Honey Methodology and Quality Measures

ISSN: 2326-0378

Released April 14, 2023, by the National Agricultural Statistics Service (NASS), Agricultural Statistics Board, United States Department of Agriculture (USDA).

Scope and Purpose: The Bee and Honey Inquiry is conducted annually in all States. The target population consists of all known producers with five or more colonies. Data are collected on the following: current year honey production, total colonies, colonies harvested, current year quantity sold, and value of sales for honey produced in the current year and in the previous year, expenditures, number of employees, and honey stocks as of December 15. Stocks exclude those held under the commodity loan program.

Data are summarized for all operations reporting five or more total colonies. If honey stocks or colonies were present in more than one state, each state is counted. Estimates are published for honey-producing colonies, yield per colony, production, stocks on December 15, average price per pound, and value of production at a National and State level. The publication contains combined estimates for ten States (2021) and 11 States (2022) with low levels of production labeled as "Other States". Estimates for expenditures, employees, honey prices by color class and marketing channel are also included in the publication.

Survey Timeline: For the Bee and Honey Inquiry data collection begins in December using the current year as the reference period. Honey Stocks are recorded for a December 15 reference date. Questionnaires are mailed in early December. Telephone follow-up is conducted for nonresponse records beginning in late January. Enumerators at NASS data collection centers collect data for a period of approximately one month. Assigned Regional Field Offices (RFOs) have approximately two weeks, from the end of data collection in February, to complete editing and analysis and execute the summary. Over the next three weeks, a National review is completed to include interpretation the survey results and State and National estimates are established. Estimates are released to the public in March as specified by the Agricultural Statistics Board (ASB) on its annual publications calendar.

Sampling: The target population for the Bee and Honey Inquiry is all agricultural operations with five or more total colonies of bees. The number of colonies on each operation is maintained on the NASS List Sampling Frame (hereafter List Frame) to identify operations eligible for sampling. For bee and honey operations, the List Frame is a current and unduplicated list of agricultural operations, and all current bee and honey operations are assumed to be on the list. Each bee and honey operation is classified into one of several mutually exclusive strata based on the number of total colonies controlled by the operation and whether an operation is located in multiple states. Survey samples are selected annually.

Data Collection: 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, 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.

All RFOs use the same standard questionnaire for data collection. For consistency across modes, the paper version is considered the master questionnaire and the Computer Assisted Self Interview (CASI), mobile Computer Assisted Telephone Interview (mCATI), and Computer Assisted Telephone Interview (CATI) 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 CASI, mCATI, and CATI instruments are thoroughly tested.

Sampled operations receive a pre-survey letter explaining the purpose and importance of the survey and that they are being contacted for survey purposes only. Attached to the letter is a complete copy of the paper questionnaire and a pass code, which can be used to complete the survey securely online. RFOs are responsible for their data collection strategy, but RFOs must include provisions for respondents to report securely online. If response is not received by mail or online, respondents are contacted by CATI.

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. Only clean records are eligible for analysis and summary.

During the data edit, operations reporting colonies in more than one state must have a special review completed. A reconciliation review is completed between the sending and receiving States. All RFOs involved must agree upon the allocation of honey amongst states. This reconciliation procedure eliminates duplication and ensures that the honey is recorded in the State in which the honey was harvested, or stocks were stored.

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 similar records. Outliers and unusual data relationships become evident and assigned RFO staff review them to determine if they are correct. The tool allows comparison to an operation's previously reported data to detect large changes in the operation. Data found to be in error are corrected, while data found to be correct are retained.

Nonsampling Errors: Nonsampling 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.

Estimators: Each bee and honey operation in the sample has an initial sampling weight, which is the inverse of the sampling fraction for the stratum to which the bee and honey operation is assigned. Response to the survey is voluntary. Producers may refuse to participate in the survey, may not be located during the data collection period, or may submit incomplete reports. For the Bee and Honey Inquiry, nonrespondents are accounted for in one of two ways.

For bee and honey operations in the strata made up of large, unique operations, production, colonies, stocks, and production sold must be manually imputed. Nonrespondents in all other strata are accounted for by adjusting the weights of the complete responses. The adjustment occurs at the stratum level for all strata that represent bounded homogenous groupings of similar sized operations. The adjustment is also performed for each individual item (number of colonies and honey sales) because sometimes only a partial report is obtained.

