# A Method for Estimating County-Level Populations of Agricultural Workers and Their Dependents

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*Value of* ***thought.***
*Value of* ***solution.***

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## Introduction

Since the United States (U.S.) government does not provide estimates of the agricultural worker population for U.S. geographic locations the National Center for Farmworker Health asked JBS International Inc. to develop county level estimates for agricultural workers and their dependents. The purpose of these estimates is to assist those planning and providing services, particularly health services to agricultural workers. This report explains the data sources and methods used to calculate the estimates based on the 2017 Census of Agriculture.

JBS produced estimates of several components of the agricultural population including:

- Workers actively employed in agriculture;
- Workers who have recently left agricultural work,
- Aged agricultural workers who are not actively working in agriculture; and
- Dependents of agricultural workers that are not active agricultural workers themselves.

JBS calculated county-level estimates for all active agricultural workers as well as separate estimates for crop and livestock workers.

The 2017 estimates update previous estimates developed using 2012 COA data. The methods used for the 2017 worker estimates are similar to those for the 2012 estimates except for some minor changes. Additionally, the 2012 estimates did not include turnover and retired agricultural workers.

## Data Sources

The data JBS used to calculate the 2017 NCFH estimates came from the U.S. Department of Agriculture's (USDA) 2017 Census of Agriculture (COA) and the 2015-2018 National Agricultural Workers Survey (NAWS).

### 2017 Census of Agriculture

The data used in creating county-level estimates of the agricultural worker population as a whole (both crop and livestock) came from USDA's Census of Agriculture. The 2017 COA asked

agricultural producers for information on the number of hired workers they employed in 2017 as well as for their expenditures on hired and contract labor. Contract labor expenditures includes monies spent on workers hired through farm labor contractors as well as firms providing specialty workers such as custom harvesters and pesticide applicators.

The strengths of using the COA is that all the data for the active agricultural worker estimates came from a single source. Individual agricultural producers provided all three numbers about their operations on a single COA form. The use of a single source reduced potential variance in the estimates due to using multiple sources of data. Additionally, the COA has a solid reputation as a valid and reliable source of agricultural data. COA data are collected by the USDA's National Agricultural Statistics Service using well-established data protocols.[1]

An advantage of the COA is that it includes counts of hired agricultural workers and the sum of agricultural expenditures that are consistent across all counties in the United States.[2] Hired labor expenditures account for 78% of all 2017 COA labor expenditures with contract labor expenditures making up the remaining 22%. As described below, JBS uses a formula to approximate the number of contract workers based on COA expenditures on hired and contract workers.

Finally, the COA definition of agricultural work conforms with the definition of agriculture defined by the Health Resources and Services Administration (HRSA). Agricultural workers are defined as those working in NAICS 111 Crop Production, 112 Animal Production and Aquaculture, 1151 Support Services for Crop Production and 1152 Support Services for Animal Production.[3]

The data for calculating the total number of agricultural workers came from USA's public access files for the 2017 COA.[4] The separate estimates for crop workers and livestock workers relied on two special tabulations of the 2017 COA provided by the National Agricultural Statistics Service (NASS).[5]

## The National Agricultural Workers Survey

The COA data does not have information on agricultural worker dependents nor information on agricultural workers who are retired or who have recently left the agricultural workforce.

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1 Further information on the COA and its reliability and validity can be found at https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_US/usappxa.pdf

2 The US Bureau of Labor Statistics (BLS) provides quarterly counts and an annual average of contract workers whose employers pay federal and state unemployment taxes. However, only four states require universal unemployment coverage for agricultural workers. Additionally, BLS does not provide an unduplicated annual count is not available from BLS.

3 National Center for Farmworker Health NAICS accepted by HRSA for Farmworker Eligibility http://www.ncfh.org/uploads/3/8/6/8/38685499/naics_accepted_by_hrsa_for_farmworker_eligibility_%5B09012016%5D.pdf

4 USDA COA 2017 data available through USDA Quick Stats https://quickstats.nass.usda.gov/?source_desc=CENSUS

5 Special Tabulation 23531 providing 2017 Census of Agriculture Farm Labor Data by NAICS 111 and 112 requested by JBS and Special Tabulation 23531 providing 2017 Census of Agriculture Farm Labor Data by NAICS 111 and 112 requested by US DOL

For calculating these estimates JBS relied on data from the National Agricultural Workers Survey (NAWS), an annual survey of crop workers based on a nationally representative probability sample. The NAWS is an establishment survey contacting crop workers through their employers for face-to-face interviews with trained interviewers. The data used here includes information on 7,928 crop workers conducted between October 1, 2015 and September 30, 2018.[6]

