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Workplace Health-and-Safety Violations in
Agriculture: Epidemiology and
Implications for Education and
Enforcement Policy

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The Chicano/Latino Policy Project (CLPP) is an affiliated research program of the Institute for the Study of Social Change at the University of California, Berkeley. The CLPP supports, coordinates and develops research on public policy issues related to Latinos in the United States and serves as a component unit of a multi-campus Latino policy studies program in the University of California. CLPP's current research focus is Latino youth achievement. However, CLPP is committed to supporting and promoting the development of public policy research from a wide range of disciplines, including, but not limited to education, health care, immigration and political participation, and labor mobility.

The Institute for the Study of Social Change is an organized research unit at the University of California at Berkeley devoted to studies that will increase the understanding of the mechanisms that influence social change. ISSC has a particular mandate to conduct research and to provide research training on matters of social stratification and differentiation, including the condition of both economically and politically depressed minorities as well as the more privileged strata.

The California Policy Seminar was established in 1977 as a joint effort of the University of California and state government. The CPS applies the extensive research expertise of the UC system to the analysis, development, and implementation of state policy through a variety of activities on a wide range of topics. CPS conducts two programs—policy research and technical assistance—both of which are supported by an active dissemination effort involving publications and special briefings that feature the policy-related research of UC faculty. CPS also administers the Latina/Latino Policy Research Program. The Latina/Latino Policy Research Program was created as part of a UC Office of the President initiative on policy studies related to the state's Latino population, which was established in response to California Senate Concurrent Resolution 43.

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A summary of this report is available at <http://www.ucop.edu/cps/mccurdy.html>, or you may request the paper version of this Policy Brief by calling the CPS at (510) 643-9328.

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I. EXECUTIVE SUMMARY

INTRODUCTION AND RESEARCH OBJECTIVES

Agriculture is one of the most important industries in California, enjoying over \$22 billion in farm cash receipts annually. In addition to economic benefits, national and state data show that agriculture is one of the most dangerous industries with respect to occupational illnesses and injuries. Because Latino and Latina workers provide the majority of production labor in the industry, they are at uniquely increased risk for occupational injury and illness.

Regulation of the agricultural workplace is under the purview of several federal, state, and local agencies, including the U.S. Department of Labor, Occupational Safety and Health Administration, State of California (Cal-OSHA), Department of Industrial Relations, Department of Pesticide Regulation, U.S. Environmental Protection Agency, county health departments, county agricultural commissioners, and the California Highway Patrol (transportation of workers to jobs).

The fragmentation of regulatory activities causes inefficiency and confusion on the part of employers, employees, and regulators. In particular, lack of information sharing between agencies leads to ineffective enforcement and educational efforts. Consequently, a pilot program was begun in 1992 that partnered agencies to improve efficiency through sharing of resources and information. The program, intended to target industries with a history of regulatory problems, was named the Targeted Industries Partnership Program (TIPP). Agriculture and garment manufacturing were chosen as targeted industries because of their importance for California and their history of regulatory problems.

TIPP is jointly administered by the California Labor Commissioner's Office and the U.S. Department of Labor, Wage and Hour Division (USDOL-WHD). Participating agencies include the Department of Industrial Relations, Division of Labor Standards Enforcement (CDIR-DLSE); the Employment Development Department (EDD); and Cal-OSHA. During any given TIPP activity, up to twelve agencies (federal, state, or local) may be involved.

This coordinated approach helps to weave together what would otherwise be a haphazard patchwork of regulatory activity. Specific violations addressed by the TIPP inspectors include health and safety, farm-labor contractor laws (licensing, registration, vehicle insurance), workers' compensation insurance, and regulations pertaining to wage and hour requirements and record keeping. In spite of the importance of these efforts in promoting workplace welfare, responsible agencies have inadequate resources for enforcement, education, and epidemiological analysis that could

provide insight into the patterns of violations and help focus agency efforts.

The main research objective of this project is to characterize agricultural operations that have received notices of violation of health, safety, and labor regulations during 1993 and 1994 through TIPP and to identify patterns and risk factors for violation. Using a database of California farm operations developed and maintained by the California Institute for Rural Studies (CIRS), we compared operations that received notices of violations through TIPP during 1993 and 1994 with those that did not. This allowed us to develop a profile of operations at high risk for labor-law violations, identify and characterize risk factors, and describe patterns of violation. In addition, TIPP files were matched against the Licensed Farm Labor Contractor file (provided by the CDIR) to identify which TIPP citations were made to licensed farm-labor contractors.

