



Cost of Pollination Methodology

ISSN: 2572-4681

Released February 8, 2023, by the National Agricultural Statistics Service (NASS), Agricultural Statistics Board, United States Department of Agriculture (USDA).

Cost of Pollination Survey Methodology

Scope and Purpose: The Cost of Pollination survey, conducted annually in all 50 states, collects information on acreage pollinated, colonies used, and dollars spent for a variety of crops.

Survey Timeline: For the Cost of Pollination survey, data collection begins in October and concludes in December. Estimates are released to the public in early January on the date designated by the Agricultural Statistics Board (ASB) on its annual publications calendar.

Sampling: The target population for Cost of Pollination estimation program is all farms and ranches with at least one acre of a crop determined to be potentially pollinated by honey bees. There were 33 specific crops, identified to use honey bee pollination, targeted in the Cost of Pollination sampling scheme. Additional crops were allowed to be reported in the “All Other Crops” item code on the questionnaire.

The Cost of Pollination samples were selected using a Multivariate Probability Proportional to Size (MPPS) sampling scheme. Each record was assigned a measure of size based on list frame data for multiple specified commodities. Nonresponse groupings were formed based on each records probability of selection and previous pollination history. The 2022 sample size was 15,590, and the 2017 sample size was 14,532.

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 Regional Field Offices (RFO) use the same standardized 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 questionnaire. The questionnaire content and format are evaluated annually through a specification 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. Limited personal interviewing may be conducted, generally for large operations or those with special handling arrangements.

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 Tool: Edited data are processed through an interactive analysis tool which displays data for all reports by item. The tool provides scatterplots, 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.

Non-sampling Errors: Non-sampling errors are present in every 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: Response to the 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. The nonrespondents are accounted for in the estimation process.

Point estimates, called direct expansions, are calculated by multiplying the reported value by the nonresponse adjusted weight and summing to a nonresponse grouping total. The nonresponse adjustment is calculated by summing the weights for all sample records within the group and dividing by the sum of the weights from the usable records. This adjustment assumes that the data of the nonrespondents are similar to the data of the respondents. A variance estimate is also computed for each nonresponse grouping. Totals and variances are additive across nonresponse groupings to form a state estimate and states are additive to regional estimates.

Ratio estimates are also computed for many items. For example, dollars per acre values are calculated as the ratio of total dollars paid to acres paid for pollination. Both the numerator and denominator must be usable for that record to be used in the ratio estimator.

Estimation: Estimates were prepared by the Agricultural Statistics Board after reviewing recommendations and analysis submitted by each Regional Field Office. All data were analyzed for unusual values. Data from each operation were compared to their own past operating profile and to trends from similar operations. Data for missing operations were covered by weighting positive data of similar operations based on location and nonresponse grouping. National and State survey data were reviewed for reasonableness with each other, estimates from the previous survey cycles, and other USDA, NASS reports. To be published individually, a crop must have an appropriate threshold of paid pollinated acres in a region and meet USDA/NASS’s confidentiality policy. If a crop did not meet either of these requirements, it was combined with all other unpublished crops under the “All Other” heading. Due to the differences in regions and years, the aggregate and other published estimates may include different crops.

Estimation Regions: To improve the reliability and increase the number of estimates which could be published, estimates were published at a regional level, based on the regions used for the 2012 Census of Agriculture. Regions 6 and 7 were combined. The states in each region were as follows:

Region 1: Connecticut, Illinois, Indiana, Iowa, Kansas, Massachusetts, Maine, Michigan, Nebraska, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, Wisconsin.

Region 2: Alabama, Delaware, Georgia, Kentucky, Maryland, North Carolina, South Carolina, Tennessee, Virginia, West Virginia.

Region 3: Arkansas, Florida, Louisiana, Missouri, Mississippi, New Mexico, Oklahoma, Texas.

Region 4: Colorado, Minnesota, Montana, Nevada, North Dakota, South Dakota, Utah, Wyoming.

Region 5: Alaska, Idaho, Oregon, Washington.

Region 6 & 7: Arizona, California, Hawaii.

Quality Metrics for Cost of Pollination Statistics

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 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 and the weighted item response rates.

Sample size is the number of observations selected from the population to represent a characteristic of the population. For Cost of Pollination, this number reflects operations with list frame acreage of targeted crops that were selected for the survey.

Response rate is the proportion of the sample that completed the survey, excluding those operations that did not have the item of interest or were out of business at the time of data collection. This calculation follows Guideline 3.2.2 of the OMB Standards and Guidelines for Statistical Surveys (September 2006).

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 (CV) 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. 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. Selected estimates on acreage paid for pollination and colonies used for pollination have CVs published on the USDA, NASS Quick Stats system:

www.nass.usda.gov/Quick_Stats/

- High Reliability Estimate. CV less than 15 percent.
- Medium Reliability Estimate. CV between 15 percent and 29.9 percent.
- Low Reliability Estimate. CV 30 percent or higher. Caution should be used when using this estimate in any form. Please consult NASS for more information or guidance.

Cost of Pollination Survey Sample Size, Response Rate, and Weighted Item Response Rate – United States: 2017 and 2022

Region ¹	Sample size		Response rate		Colonies Used for Pollination	
					Weighted Item Response Rate	
	2017	2022	2017	2022	2017	2022
	(number)	(number)	(percent)	(percent)	(percent)	(percent)
1	5,146	5,812	54.3	46.3	69.3	67.2
2	2,175	2,833	47.4	31.5	69.3	58.8
3	2,227	1,530	40.5	25.7	69.3	46.2
4	656	667	51.8	48.5	77.7	77.7
5	1,806	1,905	58.3	53.1	69.3	54.6
6 and 7	2,522	2,843	48.7	42.5	67.2	52.5
United States	14,532	15,590	51.0	42.3	(NA)	(NA)

(NA) Not available.

¹ See Estimation Regions on page 3.

Information Contacts

Process	Unit	Telephone	Email
Estimation	Livestock Branch	(202) 720-3570	HQ_SD_LB@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_CSD_SB@nass.usda.gov
Summary and Estimators	Summary Estimation and Disclosure Methodology Branch	(202) 720-2248	HQSDSMB@nass.usda.gov
Dissemination	Data Dissemination Office	(202) 720-3400	HQSDOD@nass.usda.gov
Media Contact and Webmaster .	Public Affairs Office	(202) 720-2639	HQOAPAO@nass.usda.gov

Access to NASS Reports

For your convenience, you may access NASS reports and products the following ways:

- All reports are available electronically, at no cost, on the NASS web site: www.nass.usda.gov.
- Both national and state specific reports are available via a free e-mail subscription. To set-up this free subscription, visit www.nass.usda.gov and click on “National” or “State” in upper right corner above “search” box to create an account and select the reports you would like to receive.
- 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.

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employment on the basis of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, or all or part of an individual's income is derived from any public assistance program, or protected genetic information in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases will apply to all programs and/or employment activities.)

If you wish to file a Civil Rights program complaint of discrimination, complete the [USDA Program Discrimination Complaint Form](#) (PDF), found online at www.ascr.usda.gov/filing-program-discrimination-complaint-usda-customer, or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter to us by mail at U.S. Department of Agriculture, Director, Office of Adjudication, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, by fax (202) 690-7442 or email at program.intake@usda.gov.