

# Health & Safety *Report*

Worker Health and Safety Branch

HS-1751

## **CALIFORNIA FARM WORKER ACTIVITY PROFILE** A Database of Farm Worker Activity Demographics

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## INTRODUCTION

As an essential component of the risk assessment process, human exposure assessment requires the assembly of many types of data to develop a set of exposure values. Risk assessors require data such as daily exposure estimates, dermal absorption rates and length of the work activity period to estimate daily and lifetime doses. Often these data are unavailable for evaluating pesticide exposure. Thus to fill these and other data gaps, risk assessors use conservative default values, surrogate data, information gathered via informal telephone interviews or estimates based upon current knowledge. Farm worker activity data is scarce or found in obscure publications. What activities take place for each crop? When do these activities take place? How long do they last? How much labor is required to complete each activity?

The project objectives were to compile demographics on California agricultural farm worker activities and make that data readily available for use in evaluating daily, seasonal and annual exposure to pesticides. This database includes information on harvested acreage, cultural practices necessary to grow a crop, length of peak and overall activity periods (such as harvest) and average hours worked per week.

## METHODS

Data were collected from a number of sources and compiled into a relational database. These sources include the California Employment Development Department (EDD), U.S. Department of Agriculture and the California Department of Food and Agriculture publications and the University of California Cooperative Extension. All data currently in the database are from 1994 statistics, with the exception of the cost studies. A user interface was then developed for querying the database and generating custom reports.

### Data Acquisition

The California Agricultural Employment and Earnings Bulletin<sup>1</sup> provides data grouped by agricultural industry (vegetable crops, deciduous fruit, etc.) on average hours an employee worked per week in the state and in each of six regions. These regions are the Sacramento Valley, San Joaquin Valley, Desert, North Coast, Central Coast and South Coast. The bulletin covers 27 agricultural industries. Data are obtained from EDD Unemployment Insurance files and a monthly survey conducted by the EDD Labor Market Division of over 4,000 employers (about 14% of the state's agricultural employers, selected to be statistically representative by size, geographic location and industry). These data represent work activities taking place during the mid-month week that includes the 12<sup>th</sup> calendar day. Employment data do not include employers or unpaid family members. The average hours per week are based on full-time and part-time production worker data. Data were entered into the database directly from these reports.

EDD also publishes the California Farm Labor Report<sup>2</sup> (Report 881A) which contains data on crop activities and peak labor requirements. Report 881A is designed to inform farm laborers of the employment opportunities available throughout the state each month. The report lists "major crop activities"; defined as those in which 100 or more workers will be employed for at least one week. Report 881A is published the middle of each month and describes farm labor activities at the middle of the previous month. These monthly documents provide data on crop, current and future farm labor activities, approximate starting date (or % of activity completed), approximate

peak activity period, estimated peak labor requirement, and approximate activity ending date. Peak period is defined as the time period when 80% or more of the peak labor requirement is employed. Data were entered into the database directly from these documents without adjustment, with the following exception.

Report 881A does not always provide the approximate starting date for each activity in the county, but instead occasionally reports the percent activity completed. For those activities in which the starting date is not given, the following formula was used to calculate the approximate start date (except when more than 50% of the activity was completed):

Start Date = Report Date - DAW (days already worked), where  
DAW =[no. of activity days remaining x (% activity completed ÷ % activity not yet completed)]

Generally, the algorithm estimated reasonable start dates when compared to data from other years. However, the algorithm seems to overestimate (compared to data from other years) the activity starting date when the percent of activity completed is more than 50%.

Other valuable data sources are the cost studies<sup>a/</sup> developed by the University of California Cooperative Extension, which describe the costs involved in establishing and producing a specific crop in various areas of California. Each cost study is specific to a particular crop, cultural practice and growing area. Within the database, these data define activities used to produce a crop and often provide the number of hours/acre required to complete the activity. Among cost studies, there is a lack of consistency in reporting activities. For example, grape cultural activities are reported as canopy management by the authors in one area and as individual activities (girdling, turning cane, etc.) in another area. In general, the activities were recorded as reported in the cost study report.

