



Farm Labor Methodology and Quality Measures

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Farm Labor Survey Methodology

Scope and Purpose: The NASS Farm Labor Survey provides the basis for employment and wage estimates for all workers directly hired by U.S. farms and ranches (excluding Alaska), for each of four quarterly reference weeks. Selected annual average estimates are summarized from the associated quarterly estimates.

The Farm Labor Survey is conducted in cooperation with the Department of Labor. The employment and wage estimates published support USDA and Department of Labor programs, and are used by additional federal, state, and local government agencies, educational institutions, farm organizations, and private sector employers of farm labor.

The NASS Farm Labor Survey is conducted semi-annually in April and October, in all surveyed states except California. During the April data collection, data for both January and April reference weeks are collected. During the October data collection, data for both July and October reference weeks are collected. The quarterly reference week is the Sunday to Saturday period which includes the 12th day of the month. For California, collection of these data is currently conducted on a quarterly basis, as part of the California Employment Development Department (EDD) monthly labor program.

Estimates published include number of hired workers during each quarterly reference week, the average hours worked, and average wage rates by type of worker. Estimates are published for the U.S., each of 15 multi-state labor regions, and the single-state regions of California, Florida, and Hawaii.

Survey Timeline: Data collection begins the week following the April or October reference week and extends approximately one week beyond the end of the month, for all surveyed states except California. In California, data collection begins shortly after the reference week in each of the four surveyed quarters and typically extends three to four weeks beyond the end of the month. NASS Regional Field Offices (RFOs) have about four or five business days following the NASS semi-annual data collection period, to complete editing and analysis, execute the summary, and interpret the survey results at the state level for each member state. The Agricultural Statistics Board performs a national review, reconciles state estimates to regional and national estimates, and prepares the official estimates for release in five to eight business days. Official Farm Labor Survey estimates are published in May (for the January and April quarters) and November (for the July and October quarters, and annual average estimates).

Sampling: The target population for the Farm Labor Survey program is all farms and ranches with \$1,000 or more in agricultural sales (or potential sales), excluding Alaska farms. NASS uses a dual frame approach, consisting of list frame and area frame components, to provide complete coverage of this target population.

The list frame includes all known agricultural establishments. A profile, called control data, 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. The primary control datum for farm labor is the peak number of workers value, the most recently reported annual peak number of hired workers for each record. List frame records with positive peak number of worker control data are included in the list frame farm labor population. The California list frame labor population defined by positive peak number of workers alone is sufficiently complete, due to the collaboration with the California EDD. For all other states, records without peak number of worker control data that have a calculated farm value of sales of at least \$10,000, many of which are expected to employ agricultural workers, are also part of the list frame farm labor population. In total, the list frame farm labor population includes approximately 1.3 million U.S. farms and ranches.

The area frame contains all land in the U.S. (except Alaska) and is therefore complete for the Farm Labor Survey program. For all states, land is stratified according to intensity of agriculture using satellite imagery. The land in each stratum is divided into segments of roughly one square mile. Segments are optimally allocated and sampled to effectively measure crops and livestock. The sampled segments are fully enumerated each June, in all states except Hawaii. All farms and ranches found operating tracts in enumerated segments are checked to see if they are included in the list frame farm labor population. The farms and ranches that are not included in the list frame labor population, called nonoverlap tracts, are eligible for the farm labor nonoverlap sample.

The farm labor list frame sample is selected using a hierarchical stratified sampling design with strata defined by peak number of farm workers or calculated farm value of sales. The sample is a panel sample and is designed to achieve a U.S. level coefficient of variation of four percent of the point estimate for all hired workers and one percent of the ratio estimate for wage rates of all workers. The U.S. list frame sample size for the Farm Labor Survey in recent years is approximately 12,500. An additional 1,500 to 2,500 sampling units are selected to support the California EDD labor program exclusively. Each list frame sampling unit is assigned a sampling weight which is used to create the survey estimates.

