



National Hemp Report Methodology and Quality Measures

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Released May 16, 2024, by the National Agricultural Statistics Service (NASS), Agricultural Statistics Board, United States Department of Agriculture (USDA).

Scope and Purpose: The Hemp Production and Disposition Inquiry (PDI) is a survey conducted under an agreement with the Agricultural Marketing Service (AMS) and collects information on the total planted and harvested area, yield, production, and value of hemp by utilization in the United States. The survey provides critical data about the hemp industry to assist producers, regulatory agencies, state governments, processors, and other key industry entities. As defined in the Agricultural Improvement Act of 2018 (2018 Farm Bill), the term “hemp” means the plant species *Cannabis sativa* L. and any part of the plant such as the seeds, all derivatives, and extracts, whether growing or not, with a delta-9 tetrahydrocannabinol (THC) concentration of not more than 0.3% on a dry weight basis. The Domestic Hemp Production Program, established in the 2018 Farm Bill and administered by AMS, allows for the cultivation of hemp under certain conditions. As of 2022, all 50 states operated under the regulations of the 2018 Farm Bill. The target population for the Hemp PDI survey is all growers in the United States who are licensed to grow hemp in 2023 under the 2018 Farm Bill. The survey is administered in all 50 States.

Timeline: For the 2023 crop year, data collection began with the mailing of questionnaires in January of 2024. Telephone follow up with nonrespondents began in February and concluded in March. Analysis, summarization, and the establishment of estimates were completed from mid-March to mid-April. The publication was released on April 17, 2024.

Sampling: The sampling frame is all farm operations potentially growing hemp on the NASS list frame and was updated using lists from AMS and other USDA agencies. For the 2023 survey, the resulting sample of 8,037 operations is a census of all known hemp growers.

Data Collection: NASS in cooperation with AMS and other USDA agencies developed the Hemp Production and Disposition Inquiry questionnaire. During questionnaire development, NASS survey methodologists conduct cognitive interviews, and updates are made based on cognitive testing results. Mail, web, and telephone interview modes of data collection are utilized for the survey. All sampled operations are mailed a questionnaire and instructions to complete the survey on the internet. A postcard reminder is mailed after the first week of data collection to those who have not responded, and then telephone follow up begins with any remaining nonrespondents. NASS promotes the survey online and emphasizes the importance of survey response.

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 questionnaires 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 be protected from disclosure, 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, they are edited for consistency and reasonableness using automated systems. The edit logic also ensures administrative coding 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. Records that do not pass the edit logic are either updated or certified by an analyst as accurate. In some cases, respondents are re-contacted to verify unusual survey responses.

Analysis Tools: Edited data are analyzed through a standard 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 record level data of similar records. Atypical responses, unusual data relationships, and statistical outliers for all items are revealed by the analysis tool. RFO and Headquarters staff review such relationships to determine if they are correct. Data found to be in error are corrected, while accepted data are retained.

Nonsampling Errors: Nonsampling error is present in any survey process. This error includes reporting, recording, and editing errors, as well as nonresponse error. Steps are taken to minimize the impact of these errors, such as questionnaire testing, comprehensive interviewer training, validation and verification of the processing systems, application of detailed computer edits, and evaluation of the data via the analysis tool.

Estimators: Response to the Hemp PDI 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 acreage and production are to be made.

Nonresponse weighting groups or strata are created in each state based on historical and administrative data. Nonrespondents are accounted for by adjusting the weights of the complete responses in each stratum. The adjustment is also performed for each individual item because sometimes only a partial report is obtained. The adjustment is calculated by taking the total number of operations in the stratum and dividing by the number of complete responses in the stratum. This ratio is applied to the sampling weights of the complete records. This adjustment assumes that the data of the nonrespondents are like the data of the respondents. The sampling frame is assumed to be complete, so weights are not adjusted for undercoverage.

Two kinds of estimators are used in the Hemp PDI survey: direct expansions and ratio estimators. Direct expansions are used to estimate totals such as total planted and harvested acres and production. Direct expansions are calculated by summing the reported values multiplied by the nonresponse adjusted sampling weights. Variances and coefficients of variation (CVs) are calculated for the direct expansions to measure the precision of the estimates.

The ratio estimator takes the form of a ratio of two direct expansions which are calculated using the method described above. The ratio estimator is used for all within survey ratios (e.g., Yields and Prices). If either the numerator or denominator of the ratio is not complete, the sampling unit is excluded from the estimate and the weights of the complete records are adjusted accordingly. CVs are also calculated for any ratio estimates in the summary. One advantage of the ratio estimator is that the CVs tend to be smaller than those for the direct expansions.

Estimation: When all samples are accounted for, all responses fully edited, and the analysis material is reviewed, State and National summaries are executed in Headquarters. The summary results provide multiple point estimates and corresponding 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 results, such as strata level expansions, response rates, and percent of the expansion from complete reports.