The methods used to calculate retirees, turnover and dependents draw on work done by the National Farmworker Jobs Program (NFJP) and the Legal Services Corporation (LSC) service populations estimates. Both programs combine NAWS data with USDA data to derive service population estimates. Each method was developed separately and was based on an assessment of available data and methods by a panel of experts.[7] [8]

The strength of the NAWS is that it collects detailed information on crop workers that can supplement other data sources and inform calculations of workers, dependents, turnover and retired agricultural crop workers. A limitation of the survey is that it does not include livestock workers. Since there is no similar data source for livestock workers, the calculations for crop workers are used to infer information about livestock workers, their dependents, turnover and retirement. Another limitation is that due to the design and reporting limitations, the information can only be reported at the region level. The estimates produced by JBS use the 12 NAWS sampling regions which are derived from USDA's 17 region classification system. Of the 12 regions, two are individual states, California, and Florida. The remaining 10 regions are groups of states.[9] The NAWS sample does not include Alaska or Hawaii, so NAWS national averages were used for those regions.

## Methods for estimating county-level populations of agricultural workers and their dependents

### Active Agricultural Workers

An active agricultural worker was defined as an individual who performed agricultural work in a county at any point during the year. Due to agriculture's seasonality, the number of workers performing agricultural work in a given month will fluctuate and generally be lower that than the total employed over the course of the year. These fluctuations depend on each county's seasonal pattern of agricultural work.

[6] Additional details on the design and quality of the NAWS data can be found at https://www.reginfo.gov/public/do/PRAViewDocument?ref_nbr=201506-1205-006

[7] The Legal Services Corporation 2016 Report can be found at https://www.lsc.gov/about-lsc/matters-comment/agricultural-worker-population-estimates

[8] A description of the NFJP funding formula based on state service population estimates can be found in the **Federal Register** for May 19, 1999 (64 FR 27390). https://www.federalregister.gov/.

[9] More information including a map of the regions can be found at https://www.dol.gov/agencies/eta/national-agricultural-workers-survey/methodology

## Calculations used in the estimates

The number of hired crop and livestock works in each county was provided by USDA. However, the number of contract workers performing crop and livestock work had to be calculated. The formula for calculating the number of contract workers divided agricultural producers' contract labor expenditures by their expenditures per hired worker. The expenditures per hired worker was the result of dividing hired labor expenditures by the number of hired workers. The total number of agricultural workers is then the sum of total hired and total contract workers.

*Expenses per hired worker = USDA Total hired labor expenditures / USDA Total hired workers*

*Estimated contract workers = USDA Total contract labor expenditures / Expenses per hired worker.*

*Total agricultural workers = USDA Total hired workers + Estimated contract workers*

## Strengths and Weaknesses of the approach

The contract worker estimates rely on an assumption that contract workers cost the producer the same as a hired worker. While contract workers are generally paid less than hired workers,[10] labor contractors have overhead which is included in the price paid by the employer for contract workers. This overhead includes the costs of running the business, insurance, employment taxes and other personnel-related costs. Economists do not agree on whether contract workers are similar in price, more expensive or cheaper than hired labor. Classical economic theory argues that they are cheaper, while others say that contract workers may cost the same or slightly more and still be of value due to the contractor's role in taking on the regulatory compliance burden (though the employer may still retain joint liability in some cases). If contract workers are cheaper than hired workers, then the estimate here may understate this population.

Since the COA numbers are reported by producers, there is a chance that workers are double counted since they may have multiple farm jobs during the reporting year. While 19 percent of farm workers have multiple jobs, the majority do not. Duplication due to workers with multiple jobs is of less concern at the county level that at the state and national level. Migrants account for 37 percent of the 19 percent of farmworkers with multiple jobs. Since the NAWS definition of a migrant is someone who travels 75-or more miles to obtain a job in crop work, this means that the additional jobs are likely in another county. If a county has large numbers of workers who have more than one job within the county, then the estimates provided will overstate the number of unique individuals in that county.

## Missing estimates and imputations

Using the data and methods above, JBS calculated county-level estimates of livestock and crop farmworkers, based on 2017 COA data. Some counties had values for hired workers or labor expenditures that were suppressed by USDA, most likely to maintain operator privacy. A number of counties were missing one or more estimates due to missing 2017 COA data for the

[10] Findings from the National Agricultural Workers Survey (NAWS) 2015-2016: A Demographic and Employment Profile of United States Farmworkers. Research Report No. 13. January 2018. https://www.dol.gov/sites/dolgov/files/ETA/naws/pdfs/NAWS_Research_Report_13.pdf

county. Only 6 percent of counties had missing values in the public access data (that reported combined crop and livestock numbers), while 20% of counties were missing one or more values used in the breakdown of crop and livestock workers. Table 1 shows the number of counties with missing data.