The final data source used in the database is the 1994 County Agricultural Commissioner's Data<sup>3</sup> published jointly by the U.S. Department of Agriculture and the California Department of Food and Agriculture. These data provide statistics on the number of harvested (and sometimes the number of planted) acres in California. There are some limitations in these data due to confidentiality in reporting, but they appear to be minor with no effect on the data quality. (For instance, acreage is not reported by county if it can identify the specific grower [i.e., there is only very limited acreage in a county for a particular crop].) Within the database, the acreage not recorded by county is listed under "Other".

### The Database and User Interface

We developed the database and the user interface in Microsoft Access 2.0 (Windows 3.x), converted it to Windows 95 and Access 95 then converted it again to Access 97. The program and database files are stored on the Worker Health and Safety (WH&S) file server, however it can also run on a stand-alone PC. See Appendix 1 for installation instructions and system requirements. The application operates as a run-time executable, and can be distributed without

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<sup>a/</sup> Cost studies are developed by the staff of the University of California Cooperative Extension and published jointly by the US Department of Agriculture and the Cooperative Extension. Each study is specific to a crop and is cited individually in the database.

additional licensing. The database was developed so it can be easily converted into Oracle® database format, if desired.

## **RESULTS/DISCUSSION**

This database is intended for use in developing exposure assessments. In conducting exposure assessments, risk assessors may need to develop data on absorbed daily dosage, seasonal absorbed dosage and annual absorbed dosage, depending upon the toxicological endpoint of concern. Each of these calculations requires a different piece of information on the activities of the work force. For absorbed daily dosage, assessors require data on the number of hours worked per day. For seasonal and annual absorbed dosage, the number of days worked per season and/or year is needed<sup>4</sup>.

This computer program enables users to generate custom reports on various agricultural field worker activity parameters that are relevant to exposure assessment. Upon launching the program, the user finds a main menu with an option to select one of four reports. The reports are based upon each of the data sources discussed previously. Upon selecting a particular report, the user is prompted to select (from pick lists) parameters necessary to customize the report, such as crop, activity and region. Users can access the reports in any order. Each report includes the reference(s) for the data source.

Currently, the database contains statistics for the following crops: broccoli, cauliflower, celery, cotton, raisin grapes, table grapes, wine grapes, grapefruit, lemon, lettuce, nectarines, oranges, peaches, plums, prunes, strawberries, fresh market tomatoes and processing tomatoes. The activities profiled include harvest, "preharvest", weed/thin, prune, thin, many other canopy management practices in grapes and many cultural practices involved in growing fresh market tomatoes.

The following graphics illustrate the program output using workers harvesting plums as an example. The first report summarizes harvested and planted (when data are available) acres of a particular crop in California. Table 1 displays the harvested acres of plums in California (planted acreage is unavailable for plums). From these data, the risk assessor gets an idea of the overall size of the crop and the areas in the state where the majority of the crop is grown.

**Table 1: California Plum Acreage (1994 CAC Statistics)**

Region	County	Harvested Acres	Percent of Total	Planted Acres*	Percent of Total
Central Coast	Contra Costa	20			
	<b>Central Coast Total</b>	<b>20</b>	<b>&gt;0.05%</b>		
Sacramento Valley	El Dorado	70			
	Placer	622			
	Sutter	46			
	<b>Sacramento Valley Total</b>	<b>738</b>	<b>1.7%</b>		
San Joaquin Valley	Fresno	16,169			
	Kern	2,934			
	Kings	2,024			
	Madera	1,268			
	Merced	172			
	Tulare	20,565			
	<b>San Joaquin Valley Total</b>	<b>43,132</b>	<b>97.4%</b>		
Unspecified	Other	381			
	<b>Unspecified Total</b>	<b>381</b>	<b>0.9%</b>		
	<b>Grand Total:</b>	<b>44,271</b>			

\* Blank spaces indicate that no acreage was reported.