The farm labor area frame nonoverlap sample is selected using a stratified sample design based on data collected each June. An area frame nonoverlap sample is selected for each surveyed state except California and Hawaii. The California sample does not include a nonoverlap portion because the list frame is assumed to be complete. For Hawaii, the area frame is excluded from sampling because this frame is not updated on an annual basis. The total farm labor area frame nonoverlap sample, which includes the remaining surveyed states, consists of approximately 1,500 sampling units. Each area frame nonoverlap sampling unit is assigned a sampling weight which is used to create the survey estimates.

Data Collection: Data collection proceeds with utilization of NASS data collection instruments and follow-up procedures, in all surveyed states except California. In California, the California EDD conducts data collection utilizing EDD-specific instruments and follow-up procedures which are similar to NASS procedures.

Data Collection for All States Except California

For consistency across modes, the paper version is considered the master questionnaire and the Computer Assisted Telephone Interview (CATI) and web reporting 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 instruments are reviewed including the CATI and web instruments, and the web-supported Computer Assisted Personal Interview (CAPI) instrument.

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 do not already exist elsewhere, and that the public is not excessively burdened. The Farm Labor Survey 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.

In addition to asking the specific farm labor items, all instruments collect information to verify the sampled unit, determine any changes in the name or address, identify any partners to detect possible duplication, verify the farm still qualifies for the target population, and identify any additional operations operated by the sampled operator.

During each semi-annual data collection period, sampled farms and ranches receive a pre-survey letter explaining the survey and that they will be contacted for survey purposes only. The letter provides a paper copy of the questionnaire to allow respondents to respond by mail or to prepare in advance for a follow-up interview and also provides a pass code they can use to complete the survey on the internet. All questionnaires completed on paper are returned to the NASS National Operations Center where they are visually reviewed and key entered. All modes of data collection are utilized for

the Farm Labor Survey. 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 phone follow-up interviews from NASS Data Collection Centers, using CATI. Personal interviews, conducted via CAPI, are generally reserved for large operations or those with special handling arrangements. Data collection is coordinated for farms sampled for multiple on-going NASS surveys.

Data Collection for California

The California EDD utilizes a mail out phase with follow-up similar to the NASS procedure. All sampling units from the NASS California labor sample receive an EDD labor questionnaire which includes the NASS Farm Labor Survey questions as well as additional content.

Because the EDD program is monthly, collection of California labor data begins shortly after each respective quarterly reference week, and complete datasets are received at NASS by the following month. The EDD data collection period typically extends two to three weeks beyond the concurrent NASS April and October data collection periods. For this reason, the final California datasets for the April and October reference weeks are not fully processed until the following NASS semi-annual survey period.

Throughout the EDD data collection period, electronic files containing labor data are regularly transmitted securely to the NASS Pacific RFO in California. These files are made available to the NASS editing and analysis instruments, so that all subsequent data handling proceeds according to the NASS data analysis and estimation program.

Survey Edit: As survey data are collected and captured, data are edited for consistency and reasonableness using automated systems. Reported data are edited as a batch of data when first captured. The edit logic ensures the coding of administrative data 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. Some data items in the current survey are compared to data items from earlier surveys to ensure certain relationships are logical. The edit assigns a status to each record, indicating whether or not the record passes or fails the edit requirements for consistency and reasonableness. Records that fail edit requirements must be updated or must be certified by an analyst to be exempt from the failed edit requirement. All records must pass edit requirements, or be certified exempt, before further analysis and summary.

Analysis Tools: Edited Farm Labor Survey data are processed and analyzed with a standard interactive data 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 with previously reported data for the same record, and reported data from similar records. Atypical responses, unusual data relationships, and statistical outliers for all labor items are revealed by the analysis tool. RFO and NASS 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 Error: 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 processing systems, application of detailed computer edits, and evaluation of the data via the analysis tool. The respondent pool is monitored and reviewed during and after data collection, and data collection strategies modified where necessary, to continually minimize nonresponse error.