Regulatory agencies can use information profiling high-risk operations to target educational and enforcement programs within the agricultural sector. The program brings major benefit for both employees and employers. Employees have greater assurance of working in a safe work environment. Farm operators who are in compliance with the law also benefit, because more widespread compliance means they are less likely to be competing with persons reducing operating costs through noncompliance. The state as a whole stands to benefit in that improved compliance brings about safer working conditions, leading to increased productivity and reduced lost-work time, medical expenses, and other associated losses.

The specific aims of this project are to:

1. Identify the group of agricultural employers that received notices of violations through TIPP during 1993-1994, the most recently available two-year period.
2. Compare operations that received notices of violation with operations that had not.
3. Develop a characteristic risk profile of operations likely to receive notices of violation.
4. Prepare a report describing the results and including policy implications and recommendations.

The basic rationale supporting ongoing programs for assessing compliance with health-and-safety regulations is that these efforts will improve compliance and thereby reduce occupational health risks. However, compliance-assessment efforts typically are enforcement-based or complaint-based, which inevitably injects bias and error into statistical summaries because inspections do not involve a representative sample of operations. The consequences of this for policymakers is that they often must act without valid and reliable information.

One reason that statistical assessment of enforcement and compliance receives little support is cost. In addition, workplace regulation is fragmented by the involvement of several agencies comprising disparate jurisdictions.

In this context, TIPP represents a creative effort to use resources efficiently by partnering several agencies with responsibility for regulating the agricultural workplace. We used data from this

program to develop a risk profile of operations that received notices of violation for 1993 and 1994. The main findings and recommendations are listed below. Although they were not part of the original specific aims for this project, we also examined Cal-OSHA reports of serious violations entered in the Integrated Management Information System (IMIS) and examined TIPP data in the context of labor expense as a surrogate for labor activity or demand.

SUMMARY OF METHODS

The general goal of this study was to identify agricultural operations receiving notices of violation through TIPP and compare them with operations that had not received notices of violation. We linked reports of violations from the TIPP database for 1993 and 1994 to specific agricultural producers contained in a large database of over 37,000 California farm operators developed and maintained by the California Institute for Rural Studies. Through this linkage, we identified those producers with violations and compared this group to producers without violations. The results were used to develop a comparative profile of high-risk producers for the purpose of focusing educational and enforcement resources. We also linked the TIPP files to the CDIR's Licensed Farm Labor Contractor file to identify which citations had been issued to licensed farm labor contractors.

In this manner we were able to identify operations that had received notices of violation through TIPP in 1993 and 1994 and identify them as farms, licensed farm-labor contractors, or unlicensed farm-labor contractors. For farmers we were able to compare cited operations with those that had not received notices of violation. Using standard statistical techniques, we compared these two groups to develop a profile of operations receiving notices of violation. Reports from the OSHA IMIS database and labor expense data were obtained from the relevant governmental agencies as described in this report.

SUMMARY OF RESULTS

1. The TIPP databases yielded 323 reports for 1993 and 278 for 1994, for a combined total of 601 reports comprising 1525 notices of violation.
2. Of the 601 TIPP reports for 1993 and 1994, 261 (43.4%) involved farm operators. While 69% (223/323) of the 1993 reports involved multiple notices of violation, only 19% (53/278) of the 1994 reports did so. We note, however, that participating agencies may keep separate records of their enforcement actions. In particular, health-and-safety violations identified by Cal-OSHA were no longer included in the TIPP database after 1993. Thus, no single set of records reflecting TIPP activities exists.
3. Of the 1525 notices of violation contained in TIPP reports for 1993 and 1994, 131 (8.6%) involved health-and-safety infractions. The most common of these were inadequate washing facilities, cited in 70 (53.4%) notices of violation.