**Data Sources:** Harvested Acreage - 1994 County Agricultural Commissioners' Data. 1994. California Agricultural Statistics Service, U.S. Department of Agriculture and California Department  
Planted Acreage - California Agricultural Statistics, 1994

Next the risk assessor needs to evaluate the cultural activities that take place in plums. Table 2 illustrates the type of information available from the cost studies. The information provided includes approximate timing of various pest control activities and the activities involving farm labor. The risk assessor can quickly assess the potential impact of pest control activities. For example, control of the codling moth may impact the timing of fertilization, thinning, irrigation and possibly harvest. These data, combined with the Pesticide Use Report, will highlight where labor activities and timing of pesticide applications overlap.

**Table 2: Crop Cultural Activities for Plums in the San Joaquin Valley, California**

Crop	Activity	Hours/acre	Percent of Total Hours	Activity Timing
<b>Plum, Southern San Joaquin Valley; Friar Variety</b>				
	Prune and train	51.6	18%	December-January
	Weed control - preemergent	0.1		December
	Shred brush	0.4		January
	Pest control - dormant	0.2		January
	Pollination	0.0		February-March
	Cultivate	0.4		March, July
	Furrow middles	0.3		March
	Pest control - codling moth	0.4		April, June-July
	Fertilize	0.1		April
	Thinning	143.3	51%	April-May
	Irrigate	10.3	4%	April-September
	Weed control - middles	0.6		May-September
	Weed control - spot spray	0.4		May-September
	Pest control - mites	0.2		June-July
	Harvest	74.2	26%	July
	<b>Total Hours/Acre In Season</b>	282.5		

**Data Source:** Johnson, R.S., H. Andris, B. Beede, K. Day, K. Klonsky and P. Livingston. 1992. Sample Costs to Establish and Produce Plums, Friar Variety, In the Southern San Joaquin Valley - 1992. University of California Cooperative Extension.

Now that the assessor knows the activities to target, data are needed on the exact timing and length of these activities. How many days are in the plum harvest season? To answer this question, one will review the activity periods report for the plum harvest. Table 3 provides data on the total season length and the peak activity season along with the number of workdays in those time periods. The total number of workdays assumes a person works 6 days a week during the peak season and 5 days per week during the rest of the activity period. The "Peak Personweeks Required" is the highest labor requirement at peak season.

**Table 3: Total and Peak Activity Periods of Persons Harvesting Plums in California, 1994**

Region/ County	Total Activity Period Start Date End Date		Total Activity Period (days)	No. Total Workdays*	Peak Activity Period** Start Date End Date		Peak Activity Period (days)	No. Peak Workdays***		Peak Personweeks Required
<b>Sacramento Valley</b>										
Placer	06-Jun-94	06-Aug-94	61	48	17-Jun-94	16-Jul-94	29	25		120
	<b>Regional Average</b>		<b>61</b>	<b>48</b>	<b>Regional Average</b>		<b>29</b>	<b>25</b>	<b>Region Total</b>	<b>120</b>
	<b>Regional Maximum</b>		<b>61</b>	<b>48</b>	<b>Regional Maximum</b>		<b>29</b>	<b>25</b>		
<b>San Joaquin Valley</b>										
Fresno	14-May-94	01-Oct-94	140	106	12-Jun-94	23-Jul-94	41	35		3,900
Kern	14-May-94	20-Aug-94	98	74	20-Jun-94	16-Jul-94	26	22		840
Kings	01-May-94	20-Aug-94	111	88	14-May-94	16-Jul-94	63	54		490
Madera	02-Jun-94	03-Sep-94	93	69	24-Jun-94	09-Jul-94	15	13		100
Tulare	26-May-94	27-Aug-94	93	74	04-Jun-94	30-Jul-94	56	48		5,650
	<b>Regional Average</b>		<b>107</b>	<b>82</b>	<b>Regional Average</b>		<b>40</b>	<b>34</b>	<b>Region Total</b>	<b>10,980</b>
	<b>Regional Maximum</b>		<b>140</b>	<b>106</b>	<b>Regional Maximum</b>		<b>63</b>	<b>54</b>		
	<b>Overall Average</b>		<b>99</b>	<b>76</b>	<b>Overall Average</b>		<b>38</b>	<b>33</b>	<b>Overall Total</b>	<b>11,100</b>
	<b>Overall Maximum</b>		<b>140</b>	<b>106</b>	<b>Overall Maximum</b>		<b>63</b>	<b>54</b>		

