



Cash Rents Methodology and Quality Measures

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Cash Rents Survey Methodology

Scope and Purpose: The Cash Rents Survey and the June Area Survey are conducted annually and obtain acres rented and cash rental rates from farmers and ranchers in the United States excluding Alaska. These surveys provide the basis for estimates of the current year's cash rents paid for irrigated cropland, non-irrigated cropland, and permanent pastureland. Estimates of irrigated and non-irrigated pastureland are not established due to the scarcity of irrigated pastureland. State, district, and county level cash rent estimates are published, pending compliance with disclosure rules and publication standards.

The cash rents estimates derived from these surveys supply basic information needed by farmers to make decisions for both short-term and long-term planning. These estimates may be used by individual producers in planning for their agricultural operation or by Agricultural Extension Services or university staff in developing operating budgets for agricultural operations in their locale.

The United States Department of Agriculture's National Agricultural Statistics Service (NASS) was directed through the 2008 Farm Bill to collect cash rents data for use by the Farm Service Agency (FSA) in program administration. The Food, Conservation, and Energy Act of 2008, Section 2110, states, "The Secretary (acting through the National Agricultural Statistics Service) shall conduct an annual survey of per acre estimates of county average market dry land and irrigated cash rental rates for cropland and pastureland in all counties or equivalent subdivisions within each state that have 20,000 acres or more of cropland and pastureland."

Survey Timeline: The Cash Rents Survey data collection period begins in mid-February and ends in early July. Data collection is coordinated with other surveys being conducted during this period. Also during June, cash rents data are collected on the June Area Survey. National and state level cash rents estimates are published in August for all states, excluding Alaska. District and county level cash rents estimates are published in September.

Sampling: The target population for the cash rents estimate program is all farms and ranches with \$1,000 or more in agricultural sales (or potential sales) who rent land from others on a cash rent basis. The Cash Rent Survey sample is selected from a list frame of farm and ranch operators maintained by NASS. NASS is constantly seeking qualifying farming operations from outside sources to be added to the list. A profile, known as control data, of each operation is maintained which indicates what the farm has historically produced and a general indication of size. This information allows NASS to define sampling populations that are specific to each survey and employ advanced and more efficient sample designs.

Samples for the Cash Rents Survey are drawn with a county level stratified design to produce state, district, and county level estimates. Large operations in each county are stratified into the census strata, where all are included in the sample. The national sample size for the Cash Rents Survey is approximately 245,000.

The June Area Survey utilizes an area sampling frame for national and state level estimates. The area frame contains all land in the United States (except Alaska) and is therefore complete for the cash rents program. The frame in each state is divided into segments of land. For more intense agricultural regions, segments are about one square mile in size. An optimal sample is selected in each state with a national sample size of about 11,000.

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, show the design applies sound statistical practice, ensure the data does not already exist elsewhere, and show that the public is not excessively burdened. The Cash Rents 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 that response to the survey is voluntary and not required by law.

Data collection for the Cash Rents Survey is mainly conducted by mail and telephone. The initial mail-out occurs in mid-February followed by a second mailing in early April. A letter is enclosed with the questionnaire for the respondent to complete and return by mail. The questionnaire can also be completed securely online. Non-response phone follow-up is conducted using Computer Assisted Telephone Interviews (CATI) at Data Collection Centers from April to July. Personal interviews are limited to large operations or those with special handling arrangements, with data collected on either a paper form or by a Computer-Assisted Personal Interviewing (CAPI) instrument.

Data collection for the June Area Survey is conducted by a personal interview. Enumerators must account for all operations and land contained in their assigned segments. Enumerators interview and collect responses from the end of May through mid June. Survey questionnaires are returned to Regional Field Offices (RFOs) where they are visually reviewed and key entered.

Survey Edit: As survey data are collected and captured, they are edited for consistency and reasonableness using automated systems. The edit logic ensures administrative coding follows the methodological rules associated with the survey design. Relationships between data items on the current survey are verified and, in certain situations, items are compared to data from earlier surveys to make sure certain relationships are logical. The edit determines the status of each record to be either "dirty" or "clean" (i.e., failing or passing the edit requirements for consistency and reasonableness). Dirty records must be updated and re-edited, or certified by an analyst to be accurate. Corrected data are re-edited interactively. Only clean records are eligible for analysis tools and summary.

Analysis Tools: Edited survey records are processed and analyzed with interactive data analysis tools which display data for all reports by item. The tools provide scatter plots, tables, charts, and special tabulations that allow the analyst to compare record level data with previously reported data for the same record, and reported data from similar records. Atypical responses and unusual data relationships are revealed by the analysis tool. RFO and Headquarters (HQ) 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 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, application of detailed computer edits, and evaluation of the data via the analysis tool.

Nonresponse Adjustment: Response to the Cash Rents Survey and June Area 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 cash rental rates are to be made. For the Cash Rents Survey, nonresponse adjustments are made through rereighting techniques applied to the data from reporting farms and ranches.