Nonresponse Adjustment: Response to the Farm Labor 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 farm labor are to be made. For the Farm Labor Survey, nonrespondents are accounted for by adjusting the weights of the respondents. The adjustment occurs by stratum as all strata represent homogeneous groupings of similar sized farms. The adjustment is performed by individual data item so adjustments for item nonresponse (partial reports) and unit nonresponse (refusals and inaccessibles) are done in a single calculation.

Estimators: 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 nonoverlap tracts sampled to measure the labor not accounted for by the list have a weight determined by adjusting their original area frame weight by any second stage sampling weight.

The Farm Labor Survey uses a “reweighted” estimator to compute direct measures of hired farm workers. The reweighted estimator uses a global weight adjustment across all usable reports, which is the initial sampling weight adjusted for nonresponse. 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 each reported value by the final adjusted weight and first summing to stratum totals. A variance estimate is also computed at the stratum level. The nonoverlap tracts are treated as an additional stratum. Totals and variances are additive across strata. Ratio estimates are also computed for many items. For example, wage rates are calculated as the ratio of total wages to total hours worked. Ratio estimators use the reweighted estimator described above for the numerator and denominator direct expansions. Both the numerator and denominator must be usable in order for a given record to be used in the ratio estimator.

Outliers: Both RFO and HQ statisticians conduct a review of worker and wage outliers, identified through the interactive data analysis tool, to ensure the most accurate data and indications possible. The RFO statisticians review outliers for states within their regions and the HQ statistician examines outliers across all states. Many outliers trace back to unique situations that do not exist in the target population as much as the survey weight would indicate. In some cases, aging control data result in misstratification, and this misstratification can also give rise to outliers. A determination is made as to whether an adjustment to final estimates will be required for each outlier.

Estimation: The number of hired workers, average hours worked, average wage rate data, and all associated sub-items for each surveyed reference week are summarized from the dataset. Because identical data collection instruments are used for all states, as well as identical editing and analysis processes, state data can be summarized to regional and national survey point estimates. For estimation purposes, point estimates are adopted as survey indications for all data items. The summary results provide multiple direct and ratio indications for each data series being estimated. The results also provide information used to assess the performance of the current survey and evaluate the quality of the survey indications. RFOs interpret state level survey indications and submit state level recommendations for all member states to HQ, providing justification in cases where recommendations deviate from survey indications, as well as other state specific comments and justifications. HQ executes the regional and U.S. level summaries, which utilize the same estimators and produce the same indications as the state level summaries.

The estimation process is facilitated at all levels with a second interactive analysis tool, which selectively displays current and historic summary indications and measures of indication quality, state level recommendations and comments, and final estimates for all published data items. The instrument generates tables and charts of this database content, allowing statisticians to assess trends, evaluate current and historic relationships between summary indications and preliminary or final estimates, and current and historic state level comments on local conditions and data assessment. Statisticians view and analyze all necessary database content through the instrument, to complete the estimates. RFO statisticians review only data and analyses relevant to their state level estimates, and HQ statisticians review all state, regional, and national data and analyses. All entry and transmittal of preliminary and official estimates and comments is accomplished through this data tool. Additionally, the annual average estimates are calculated using this data tool after all final quarterly estimates are established.

For the final step in the estimation process, NASS assembles a panel of statisticians to serve as the Agricultural Statistics Board (ASB) for the Farm Labor Survey, which reviews the U.S. level, regional, and state level summary indications and establishes all final, official estimates for each surveyed reference week. Since larger sample sizes yield more precise results, the ASB employs the “top-down” approach by determining the U.S. level estimates first and reconciling the state recommendations to the U.S. and regional numbers for all estimates including number of hired workers, average hours worked, average wage rates, and associated sub-items. As part of the semi-annual process, the ASB also considers revised California recommendations submitted after interpretation of final April or October datasets from the prior survey period, and issues revisions of previously published California and U.S. level estimates where appropriate. Through examining indications across states and regions, re-examining outliers and historic indications and estimates, and considering state

level recommendations and comments, the ASB is able to establish all final estimates according to both local conditions and regional and national conditions and trends. After all final quarterly estimates are established, the ASB verifies the annual average estimates for the November publication, which are summarized weighted averages of the final U.S. and regional level estimates for each of the four quarters.