\* Total number of workdays in the activity period. Assumes working 6 days/week in the peak period and 5 days/week in nonpeak times.

\*\* Peak period is defined as the time period when 80% or more of the peak labor requirement is employed.

\*\*\* Number of workdays in peak activity period. Assumes working 6 days/week.

Source: Employment Development Department (EDD), 1994. Estimated Midmonth Employment by County - Week Ending: January, 15, 1994 (and every month in a 1-year period). State of California, EDD, Job Service Division, Agriculture Reporting Unit. Report 881A.

The final report estimates number of hours worked per week in each major agricultural industry. Thus, in our example, to find the number of hours worked in plum orchards, the risk assessor would look at the data under "Deciduous Tree Fruit". Table 4 exhibits the data from this report.

**Table 4: Hours Worked Per Week in San Joaquin Valley Plum Orchards in California\***  
**Selection Criteria:** Plum

Crop Grouping/Region	Month	Hrs Worked Per Week
<b>Deciduous Tree Fruit</b>		
<b>Region: San Joaquin Valley</b>		
	Jan 1994	44.4
	Feb 1994	35.3
	Mar 1994	42.1
	Apr 1994	45.7
	May 1994	42.8
	Jun 1994	42.7
	Jul 1994	44.9
	Aug 1994	39.5
	Sep 1994	41.5
	Oct 1994	34.8
	Nov 1994	35.0
	Dec 1994	41.0
	<b>Regional Average</b>	<b>40.8</b>

\*This report is based on data from crop groupings (i.e., Deciduous Tree Fruit) in six regions in California. Thus, all values in this table are averages of all activities in all crops within the crop grouping. It is not data specifically for plums.

Source: Employment Development Department, 1994. California Agricultural Employment and Earnings Bulletin, January 1994 through December 1994. State of California, EDD, Labor Market Information Division. (Tables 2-D, 3-D, 4-D, 5-D, 6D and 7D)

We have documented each data point entered in this database. This document is rather lengthy, but is available upon request.

## DISCUSSION

In an attempt to validate portions of the database output, we compared the harvest activity periods to reports on shipping activities. In California, the shipping season for most fresh fruit and vegetables should coincide reasonably well with the harvest season.

The California Tree Fruit Agreement (CTFA) constitutes the marketing agreement for stone fruit growers in California. CTFA produces an annual report<sup>5</sup> detailing the length of the shipping season by crop. In 1994, CTFA records indicate the shipping season for plums in the San Joaquin Valley was May 5 through September 15. The peak shipping season (>900,000 packages) was May 26 through August 4; shipping slowed (<900,000 packages) the week June 2 but picked up again after June 16. A query of the database indicates the 1994 harvest season for

plums in the San Joaquin Valley was May 1 through October 1 with the peak season running from May 14 through July 30. These data agree reasonably well.

If we examine the 1994 nectarine harvest season, we find the shipping season runs from April 28 through September 15<sup>5</sup>. The peak shipping season (>900,000 packages) was June 9 through August 25. The CFWAP database indicates the 1994 harvest season for nectarines in the San Joaquin Valley was April 26 through October 8, with the peak season from May 14 through August 6. Again, these data agree reasonably well.