Direct expansions are calculated by multiplying the reported value by the combined nonresponse weight and sampling 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 State estimates are additive to a National estimate.

Ratio estimates are also computed for many items including prices. Ratio estimates use the reweighted estimator described above for the numerator and denominator direct expansions. Both the numerator and denominator must be complete for that record to be included in the ratio estimate.

Estimation: When all samples are present, all responses fully edited and the analysis material is reviewed, each assigned RFO executes a summary to evaluate and analyze the data under its responsibility. Since identical surveys are conducted in each State, the samples can be pooled, and National survey results computed. The summary results provide multiple indications and their standard errors. It also provides information to assess the performance of the current survey and evaluate the quality of survey indications, such as response rates and strata level expansions. RFOs are responsible for

performing a detailed review of their survey results. Any irregularities revealed by the summary must be investigated and resolved, if necessary. NASS assembles a panel of statisticians to serve as the ASB, which reviews the State and National summaries and establishes the State and National estimates for honey production, honey-producing colonies, yield, and stocks. Price and value of production estimates are set at the state level with US estimates summed from each State. National estimates are also set for expenditures and number of employees.

Previous year's estimates are subject to revision when the current year's estimates are set. Revisions are the result of late reports or corrected data. Price revisions can result from additional sales reported 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 estimates can be compared, and bias determined.

Quality Metrics for Honey

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 table 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 CVs measure the error due to sampling as well as some nonsampling error. Nonsampling error is also evaluated by examining 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 responds to 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.

Bee and Honey Inquiry Sample Size and Response Rates: To assist in evaluating the performance of the estimates in the Honey report, the sample size and response rates are displayed. Response rates overall for 2021 and 2022 are displayed.

Bee and Honey Inquiry Sample Size and Response Rate – States and United States: 2021 and 2022

State	Sample size		Response rate	
	2021	2022	2021	2022
	(number)	(number)	(percent)	(percent)
Alabama	200	195	69.5	65.6
Arizona	43	42	62.8	42.9
Arkansas	89	94	69.7	52.1
California	453	457	47.7	46.4
Colorado	94	105	57.5	53.3
Florida	502	539	49.0	53.6
Georgia	264	266	52.7	53.4
Hawaii	47	(D)	55.3	(D)
Idaho	79	75	60.8	64.0
Illinois	282	278	63.1	66.5
Indiana	160	156	46.9	65.4
Iowa	145	144	51.0	63.9
Kansas	73	78	69.9	62.8
Kentucky	231	231	60.2	64.5
Louisiana	109	110	56.0	57.3
Maine	41	39	63.4	48.7
Michigan	232	228	52.6	68.9
Minnesota	167	173	55.7	50.9
Mississippi	96	98	62.5	60.2
Missouri	160	161	61.3	64.6
Montana	50	53	54.0	50.9
Nebraska	58	56	70.7	58.9
New Jersey	94	106	47.9	54.7
New York	273	264	49.1	53.8
North Carolina	304	352	63.8	71.9
North Dakota	96	92	64.6	63.0
Ohio	325	313	48.3	61.3
Oregon	125	134	63.2	59.7
Pennsylvania	317	313	59.0	60.1
South Carolina	132	129	47.0	59.7
South Dakota	75	72	66.7	58.3
Tennessee	259	256	59.9	62.5
Texas	377	377	57.0	56.0
Utah	72	88	68.1	73.9
Vermont	32	37	62.5	54.1
Virginia	222	262	56.3	65.3
Washington	148	151	58.1	62.9
West Virginia	128	147	71.1	75.5
Wisconsin	191	204	63.4	60.8
Wyoming	28	30	71.4	56.7
Other States [1]	375	429	56.3	57.6
United States	7,148	7,334	56.9	59.7

(D) Withheld to avoid disclosing data for individual operations.
[1] Includes data for States not published in this table.