Information obtained from the survey along with Federal and State administrative data is used to establish estimates of total planted and harvested acres, yield, production, price, and value by utilization. These National and State level estimates are reviewed by the Agricultural Statistics Board (ASB) for errors, reasonableness, and consistency. To be considered, the administrative data must be deemed reliable and come from an unbiased source.

All hemp estimates are subject to revision the following year based on a thorough review of all available data. Estimates will also be reviewed following the 5-year Census of Agriculture, which is an exhaustive data collection effort of all known farm operations across the United States. The information gathered from the Census of Agriculture provides the last chance for revision.

Quality Metrics for National Hemp Report

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 Hemp PDI Survey CVs measure the error due to sampling as well as some nonsampling error. Nonsampling error is also evaluated by examining survey 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.

Response rate is the proportion of the above 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 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.

Hemp PDI Survey Sample Size and Response Rate - States and United States: 2022 and 2023

State	Sample Size		Response Rate	
	2022 (number)	2023 (number)	2022 (percent)	2023 (percent)
Alabama	124	127	73.5	43.3
Alaska	(D)	(D)	(D)	(D)
Arizona	54	42	76.4	83.7
Arkansas	42	(D)	44.7	(D)
California	164	133	57.0	48.8
Colorado	267	204	64.2	52.5
Connecticut	83	(D)	78.0	(D)
Delaware	(D)	(D)	(D)	(D)
Florida	1,062	1,126	42.8	34.3
Georgia	224	196	64.1	39.4
Hawaii	(D)	(D)	(D)	(D)
Idaho	20	25	90.6	91.1
Illinois	382	242	70.1	66.8
Indiana	(D)	(D)	(D)	(D)
Iowa	46	39	81.7	71.0
Kansas	125	123	79.0	70.1
Kentucky	304	280	64.2	71.4
Louisiana	108	87	60.2	54.4
Maine	23	31	83.5	86.3
Maryland	60	55	81.2	74.1
Massachusetts	69	52	82.9	87.0
Michigan	164	(D)	67.1	(D)
Minnesota	477	483	65.5	44.9
Mississippi	427	125	52.3	56.1
Missouri	157	103	75.6	70.7
Montana	97	90	71.7	71.9
Nebraska	64	39	65.6	89.9
Nevada	(D)	(D)	(D)	(D)
New Hampshire	(D)	(D)	(D)	(D)
New Jersey	79	64	87.7	65.1
New Mexico	48	(D)	76.4	(D)
New York	266	294	76.4	64.1
North Carolina	541	665	76.2	64.9
North Dakota	73	68	85.0	85.6
Ohio	162	95	63.3	83.8
Oklahoma	(D)	73	(D)	62.9
Oregon	294	242	79.7	75.9
Pennsylvania	331	256	76.6	76.4
Rhode Island	(D)	(D)	(D)	(D)
South Carolina	216	172	67.9	56.1
South Dakota	47	57	93.3	93.6
Tennessee	307	309	71.1	71.6
Texas	713	415	62.3	65.5
Utah	60	52	81.6	86.3
Vermont	94	335	81.3	48.1
Virginia	355	287	76.0	67.9
Washington	106	86	67.2	72.6
West Virginia	121	86	82.3	76.6
Wisconsin	352	371	84.3	68.4
Wyoming	(D)	(D)	(D)	(D)
Other States ¹	402	508	69.7	76.8
United States	9,110	8,037	69.1	63.1

(D) Withheld to avoid disclosing data for individual operations.

¹ Includes data withheld above.

Quality Metrics for Hemp Grown in the Open Area Planted - States and United States: 2022 and 2023