4. Of the 601 TIPP reports for 1993 and 1994, farm-labor contractors represented 27% (87/323) for 1993 and 1994 (74/278).
5. One hundred sixty-nine TIPP reports comprising 520 notices of violation were matched with operations within the California Farm Operators Database. Operations receiving notices of violation from TIPP during 1993 or 1994 and matched to the California Farm Operators Database had greater acreage than operations not receiving notices of violation (mean 8,675.7 vs. 7,424.2 acres, $p < 0.01$). Cited operations were also more likely than noncited operations to operate in more than one county (16.6% vs. 4.4%, $p < 0.001$). The most common crops among cited operations were strawberries (28.4% of operations), raisin grapes (16.6% of operations), and broccoli (16.6% of operations). These three crops were also more likely to be grown by cited than by noncited operations.
6. Comparison of operations receiving a single notice of violation ($n=57$) with operations receiving multiple notices of violation ($n=112$) showed that multiply-cited operations were more likely than singly-cited operations to farm in more than one county (18.8% vs. 12.3%, $p < 0.3$). This finding was not statistically significant.
7. Relative to labor expenses, operations with the following characteristics were more likely than others to receive TIPP citations: fruit and nut operations (SIC 017x), for which the excess was most marked among berry producers (SIC 0171), small operations with less than \$100,000 annual farm cash receipts, and South Coast operations.
8. Based on Cal-OSHA files and state licensing files, approximately one in 14 licensed farm-labor contractors received a fine for serious OSHA violations on an average annual basis. In contrast, farm operators exhibited a much lower average annual rate, approximately one in 400.

POLICY RECOMMENDATIONS

Recommendation 1. The State Labor Commissioner and U.S. Department of Labor should encourage and expand the TIPP model of interagency collaboration.

The TIPP model of interagency cooperation has demonstrated its effectiveness in the large percentage of TIPP reports that include multiple citations from different agencies. However, in some areas collaboration has been incomplete. For example, the database of TIPP reports for 1994 and subsequent years does not include health-and-safety violations, which are reported separately to the OSHA IMIS database.

The TIPP program should make a concerted effort to engage all agencies with regulatory responsibility in this effort. For example, the California Highway Patrol should be involved to address vehicular safety concerns, such as those related to transportation of field workers to and from work.

Increased interagency collaboration is helpful in maximizing the utility of existing resources. However, the program and the agricultural community would be likely to benefit by increases in resources devoted to preventive education and field enforcement activities. Participating staff should have sufficient command of Spanish to communicate with farmworkers.

Recommendation 2. Data collection procedures should be designed to facilitate timely data management and computer analysis suitable to the needs of participating agencies.

Data collection forms can be designed to facilitate data collection and accurate entry into computer systems for analysis. Design should include appropriate categories of violations. This process should be guided by considerations of how the data will be used. In particular, whether categories are broad and inclusive vs. narrow and precise will depend on how the data will be used from a regulatory standpoint. If it is important to distinguish different types of violations, then a greater number of narrower categories will be required.

Data forms can be prepared on optically readable forms. (These should be forms for which agency staff fill in the appropriate “bubbles”—rather than relying on handwriting recognition.) Scannable forms have a major advantage in that the completed form can simply be fed into a device that automatically reads the data and enters it into a computer for analysis. This process can save significant time, reduce data errors, and facilitate analysis and report writing. Efficiency could also be improved by immediate on-site entry into laptop computers; these could also hold useful databases (e.g., insurance coverage records and violation histories) for on-site field use.

The utility of reports could be greatly increased by including further descriptive information relevant for the participating agencies. In the IMIS system, for example, information on number of employees and union status are included. Inclusion of descriptive information deemed relevant by the participating agencies would aid in understanding patterns of violation.

Comment: Improved utilization of computers would allow more timely review of data and facilitate planning of agency activities. For example, data we analyzed for this report showed an increased risk of violations among berry producers. However, more recent information, conveyed to us in personal communications by our reviewers during the preparation of this report, suggests that current compliance among strawberry producers is high. Improved use of computers with short turn-around time for data review would allow agencies to react to changes as they occur.

Recommendation 3. Develop standardized reports showing inspection activity.

Basic reports documenting prevalence and characteristics of specified infractions could be developed and to a large extent automated by computer. Although in-depth analyses may be

subsequently required, the basic descriptive report could be developed relatively easily. In addition, if a computer-readable report form is developed, real-time data and reports could be available with little demand for administrative staff time devoted to their preparation. Rather, valuable staff time could be devoted to interpreting and developing policy, preventive, and educational measures. The design of the descriptive reports should be developed to meet the needs of the relevant agency. Customized versions of the report could be developed to meet the needs of the various participating agencies.

Recommendation 4. Target groups at increased risk for violation with educational programs to help them understand the law, resources for maintaining compliance, and enforcement efforts.