Quality Metrics for the Farm Labor Survey

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 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. The multi-component nonsampling error can be difficult to quantify and measure, but response rates may offer a partial assessment.

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 sample that completed the survey. This calculation follows Guideline 3.2.2 of the Office of Management and Budget Standards and Guidelines for Statistical Surveys (Sept. 2006).

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.

Coefficient of Variation for Wage Rate by Type of Worker – United States

Reference week	Field (percent)	Livestock (percent)	Field and livestock combined (percent)
April 10 - 16, 2016	0.7	1.1	0.6
April 9 - 15, 2017	0.8	1.2	0.6
January 10 - 16, 2016	0.8	1.1	0.7
January 8 - 14, 2017	1.1	1.2	0.8

Farm Labor Sample Size and Response Rate – Regions and United States: April 10-16, 2016 and April 9-15, 2017

Region	Sample size		Response rate	
	2016 (number)	2017 (number)	2016 (percent)	2017 (percent)
Northeast I	716	791	47.9	42.5
Northeast II	581	574	54.4	50.7
Appalachian I	599	613	50.6	53.8
Appalachian II	770	794	63.4	65.1
Southeast	670	655	54.6	65.3
Florida	530	533	47.4	51.6
Lake	913	878	50.6	50.2
Cornbelt I	893	870	53.3	48.6
Cornbelt II	734	789	49.7	52.2
Delta	777	827	67.4	73.2
Northern Plains	1013	1048	54.1	51.2
Southern Plains	1064	1051	62.5	55.1
Mountain I	445	428	54.8	57.2
Mountain II	352	363	59.1	58.1
Mountain III	349	348	54.2	55.2
Pacific	644	652	46.6	42.8
California	874	862	67.4	66.2
Hawaii	391	412	68.3	50.0
United States	12,315	12,488	56.1	55.1

Farm Labor Sample Size and Response Rate – Region and United States: January 10-16, 2016 and January 8-14, 2017

Region	Sample size		Response rate	
	2016 (number)	2017 (number)	2016 (percent)	2017 (percent)
Northeast I	716	791	48.2	40.8
Northeast II	581	574	53.2	49.1
Appalachian I	599	613	50.9	53.3
Appalachian II	770	794	62.9	65.2
Southeast	670	655	53.9	64.4
Florida	530	533	47.0	51.0
Lake	913	878	49.5	49.9
Cornbelt I	893	870	53.1	48.5
Cornbelt II	734	789	48.8	51.5
Delta	777	827	66.9	71.6
Northern Plains	1013	1048	53.6	51.0
Southern Plains	1064	1051	61.8	53.4
Mountain I	445	428	54.2	55.8
Mountain II	352	363	58.2	57.6
Mountain III	349	348	53.9	54.9
Pacific	644	652	45.7	42.8
California	874	862	72.7	72.2
Hawaii	391	412	66.2	50.0
United States	12,315	12,488	55.9	54.8

**Coefficient of Variation for All Hired Workers and Wage Rate – Region and United States:
April 10-16, 2016 and April 9-15, 2017**

Region	All hired workers		Wage rate	
	2016 (percent)	2017 (percent)	2016 (percent)	2017 (percent)
Northeast I	20.2	12.5	2.2	3.1
Northeast II	13.4	15.6	2.8	2.8
Appalachian I	11.6	12.0	2.5	3.4
Appalachian II	17.3	15.0	4.6	3.8
Southeast	13.1	14.1	2.2	2.9
Florida	11.6	8.7	3.2	2.2
Lake	9.2	10.0	2.3	2.0
Cornbelt I	20.1	12.6	4.0	5.0
Cornbelt II	14.8	12.5	3.7	3.9
Delta	12.0	8.5	2.0	1.6
Northern Plains	12.1	11.3	2.6	3.1
Southern Plains	16.9	12.8	2.7	3.0
Mountain I	37.1	18.0	2.2	4.2
Mountain II	11.9	13.9	5.9	2.9
Mountain III	12.6	14.8	5.6	2.8
Pacific	16.5	12.3	1.7	2.2
California	4.2	4.3	1.0	1.1
Hawaii	10.4	9.4	2.5	5.5
United States	3.7	2.8	0.6	0.7