For the June Area Survey, item level nonresponse is accounted for by imputing data where there are missing values. Imputed values are calculated through an automated imputation algorithm that requires a minimum of five complete reports within the imputation group to calculate the imputed value. When a group lacks a sufficient number of responses, groups are collapsed according to a defined hierarchy, preserving as much of the homogeneity as possible, until five complete reports are identified. The first imputation group is reports within the same segment. If five complete reports are not found, the imputation algorithm then moves on to reports within the same county and similar strata, then all reports in the same county, followed by all reports in the same district, and lastly, all reports in the state.

Estimators: The Cash Rents Survey uses a “reweighted” estimator to compute direct measures of acres rented for cash. 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 five. In other words, each sampled farm represents five farms. The reweighted estimator uses a global weight adjustment across all usable reports. 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.

Point estimates, called direct expansions, 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. Totals and variances are additive across strata to form a state estimate and states are additive to national estimates.

Ratio estimates are also computed for many items. For example, cash rent per acre values are calculated as the ratio of total rent paid to total acres rented. Ratio indications use the reweighted estimator described above for the numerator and denominator direct expansions. Both the numerator and denominator must be usable in order for that record to be used in the ratio estimator.

The June Area Survey uses an area frame ratio estimator that calculates the weighted average rental rate by taking the ratio of total rent paid to total acres rented. Cash rent items pertain to the entire farm level and are weighted by the original segment sampling weight and by the proportion of the farm residing inside the segment boundaries. Ratio indications are calculated including and excluding imputed data.

Outliers: NASS conducts a review of outliers found in cash rents data by reviewing rental rates for all records by practice (irrigated cropland, non-irrigated cropland, or permanent pastureland). RFO and HQ staff work together to review outliers and to ensure the most accurate data possible. A determination is made as to whether an adjustment to the cash rental rate estimate is required. Most outliers trace back to unique situations that do not exist in the target population as much as the survey weight would indicate.

Estimation: When all samples are accounted for, all responses fully edited, and the analysis material reviewed, each RFO executes summaries that generate state, district, and county level totals and ratios. The summary results provide multiple point and ratio estimates and information used to assess the performance of the survey and evaluate the quality of the survey estimates. RFOs are responsible for performing a detailed review of their survey data, interpreting the Cash Rent Survey and June Area Survey indications, and submitting state level estimate recommendations to HQ. Staff must provide justification to the Agricultural Statistics Board (ASB) in cases where recommendations deviate from survey results. The ASB reviews all state, district, and county level recommendations and establishes official estimates.

Quality Metrics for the Cash Rents Survey

Purpose and Definitions: Under the guidance of the Statistical Policy Office of the OMB, NASS provides data users with quality metrics for its published data series. The metrics tables in this document describe the performance data for the survey 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.

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 sample that responded to the survey.

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.

Cash Rents Survey Sample Size and Response Rate – States and United States: 2013 and 2014

State	Sample Size		Response Rate	
	2013 (number)	2014 (number)	2013 (percent)	2014 (percent)
Alabama	5,170	5,155	82.7	81.3
Arizona	918	929	81.6	87.3
Arkansas	5,702	5,737	81.8	80.6
California	6,480	6,651	78.4	78.4
Colorado	4,296	4,301	86.3	79.1
Connecticut	423	423	75.6	64.8
Delaware	336	345	71.2	70.8
Florida	2,591	2,656	81.0	82.8
Georgia	5,148	5,218	80.8	78.1
Hawaii	528	536	80.7	82.0
Idaho	3,610	3,701	81.9	80.3
Illinois	9,535	9,521	77.1	65.9
Indiana	8,201	8,138	70.4	72.4
Iowa	12,318	12,281	73.9	71.5
Kansas	10,429	10,550	69.6	73.4
Kentucky	6,929	6,877	79.1	77.8
Louisiana	3,541	3,530	77.5	78.0
Maine	588	582	78.9	61.3
Maryland	1,759	1,771	77.3	73.6
Massachusetts	636	646	83.2	59.5
Michigan	5,588	5,537	75.5	75.8
Minnesota	8,976	8,855	74.1	71.3
Mississippi	4,411	4,420	81.3	82.6
Missouri	10,894	11,008	76.4	68.4
Montana	4,775	4,906	68.0	75.7
Nebraska	12,168	12,454	71.4	71.1
Nevada	404	407	83.5	84.1
New Hampshire	259	257	79.2	65.6
New Jersey	960	971	84.3	67.2
New Mexico	2,099	2,106	80.0	83.6
New York	4,197	4,187	77.7	76.1
North Carolina	7,621	7,536	75.6	72.5
North Dakota	6,296	6,257	65.3	66.6
Ohio	7,562	7,442	74.0	77.1
Oklahoma	7,760	7,723	83.6	84.7
Oregon	3,585	3,662	78.8	82.3
Pennsylvania	5,356	5,254	79.1	70.4
Rhode Island	131	130	69.7	56.1
South Carolina	2,715	2,677	81.5	81.9
South Dakota	7,411	7,380	70.1	71.4
Tennessee	6,946	6,944	81.8	78.3
Texas	18,671	18,734	85.7	85.0
Utah	2,657	2,700	78.0	83.0
Vermont	774	778	81.7	68.9
Virginia	5,685	5,675	79.4	75.3
Washington	3,063	3,143	80.3	77.4
West Virginia	1,618	1,628	83.5	86.9
Wisconsin	7,042	6,928	82.6	77.3
Wyoming	1,887	1,929	82.7	80.3
United States	240,649	241,176	77.4	75.9