Based on these data, this group includes farm-labor contractors and larger farms and farmers operating in more than one county. Fruit- and nut-producing operations, in particular berry-producing operations, appear to be at higher risk than others. We caution, however, that identification of specific high-risk groups is subject to error because the data are not from a randomly selected, representative sample of agricultural operations.

Recommendation 5. Regularize follow-up of cited operations to assure subsequent compliance and determine impact of enforcement actions.

Follow-up for cited operations is an important part of maintaining subsequent compliance with regulatory requirements. Clearly, maintaining staff for this purpose represents a budgetary and personnel demand for agencies that may have insufficient resources. However, collaboration with partnered agencies offers potential efficiencies that may allow increased follow-up inspections.

Recommendation 6. Consider developing a program to provide unbiased information on the prevalence of infractions, utilizing a representative sample of local operations employing farmworkers directly or through contractors.

An inspection program utilizing an unbiased (i.e., representative) sample of local operations employing farmworkers directly or through contractors would allow agencies to determine how commonly or frequently specific infractions occur. This would provide a truer picture than currently available of infractions among operations and allow agencies to develop educational, preventive, and enforcement strategies based on a more realistic view of infractions within the industry.

In contrast, when information is based on complaints or leads, the resulting data represent a group of agricultural operations at high risk for violations; such a group is a biased sample—i.e., it is not representative of all agricultural operations. Similarly, operations that have not been inspected and cited may still have infractions of health-and-safety laws that have simply not been reported. Information on the true prevalence of specific infractions would be invaluable for developing policy

and focusing resources, and information on true prevalence can only be obtained from a valid sampling system.

A valid, unbiased sampling system ideally would involve random sample selection from a complete list of area operations. Although various state agencies maintain lists of agricultural operations for their purposes (e.g., tax collection, crop production, etc.), the state does not maintain a comprehensive listing of operations utilizing farm labor. Developing and maintaining such a list requires ongoing commitment of resources.

We note that a program to provide information on the prevalence of infractions represents a departure from the original purpose of the TIPP program. Specifically, such a program would entail inspection of a random sample of operations, rather than focusing on those with complaints or at high risk for infractions. Whereas the original TIPP model garners support among employers because it lessens unfair competition from noncompliant operators, a random-inspection program intended to provide unbiased information on the prevalence of infractions may encounter difficulty in gaining support from employers. Whereas employers support the original TIPP model because it lessens unfair competition from noncompliant operators, employers may be less likely to support a random-inspection program intended to provide unbiased information on the prevalence of infractions.

II. INTRODUCTION

The agricultural work environment is characterized by numerous potential health hazards, including farm machinery, livestock, chemicals, and respirable dusts.^{1,2} Injuries represent one of the most important occupational health problems among agricultural populations.^{3,4} According to National Safety Council data for 1993, agricultural workers sustain 35 deaths per 10⁵ person-years, making agriculture the most dangerous industrial sector according to this index, ahead of mining (33 deaths per 10⁵ person-years) and construction (22 deaths per 10⁵ person-years).⁵

Agriculture is particularly important in California. The state holds over 77,000 farms representing over \$22 billion in receipts for 1995 (according to California Department of Food and Agriculture Director Ann Veneman). California's agricultural industry employs approximately 700,000 farmworkers,⁶ who perform more than 80% of production labor on California farms.⁷ In California, over 90% of this hired labor force is foreign-born and is nearly entirely Latino.⁸ Language and literacy barriers may complicate safety training, increasing vulnerability to occupational health risks.⁹ Data from the California Workers Compensation insurance system show that in 1992 California farmworkers suffered more than 35,000 on-the-job injuries—11.6 reported injuries per 100 full-time employees.¹⁰ In contrast, California farmers and family members suffered fewer than 800

¹ Coultas, D.B., H. Gong, Jr., R. Grad, A. Handler, S.A. McCurdy, R. Player, E.R. Rhoades, J.M. Samet, A. Thomas, M. Westley (1994): Respiratory diseases in minorities of the United States. *Am J Respir Crit Care Med* 149:593-131.

² McCurdy, S. (1995): "Occupational health status of migrant and seasonal farmworkers." In H. McDuffie, J. Dosman, K. Semchuk, S. Olenchock, A. Senthilselvan (eds.): *Agricultural Health and Safety: Workplace, Environment, Sustainability* (supplement). Chelsea, Mich.: Lewis Publications, pp. 213-216.