Table 1 Missing Values in USDA County Level Crop and Livestock Labor Data

| Number of missing values and category | Crop | Livestock | Crop and Livestock |
|---|---|---|---|
| **Missing One Variable** | | | |
| 1. Missing Hired Expenses, but has Hired Operations | 74 | 70 | 22 |
| 1. Missing Hired Workers, but has Hired Operations | 10 | 12 | 25 |
| 1.Missing Contract Expenses, but has Contract Operations | 381 | 375 | 99 |
| 1. Only hired operations and missing payroll | | | 4 |
| Total missing one value | 465 | 457 | 150 |
| **Missing Two Variables** | | | |
| 2. Missing Contract and Hired Expenses, but has both Hired and Contract Operations | 51 | 60 | 11 |
| 2. Missing Hired Workers and Contract Expenses, but has both Hired and Contract Operations | 11 | 12 | 8 |
| 2. Missing Hired Workers and Hired Expenses, but has Hired Operations | 40 | 45 | 2 |
| 2. Missing hired values, Only has hired workers in county | | | 5 |
| 2. Only hired operations and missing hired information | | | 5 |
| Total Missing two values | 102 | 117 | 31 |
| **Missing all three values** | | | |
| 3. Missing all three, only has hired and contract operations | 34 | 34 | 2 |
| Total Counties Missing Data | 601 | 608 | 183 |
| Total Counties | 3079 | 3079 | 3072 |
| Percent with Missing Data | 20% | 20% | 6% |

Due to the number of missing values among the counties, missing county estimates were imputed. Since USDA does not suppress the number of operations, county-level farmworker totals for counties with suppressed data were imputed by dividing the state average of workers per farm times the number of farms in the county. When there was missing data at the state level, the averages were made from the sums of farms and worker estimates in counties that had worker estimates.

## Agricultural worker dependents.

The number of dependents was estimated for all dependents, as well as dependents ages 16 and older, 18 and older and 22 and older. For each of these estimates, agricultural dependents included all household members who were not active agricultural workers and who resided with the agricultural worker. The NAWS definition of household is all individuals in the workers economic household – those contributing to and/or being supported by the household income.

### Formulas for calculating dependents

Calculating dependents was a two-step process. JBS first calculated the average number of dependents per worker in each region. Then, these regional averages were multiplied by the county level estimates of the number of agricultural workers. Separate estimates were calculated for crop and livestock workers as well as for dependent age group (ages 16+, 18+, and 22+).

*Dependents = Average Dependents Per Worker in corresponding NAWS Region x County-Level Total Agricultural Workers*

When calculating the average dependents per worker, it was important to account for possible duplication of dependents where multiple farmworkers in a household could possibly report the same dependents. To deduplicate dependent counts to the extent possible, an additional weight was applied that adjusted for households' unequal probabilities of selection (due to having multiple farmworkers). A household with one agricultural worker had one chance of being selected, a household with two workers had two chances etc. Nine percent of NAWS respondents had an additional farmworker ages 14 or older in the household, most often a spouse.

**Reporting at 12 Regions**

| Region 12 | Total Dependents | Dependents 16 and Over | Dependents 18 and Over | Dependents 22 and Over | Percent of Migrant Workers | Percent of Seasonal Workers |
|---|---|---|---|---|---|---|
| Appalachia I II | 1.12 | 0.52 | 0.47 | 0.41 | 11% [a] | 89% |
| California | 1.60 | 0.85 | 0.74 | 0.61 | 15% | 85% |
| Corn Belt Norther Plains | 1.37 | 0.64 | 0.59 | 0.50 | 16% [a] | 84% |
| Delta Southeast | 1.71 | 0.70 | 0.61 | 0.52 | 9% [a] | 91% |
| Florida | 1.50 | 0.65 | 0.57 | 0.44 | 23% | 77% |
| Lake | 1.39 | 0.63 | 0.58 | 0.45 | 13% | 87% |
| Mountain I II | 1.66 | 0.73 | 0.65 | 0.58 | 13% [a] | 87% |
| Mountain III | 1.42 | 0.72 | 0.66 | 0.57 | 16% | 84% |
| Northeast I | 0.51 | 0.26 | 0.24 | 0.19 | 25% | 75% |
| Northeast II | 1.30 | 0.63 | 0.49 | 0.43 | 28% | 72% |
| Pacific | 1.64 | 0.81 | 0.65 | 0.50 | 18% | 82% |
| Southern Plains | 1.44 | 0.76 | 0.63 | 0.51 | 22% | 78% |

[a] Estimates should be interpreted with caution because it has a RSE of 31 to 50 percent. The RSE is calculated by dividing the standard error of the estimate (mean or percentage) by the estimate itself. Estimates with RSEs greater than 30 percent but no more than 50 percent should be used with caution. Given the RSE of 38% in the CBNP region, the Region 6 migrant and seasonal factors were used instead of the Region 12.