Cash Rents Survey Coefficient of Variation – States and United States: 2013 and 2014

State	Coefficient of variation					
	Irrigated cropland		Non-irrigated cropland		Pastureland	
	2013	2014	2013	2014	2013	2014
	(percent)	(percent)	(percent)	(percent)	(percent)	(percent)
Alabama	2.4	9.8	1.7	5.7	3.8	3.2
Arizona	11.3	7.7	(S)	(S)	19.1	19.0
Arkansas	2.8	1.8	6.7	3.6	9.6	5.8
California	6.8	5.9	7.9	9.5	4.7	14.1
Colorado	3.7	5.2	4.5	4.7	4.6	5.6
Connecticut	(S)	(S)	13.5	6.0	(S)	(S)
Delaware	6.6	12.5	4.3	2.8	(S)	(S)
Florida	18.6	9.9	41.8	10.9	17.0	8.2
Georgia	4.4	2.8	4.0	1.7	4.9	3.4
Hawaii	10.6	40.4	22.3	22.6	25.2	40.1
Idaho	5.3	4.1	6.2	5.5	11.4	13.6
Illinois	2.6	5.8	4.0	1.5	29.2	6.9
Indiana	3.9	2.7	3.1	0.9	12.7	4.9
Iowa	14.4	4.5	0.8	0.5	2.9	2.0
Kansas	4.2	4.1	2.5	1.2	2.1	2.0
Kentucky	19.6	8.1	3.0	2.6	3.0	3.0
Louisiana	4.1	4.2	7.5	2.5	7.9	9.0
Maine	(S)	(S)	6.9	4.1	(S)	(S)
Maryland	7.1	4.7	4.9	5.7	13.7	11.1
Massachusetts	14.7	25.1	22.7	12.7	(S)	(S)
Michigan	5.0	7.8	2.3	3.6	15.6	5.9
Minnesota	4.6	3.7	2.0	1.9	6.6	9.7
Mississippi	2.3	1.7	3.1	1.6	5.4	3.1
Missouri	5.1	2.4	3.9	4.7	2.2	3.7
Montana	5.4	4.9	2.9	3.4	11.3	3.7
Nebraska	1.0	0.9	2.3	1.9	3.9	3.6
Nevada	3.6	17.9	(S)	(S)	29.1	57.9
New Hampshire	(S)	(S)	9.4	8.4	(S)	(S)
New Jersey	16.2	10.4	6.4	7.5	34.3	(S)
New Mexico	16.0	9.8	9.1	10.7	5.9	8.0
New York	18.5	21.2	4.4	2.3	12.4	11.4
North Carolina	5.0	6.6	1.4	1.5	5.6	5.5
North Dakota	11.1	8.4	3.0	2.3	2.6	3.0
Ohio	26.1	10.5	1.3	1.1	11.7	11.9
Oklahoma	7.5	11.3	6.6	2.3	4.4	1.9
Oregon	4.7	14.5	10.0	6.1	9.8	13.2
Pennsylvania	16.1	12.4	6.1	5.6	15.2	12.8
Rhode Island	(S)	(S)	(S)	(S)	(S)	(S)
South Carolina	4.8	11.3	1.5	2.3	7.0	6.1
South Dakota	6.9	11.0	1.6	1.5	3.8	4.5
Tennessee	3.7	4.3	2.2	5.5	2.9	2.4
Texas	9.9	6.1	13.2	2.1	4.2	5.4
Utah	5.5	4.5	31.7	11.1	23.9	13.1
Vermont	(S)	(S)	5.8	6.1	10.8	12.9
Virginia	10.0	13.2	1.7	3.0	5.2	4.0
Washington	6.8	4.5	6.0	7.3	19.2	16.1
West Virginia	(S)	(S)	12.2	9.9	10.1	10.9
Wisconsin	6.1	6.9	2.3	2.2	4.6	8.3
Wyoming	4.0	3.8	4.9	7.1	3.5	1.9
United States	(NA)	(NA)	(NA)	(NA)	(NA)	(NA)

(NA) Not available.

(S) Insufficient number of reports to establish an estimate.

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Questionnaires	Data Collection Branch	(202) 720-6201	HQ_CSD_DCB@nass.usda.gov
Sampling and Editing	Sampling, Editing, and Imputation Methodology Branch	(202) 720-8671	HQ_MD_SEIMB@nass.usda.gov
Summary and Estimators	Summary Estimation and Disclosure Methodology Branch	(202) 720-4008	HQ_MD_SEDMB@nass.usda.gov
Dissemination	Data Dissemination Office	(202) 720-3869	HQSDOD@nass.usda.gov
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