4	4.1	60.6	34.4	2.7	3.6
Indiana	27.4	54.5	1.0	1.6	28.5	52.8	1.1	1.4
Iowa	33.4	35.0	1.8	2.1	33.7	34.9	1.7	1.8
Kansas	30.3	5.9	1.6	1.1	29.2	6.4	1.3	1.1
Kentucky	77.7	69.1	2.8	5.3	75.3	65.9	2.8	5.3
Maine	53.3	39.8	2.3	3.9	52.4	40.6	3.2	4.5
Maryland	35.3	52.2	5.4	2.8	33.7	51.5	3.8	2.3
Michigan	40.2	28.7	0.8	3.3	40.0	28.8	0.8	3.0
Minnesota	55.6	54.0	1.2	1.7	55.2	54.3	1.2	1.6
Missouri	63.7	49.0	4.9	10.9	57.7	43.1	4.1	7.1
Nebraska	32.1	24.3	3.1	5.1	32.2	24.9	2.6	5.0
Nevada	0.9	19.8	0.6	0.0	1.3	23.3	0.8	0.1
New Mexico	34.2	17.9	2.5	5.3	33.5	18.6	2.4	5.0
New York	49.9	49.1	1.2	1.3	48.6	48.9	1.1	1.2
North Carolina	64.6	51.3	1.2	1.5	65.1	50.4	1.5	1.7
Ohio	44.2	40.0	1.7	3.3	43.9	41.0	2.0	2.7
Oklahoma	5.5	6.2	2.7	4.1	6.4	8.0	3.2	3.6
Oregon	66.3	16.5	1.9	4.2	66.2	15.9	1.8	2.9
Pennsylvania	57.9	54.3	2.2	2.1	57.7	54.3	2.1	2.0
South Dakota	71.2	27.0	1.9	4.0	72.7	26.2	1.6	2.2
Tennessee	41.1	41.9	29.5	5.4	42.6	43.5	29.2	4.9
Texas	21.3	17.3	0.7	12.7	20.7	16.3	0.6	4.1
Utah	73.4	65.7	0.7	1.7	73.1	64.1	0.9	1.7
Vermont	62.0	66.7	4.6	2.5	62.1	65.1	3.9	2.3
Virginia	53.0	52.0	3.0	3.0	52.4	53.6	3.0	2.8
Washington	57.8	26.0	1.6	1.1	56.6	27.2	1.5	1.3
Wisconsin	47.1	41.2	1.1	1.4	47.2	41.1	1.1	1.2
Other States [1]	54.2	46.7	0.6	3.4	54.9	48.4	1.7	10.1
United States	49.9	37.1	0.4	0.9	49.6	36.7	0.4	0.6

[1] Includes data for states not published in this table.

Information Contacts

Process	Unit	Telephone	Email
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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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.

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