The Federal-State Market News Service also published shipping data<sup>6</sup>. In the south coast, the celery shipping dates in 1991 were November through July, with peak shipping (>900,000 units) from February through June. A query of the database indicates the 1994 celery harvest season in Ventura County was December 4 through July 15, with the peak season lasting from January 21 through March 18. Again, these dates agree reasonably well, considering the differences expected in year-to-year variation.

## REFERENCES

1. Employment Development Department (EDD). 1994. California Agricultural Employment and Earnings Bulletin, January 1994 (and every month in 1994). State of California, EDD, Labor Market Information Division. (Tables 2-D, 3-D, 4-D, 5-D, 6-D and 7-D)
2. EDD. 1994. Estimated Midmonth Employment By County - Week Ending January 15, 1994 (and every month for 1994). State of California, EDD, Job Service Division, Agriculture Reporting Unit. Report 881A
3. California Agricultural Statistics Service. 1995. 1994 County Agricultural Commissioners' Data. US Department of Agriculture and California Department of Food and Agriculture.
4. Thongsinthusak, T., J.H. Ross and D. Meinders. 1993. Guidance for the Preparation of Human Pesticide Exposure Assessment Documents. California Environmental Protection Agency, Department of Pesticide Regulation, Worker Health and Safety Branch, Report No. HS-1612.
5. Anonymous. 1995. 1994 California Tree Fruit Agreement Annual Report.
6. Federal-State Market News Service. 1992. Marketing California Celery 1991. US Department of Agriculture and California Department of Food and Agriculture.



# CALIFORNIA FARM WORKER ACTIVITY PROFILE

A Database of Farm Worker Activity Demographics

*USER'S MANUAL*

Version 3.0

## Minimum System Requirements

Pentium with 32 MB RAM

Windows 9X or NT (32-bit operating system)

Minimum disk space required - 18 MB

## Loading Instructions

1. Close down all active applications.
2. Insert Setup Disk 1 or the CD-ROM; run setup.exe.
3. Important: **Accept default directory**; otherwise the program will not operate properly.
4. Press button for typical setup.
5. File copy begins.
6. If using disks, follow instructions for copying additional disks. Remove the last floppy disk or CD.
7. To start program, launch CFWAP from CA Farm Worker Activity Profile program group.

## Crops

The database contains information for the following crops:

Broccoli	Grapes, wine	Peaches
Cauliflower	Grapefruit	Plums
Celery	Lemons	Prunes
Cotton	Lettuce	Strawberries
Grapes, raisin	Nectarines	Tomatoes, fresh market
Grapes, table	Oranges	Tomatoes, processing

## Activity

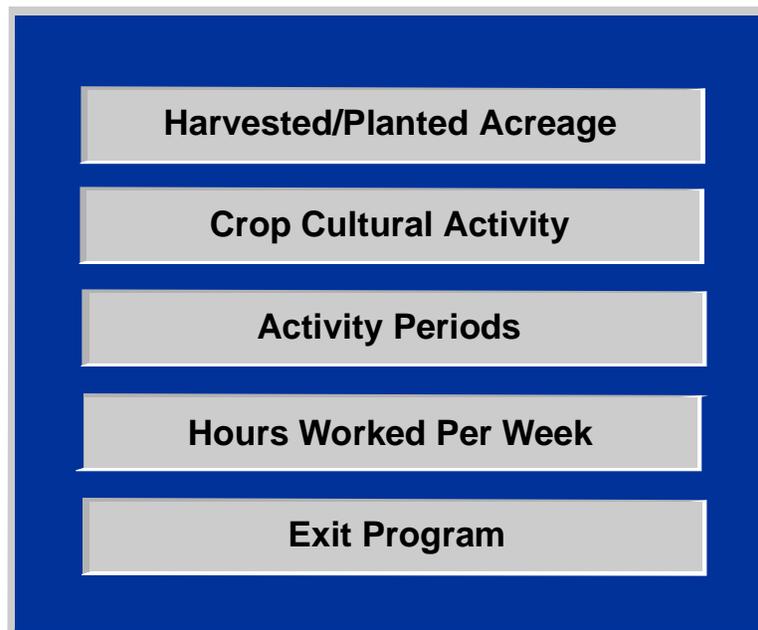
In general, information for the following crop/activity combinations can be found in the database:

Row Crops	Thin/weed Harvest	Grapes	Prune Sucker Girdle
Tree Crops	Prune Thin Harvest		Thin Tie vines Pull leaves Harvest

### **Opening Menu**

Upon launching the program, the user sees the main menu shown below. Each button corresponds to a specific report (except the "Exit Program" button). Each report cites the source of the original data.

## *California Farm Worker Activity Profile*



### **Reports**

For every report, there is a menu and tool bar at the top of the screen. The following summarizes these functions.

Options - The options menu allows you to:

- Save the report to a file - This saves the document to a rtf (rich text format) file. The rtf format loses the graphics shown in the original report; however the data translates well. The rtf file can be viewed from or inserted into most word processing files.
- ReQuery - This option take you back to select another crop (and activity/region) for the same report.
- Return to Main Menu - Click on this option and you will be sent back to the opening menu discussed above.
- Exit Program - This option gets you out of the CFWAP program completely.

Toolbar -

= Return to Main Menu



= Renew search (or requery)



= Print file



=Save to File (.rtf format)



=Exit Program

Harvested/Planted Acreage Report - Provides data on harvested, and sometimes planted, acreage for the specified crop. This data can also be used to assess the growing locations of crops in the state. The data is derived from the county agricultural crop statistics. There are only minor limitations of this particular data set; these are due to confidentiality issues. (For instance, acreage does not have to be reported if it will identify the specific grower [i.e., only very limited acreage in a county for a particular crop]). The acreage that falls in this category is listed under "Other".

The user clicks on the report button and is given the option to select a crop from a pull-down pick list. It is best to use the pick list to ensure the crop is listed in the database and to avoid spelling errors.

Cultural Crop Activity Report – This report provides data on the activities necessary to produce the crop of interest in specific areas of California. Data may also be provided on the number of person-hours per acre needed to complete the specified activity and approximate timing of the activity. In some instances the number of person-hours required per acre had to be calculated (from total labor cost per acre and wage information). Where there is complete information, the total number of hours necessary to grow and harvest a crop is totaled and percentages are given to activities. This data can be combined with data from the California Pesticide Use Report to determine where labor activities and pesticide use overlap.

The user clicks on the report button and is given the option to select a crop from a pull-down pick list. It is best to use the pick list to ensure the crop is listed in the database and to avoid spelling errors.

Activity Periods Report - This report provides data, by crop, on specific activity timing. It lists activity starting and ending dates, peak activity period and the estimated peak labor requirements. Peak activity period is defined as the time when 80% of the peak labor requirement is employed. In some instances the start of the activity period was not listed, but the percent of activity completed was given instead. In those cases, a basic proportionality algorithm was used to calculate the activity start date.

## Appendix 1

The user clicks on the report button and is given the option to select a crop, activity and region from pull-down pick lists. You must select a crop and activity. The selection of a region is optional. If a region is not selected, data will be reported for the entire state by region. It is best to use the pick list to ensure the crop and activity of interest is listed in the database and to avoid spelling errors.

Hours Worked Per Week Report - Data provided includes the average hours worked per week by *major agricultural industry* (not specific crop). Thus, if you want data for plums, this report will list average hours worked per week for deciduous fruit activities.

The user clicks on the report button and is given the option to select a crop and region from pull-down pick lists. You must select a crop. The selection of a region is optional. If a region is not selected, data will be reported for the entire state by region. It is best to use the pick list to ensure the crop is listed in the database and to avoid spelling errors.