State	Weighted Item Response Rate		Coefficient of Variation	
	2022 (percent)	2023 (percent)	2022 (percent)	2023 (percent)
Alabama	68.0	50.8	41.5	62.6
Alaska	(D)	(D)	(D)	(D)
Arizona	(D)	(D)	(D)	(D)
Arkansas	52.4	(D)	66.2	(D)
California	56.1	60.8	69.0	47.9
Colorado	68.7	58.4	51.2	46.9
Connecticut	72.9	(D)	27.5	(D)
Delaware	(D)	(D)	(D)	(D)
Florida	55.7	49.8	31.0	42.1
Georgia	67.3	54.5	36.4	76.3
Hawaii	(D)	(D)	(D)	(D)
Idaho	80.0	95.2	64.9	44.5
Illinois	71.7	65.7	30.7	33.3
Indiana	(D)	(D)	(D)	(D)
Iowa	68.6	48.9	61.9	50.2
Kansas	79.0	71.5	35.8	40.8
Kentucky	73.5	59.7	32.1	24.1
Louisiana	(D)	(D)	(D)	(D)
Maine	69.6	(D)	62.2	(D)
Maryland	63.5	57.9	27.1	71.2
Massachusetts	76.8	82.3	42.0	40.2
Michigan	72.9	(D)	41.9	(D)
Minnesota	73.7	58.4	39.6	35.6
Mississippi	73.2	(D)	59.9	(D)
Missouri	84.1	44.2	36.2	50.9
Montana	77.9	81.1	33.1	29.4
Nebraska	65.3	97.7	80.2	83.7
Nevada	(D)	(D)	(D)	(D)
New Hampshire	(D)	(D)	(D)	(D)
New Jersey	85.7	51.7	61.7	59.5
New Mexico	72.9	(D)	60.4	(D)
New York	73.0	77.2	55.0	41.3
North Carolina	82.7	56.9	34.7	52.5
North Dakota	92.7	90.2	54.5	79.4
Ohio	63.6	73.4	30.4	70.1
Oklahoma	(D)	56.3	(D)	50.7
Oregon	73.8	70.2	45.3	42.1
Pennsylvania	73.1	64.7	25.0	56.3
Rhode Island	(D)	(D)	(D)	(D)
South Carolina	62.7	55.7	52.4	35.8
South Dakota	87.2	77.9	51.5	30.6
Tennessee	73.4	60.0	60.8	61.1
Texas	(D)	62.6	(D)	49.6
Utah	73.3	94.1	54.3	40.9
Vermont	78.7	66.6	54.8	33.7
Virginia	59.9	42.3	37.8	53.7
Washington	71.7	60.0	51.7	51.8
West Virginia	81.0	67.0	33.6	31.1
Wisconsin	77.7	(D)	23.9	(D)
Wyoming	(D)	(D)	(D)	(D)
Other States ¹	58.7	90.5	34.9	50.9
United States	72.9	68.9	11.7	10.9

(D) Withheld to avoid disclosing data for individual operations.

¹ Includes data withheld above.

Quality Metrics for Industrial Hemp Grown Under Protection Area in Production - States and United States: 2022 and 2023

State	Weighted Item Response Rate		Coefficient of Variation	
	2022 (percent)	2023 (percent)	2022 (percent)	2023 (percent)
Alabama	63.7	55.6	33.2	49.9
Alaska	(D)	(D)	(D)	(D)
Arizona	70.4	82.6	58.8	52.4
Arkansas	(D)	(D)	(D)	(D)
California	56.0	66.8	38.5	70.7
Colorado	59.8	54.8	61.4	37.6
Connecticut	71.5	(D)	76.2	(D)
Delaware	(D)	(D)	(D)	(D)
Florida	55.5	44.3	51.5	58.1
Georgia	66.6	(D)	36.8	(D)
Hawaii	(D)	(D)	(D)	(D)
Idaho	(D)	100.0	(D)	53.7
Illinois	66.4	82.7	39.7	28.0
Indiana	(D)	(D)	(D)	(D)
Iowa	(D)	(D)	(D)	(D)
Kansas	67.1	71.7	35.5	50.7
Kentucky	73.1	73.1	38.3	35.3
Louisiana	70.4	60.3	48.8	60.1
Maine	(D)	84.8	(D)	65.7
Maryland	69.7	58.2	77.1	63.0
Massachusetts	76.8	84.7	72.9	56.0
Michigan	66.0	(D)	65.9	(D)
Minnesota	63.6	39.7	44.5	81.2
Mississippi	74.2	65.0	45.5	49.8
Missouri	74.0	72.6	42.0	80.3
Montana	(D)	(D)	(D)	(D)
Nebraska	(D)	79.8	(D)	52.9
Nevada	(D)	(D)	(D)	(D)
New Hampshire	(D)	(D)	(D)	(D)
New Jersey	85.9	(D)	58.3	(D)
New Mexico	72.9	(D)	82.5	(D)
New York	75.6	(D)	34.2	(D)
North Carolina	80.1	66.9	30.6	32.6
North Dakota	81.5	87.5	59.0	58.7
Ohio	63.4	67.0	39.9	66.1
Oklahoma	(D)	68.4	(D)	69.7
Oregon	73.6	69.7	61.0	35.7
Pennsylvania	72.9	68.0	51.5	38.2
Rhode Island	(D)	(D)	(D)	(D)
South Carolina	62.8	62.9	30.5	49.1
South Dakota	(D)	(D)	(D)	(D)
Tennessee	74.3	63.7	39.3	52.9
Texas	64.5	68.6	49.3	24.5
Utah	73.3	(D)	57.1	(D)
Vermont	(D)	(D)	(D)	(D)
Virginia	71.8	56.1	33.1	37.6
Washington	71.7	68.6	46.0	56.9
West Virginia	80.1	64.9	47.4	40.0
Wisconsin	78.4	76.8	34.8	42.1
Wyoming	(D)	(D)	(D)	(D)
Other States ¹	68.4	75.2	78.5	40.0
United States	66.1	64.0	18.8	13.1

(D) Withheld to avoid disclosing data for individual operations.

¹ Includes data withheld above.

Information Contacts

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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
Analysis 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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