Coefficient of Variation for Hired Workers and Wage Rate by Standard Occupational Classification System (SOC) – United States: April 10-16, 2016 and April 9-15, 2017

Title	SOC Code	All Hired Workers		Wage rate	
		2016 (percent)	2017 (percent)	2016 (percent)	2017 (percent)
Graders and sorters, agricultural products.....	45-2041	21.3	15.6	2.9	3.3
Agricultural equipment operators	45-2091	9.8	6.2	1.6	1.7
Farmworkers, crop, nursery, and greenhouse.....	45-2092	5.9	4.0	0.8	0.9
Farmworkers, farm, ranch, and aquacultural animals.....	45-2093	5.4	6.2	1.2	1.2
Agricultural workers, all other.....	45-2099	(S)	17.6	(S)	5.1
Packers and packagers, hand	53-7064	(S)	17.1	(S)	2.9
Farmers, ranchers, and other agricultural managers.....	11-9013	8.6	7.9	3.3	2.6
First-line supervisors of farming, fishing workers.....	45-1011	8.8	7.6	4.8	2.3

(S) Data item was withheld due to insufficient number of reports.

**Coefficient of Variation for All Hired Workers and Wage Rate – Region and United States:
January 10-16, 2016 and January 8-14, 2017**

Region	All hired workers		Wage rate	
	2016 (percent)	2017 (percent)	2016 (percent)	2017 (percent)
Northeast I	19.8	12.9	2.9	3.7
Northeast II	15.1	19.8	2.9	3.5
Appalachian I	13.6	14.8	2.8	4.3
Appalachian II	21.4	12.6	5.2	4.5
Southeast	13.6	15.2	2.7	4.3
Florida	9.3	8.0	3.1	2.1
Lake	10.8	11.7	2.2	2.4
Cornbelt I	27.9	14.5	5.3	7.7
Cornbelt II	15.4	14.7	3.7	4.5
Delta	11.5	12.5	2.4	2.2
Northern Plains	14.1	13.2	3.1	3.3
Southern Plains	18.9	12.7	3.0	3.3
Mountain I	29.4	14.6	3.3	4.5
Mountain II	13.3	16.4	7.1	3.3
Mountain III	11.9	13.5	5.7	3.5
Pacific	25.7	15.1	2.2	3.0
California	5.0	4.2	1.1	1.3
Hawaii	9.2	9.1	2.5	5.6
United States	4.1	3.0	0.7	0.9

Coefficient of Variation for Hired Workers and Wage Rate by Standard Occupational Classification System (SOC) – United States: January 10-16, 2016 and January 8-14, 2017

Title	SOC Code	All Hired Workers		Wage rate	
		2016 (percent)	2017 (percent)	2016 (percent)	2017 (percent)
Graders and sorters, agricultural products.....	45-2041	19.2	16.4	3.8	2.6
Agricultural equipment operators	45-2091	13.2	7.9	1.8	2.4
Farmworkers, crop, nursery, and greenhouse.....	45-2092	7.3	4.0	1.0	1.0
Farmworkers, farm, ranch, and aquacultural animals.....	45-2093	5.1	6.3	1.2	1.3
Agricultural workers, all other.....	45-2099	(S)	17.3	(S)	5.5
Packers and packagers, hand	53-7064	(S)	23.5	(S)	9.3
Farmers, ranchers, and other agricultural managers.....	11-9013	8.2	8.2	3.1	2.7
First-line supervisors of farming, fishing workers.....	45-1011	12.2	7.4	2.9	2.5

(S) Data item was withheld due to insufficient number of reports.

Access to NASS Reports

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- All reports are available electronically, at no cost, on the NASS web site: <http://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 <http://www.nass.usda.gov> and in the “Follow NASS” box under “Receive reports by Email,” click on “National” or “State” to select the reports you would like to receive.

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@nass.usda.gov.

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