Quality Metrics for Bee and Honey Inquiry - States and United States: 2021 and 2022

State	Honey production				Honey producing colonies [1]			
	Weighted item response rate		Coefficient of variation		Weighted item response rate		Coefficient of variation	
	2021	2022	2021	2022	2021	2022	2021	2022
	(percent)	(percent)	(percent)	(percent)	(percent)	(percent)	(percent)	(percent)
Alabama	72.9	88.6	6.1	5.5	66.7	88.3	4.6	6.0
Arizona	74.7	54.5	3.7	7.6	62.4	48.0	2.6	5.0
Arkansas	74.9	40.2	11.1	17.3	60.0	42.1	12.6	18.8
California	31.8	51.3	0.8	4.1	41.1	51.7	1.1	3.8
Colorado	35.3	29.4	1.4	2.6	39.7	26.7	0.8	2.1
Florida	48.0	48.2	2.5	1.2	49.6	54.8	1.5	1.1
Georgia	62.7	69.5	1.2	2.8	63.9	68.6	1.2	2.2
Hawaii	94.5	(D)	1.0	(D)	88.7	(D)	4.6	(D)
Idaho	75.1	76.3	0.5	3.6	78.3	81.6	1.7	3.2
Illinois	80.3	80.1	4.9	7.2	72.9	74.9	4.4	4.3
Indiana	72.2	86.9	11.9	4.3	72.8	83.3	12.1	4.6
Iowa	29.7	44.2	0.9	31.7	31.9	45.2	0.7	29.1
Kansas	94.5	85.1	6.6	7.4	94.8	83.6	4.6	5.4
Kentucky	67.3	57.7	9.2	5.8	65.7	59.2	7.2	5.5
Louisiana	67.3	78.2	4.9	1.8	73.1	72.6	4.0	1.7
Maine	33.5	59.1	5.2	1.9	24.3	45.1	1.8	0.8
Michigan	25.6	86.3	1.8	2.8	29.3	82.4	1.8	3.2
Minnesota	37.9	78.4	2.3	15.4	36.5	73.2	2.6	13.5
Mississippi	87.6	92.8	2.8	5.3	85.3	89.3	2.5	4.5
Missouri	89.9	83.2	16.5	8.2	94.1	69.8	10.4	6.3
Montana	28.0	46.1	0.1	(Z)	51.2	55.9	(Z)	(Z)
Nebraska	55.9	76.1	4.9	8.0	61.9	71.7	5.0	5.8
New Jersey	34.3	29.1	3.5	4.7	33.6	19.7	2.1	2.7
New York	32.8	46.0	2.6	3.9	40.6	47.9	2.5	2.9
North Carolina	78.1	90.0	8.3	5.7	81.9	91.4	5.1	4.5
North Dakota	52.5	57.6	0.5	1.7	52.8	61.7	0.4	1.4
Ohio	62.1	93.1	3.7	23.0	64.7	93.6	3.8	31.1
Oregon	66.3	55.5	2.3	2.5	68.8	57.2	1.5	2.9
Pennsylvania	78.5	69.9	3.7	4.5	79.6	67.3	3.5	4.7
South Carolina	18.5	33.6	1.8	1.9	28.8	45.1	1.8	2.1
South Dakota	36.8	49.9	0.2	0.3	43.3	50.9	0.1	0.1
Tennessee	84.6	93.5	8.9	11.1	78.4	91.2	6.5	8.2
Texas	55.8	28.4	2.4	9.0	54.8	30.5	2.2	8.4
Utah	90.1	78.2	1.5	0.9	90.7	73.8	1.0	1.6
Vermont	23.7	23.5	8.4	1.9	14.5	17.9	15.2	1.3
Virginia	80.1	89.8	7.2	11.7	80.3	90.6	5.6	8.0
Washington	49.2	25.8	19.6	2.2	51.6	33.4	14.3	2.1
West Virginia	63.8	93.0	6.1	13.9	65.0	91.3	6.6	12.8
Wisconsin	48.2	87.9	1.1	15.3	50.8	87.6	0.7	7.4
Wyoming	69.8	54.6	0.1	0.2	61.2	65.6	0.1	0.4
Other States [2]	63.2	47.9	13.7	3.0	66.3	56.7	13.6	3.7
United States	48.9	56.8	0.6	1.3	52.2	58.3	0.6	1.1

(D) Withheld to avoid disclosing data for individual operations.
(Z) Less than half of the unit shown.
[1] Honey producing colonies are colonies from which honey was harvested during the year. It is possible to harvest honey from colonies which did not survive the entire year.
[2] 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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