### Strengths and weaknesses of the approach

The strengths of the this approach are that it relies on an approach vetted by experts and uses national level data. Use of the NAWS also allows for estimating dependents with different characteristics such as the different age groupings in the table above.

There are several factors that can affect the interpretation of the dependent estimates. Since the dependent estimates are calculated at the regional level. The accuracy of a county's dependent estimates will depend on the extent to which the county mirrors the regional average. Second, due to the NAWS sample size, in estimating migrants, 4 of the regions had relative standard errors between 31 and 50 percent and are reported with caution.

Additionally, the dependent estimates include only those dependents residing with the worker. However, 12 percent of the time, the farm worker's economic household included dependents residing in other locations in the United States or outside of the United States A few non-resident U.S. dependents may be omitted from the counts and thus some county estimates may slightly understate the dependent population. It was not possible to unduplicate a small number of children ages 0-13 that worked in agriculture. All children 0-13 were counted as dependents and there is a slim chance that a few may also have had an employer who reported them to USDA as hired farmworkers. To the extent this might have happened it would make the estimates a slight overcount.

The NAWS has no data on Alaska and Hawaii and so national averages were used to calculate dependents for these states. The estimates do not adjust for H-2A workers who almost always have no non-farmworker dependents residing with them. In counties with high numbers of H-2A workers, the dependent counts will be overstated, and an adjustment should be made. Finally, no separate calculation was done for retirees or agricultural workers who recently left the agricultural labor force. These workers were assumed to have the same number of dependents as active agricultural workers.

## Retired workers and workers who recently left agricultural work.

Since there is no data on the number of workers who recently left agricultural work, JBS followed the LSC method and used a cohort analysis to calculate the size of population of retired workers and the populations of workers who recently left agricultural work. The cohort analysis relies on the fact that each year since 1989, the NAWS has interviewed a new cohort of agricultural worker. Using NAWS data and estimates of the size of the farmworker population going back to 1989, it was possible to calculate the number of workers in each birth year cohort working in agriculture each year.

### Workers recently leaving agricultural work

The number of workers from each birth year cohort was calculated for a two year period, 2016 and 2017. For each birth year cohort, the number of workers in the labor force in 2017 was subtracted from the number in the labor force in 2016. If there were more workers from that cohort in 2016 than 2017, then those workers were considered to be newly out of the workforce.

For each birth year cohort *i:*

$$Workers\ recently\ leaving\ agriculture_i = Workers\ in\ 2016_i - Workers\ in\ 2017_i$$

*Total workers recently leaving agriculture=Sum of workers recently leaving agriculture For birth cohorts with fewer workers in 2017 than 2016.*

A turnover rate was calculated by dividing the number of workers in the cohorts who were in the 2016 labor force but not in the 2017 labor force by the total active agricultural workers in 2017. The turnover rate was 26%.

### Retired agricultural workers

A separate cohort analysis was used to calculate aged farmworkers not in the agricultural workforce. This analysis also relied on the method used by the Legal Services Corporation. Since there is no national data on the age of retirement and life expectancy of agricultural workers, Legal Services Corporate assumed that agricultural workers, on average, retired at age 65 and spent 10 years in retirement. While the average life expectancy for Hispanics was 78 in 2017, farmworkers were assumed to die at a slightly younger age of 75 acknowledging the likely effects of poverty and other structural factors that might reduce their lifespan.

The cohort analysis for retirees was similar to that done for turnover, however it was limited to those individuals who would be retired, so those ages 65-75. For these birth cohorts, the number of workers remaining in the farm labor force was subtracted from the number in the birth year cohort that had ever done farm work.

*Retirees = Number in age cohorts ever in the agricultural labor force – Number currently in the agricultural labor force*

The LSC calculation showed that size of the retired agricultural population was 17% of the size of the 2017 agricultural labor force.

### Limitations of the cohort analyses

Due to data limitations, this calculation could only be done at the national level. Given the NAWS sample size, regional cohorts would be too small to provide reliable estimates. Since NAWS data is not available for Alaska and Hawaii, these states were omitted from the turnover and retiree calculations though the 48-state rate can be applied to Alaska and Hawaii counties where it appears applicable. Finally, it is not possible to determine whether retired farmworkers reside in the United States or out of the country.

## Summary

This document describes the methods used to estimate the size of the crop and livestock workforce in US counties as well as to provide regional estimates of the number of dependents per agricultural worker and national estimates of retired agricultural workers and those who have recently left the agricultural labor force. The strength of the approach is that it uses the same formulas and data sources to calculate each county's populations thus making it easy to compare or aggregate locales. At the same time, the estimates can be considered a starting point to be refined using local knowledge and data.