³ Merchant, J.A. (1991): Agricultural injuries. In D.H. Cordes and D.F. Rea (eds.): *Occupational Medicine State of the Art Reviews: Health Hazards of Farming*. Philadelphia: Hanley and Belfus, Inc., pp. 529-539.

⁴ Rust, G.S. (1990): Health status of migrant farmworkers: a literature review and commentary. *Am J Public Health* 80:1213-1217.

⁵ National Safety Council (1994): *Accident Facts, 1994 Edition*. Itasca, Ill.: National Safety Council.

⁶ Gabbard, S., E. Kissam, P. Martin (1993): *The Impact of Migrant Travel Patterns on the Undercount of Hispanic Farm Workers*. Paper presented to Research Conference on Undercounted Ethnic Populations, Bureau of the Census, Washington, D.C.

⁷ Villarejo, D., D. Runsten (1993): *California's Agricultural Dilemma*. California Institute for Rural Studies.

⁸ Meister, J.S. (1991): The health of migrant farm workers. In D.H. Cordes and D.F. Rea (eds.): *Occupational Medicine State of the Art Reviews: Health Hazards of Farming*. Philadelphia: Hanley and Belfus, Inc., pp. 503-518.

⁹ McCurdy, S. (1995): "Occupational health status of migrant and seasonal farmworkers." In H. McDuffie, J. Dosman, K. Semchuk, S. Olenchock, A. Senthilselvan (eds.): *Agricultural Health and Safety: Workplace, Environment, Sustainability* (supplement). Chelsea, Mich.: Lewis Publications, pp. 213-216.

¹⁰ California Department of Industrial Relations (1993). *Occupational Injuries and Illness Survey*. San Francisco, California, 1991. Division of Labor Statistics and Research.

occupational injuries or illnesses in the same year.¹¹ Therefore, concern for employees is the natural primary focus of efforts to improve occupational health on California farms.

THE TARGETED INDUSTRIES PARTNERSHIP PROGRAM (TIPP)

This report reviews enforcement actions in agriculture undertaken by the Targeted Industries Partnership Program (TIPP), a coordinated multi-agency education and enforcement initiative started November 1, 1992, and led for three years by former state Labor Commissioner Victoria Bradshaw and Dr. William C. Buhl (Regional Administrator, U.S. Department of Labor, Wage and Hour Division). In 1996, Roberta Mendonca succeeded Commissioner Bradshaw and now jointly directs this effort with Dr. Buhl.

TIPP focuses exclusively on the agricultural and cut-and-sew garment industries, sectors that are widely believed to have high levels of non-compliance with safety and labor laws. The effort is aimed at improving compliance through positive encouragement, by providing education and assistance customized to employer needs, as well as vigorous enforcement of federal and state laws governing conditions of employment.

A unique feature of TIPP is that it seeks to coordinate the efforts of nearly all agencies with authority for enforcement of safety and labor laws. This authority is widely dispersed among a myriad of federal, state, and local agencies, leading to potential problems such as duplication of effort and inadequate oversight. These problems are compounded by a lack of sharing of information between agencies. In a climate of significantly reduced federal and state support for regulatory activities, a coordinated effort holds the promise of using shrinking resources more efficiently.

California's 1995 farm cash receipts of more than \$22 billion were nearly twice the amount for second-ranked Iowa. The Golden State is also the top producer of a remarkably diverse number of agricultural commodities, accounting for more than half of the nation's major fresh vegetables and two-fifths of its fruits and nuts. Last year, California surpassed Wisconsin to become the leader in fluid milk production as well.

Less well understood is that California also leads the nation in the annual growth rate of farm production. Despite six years of drought, a severe recession, urbanization and major storms, California's farm production increased sharply in the past 15 years, led by very much larger outputs of fruits, vegetables, and ornamental horticultural products. These increases reflect both changes in consumer demand, especially greater per capita consumption of fresh fruits and vegetables, as well as major increases in exports, particularly to Asian markets. Overall, the annual tonnage of California vegetable production has doubled in this period, while fruit tonnage has increased by 40%.

¹¹ U.S. Department of Commerce (1994): 1992 Census of Agriculture. Volume 1, Geographic Area Series. Part 5, California State and County Data. U.S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census. AC92-A-5. Washington D.C.

These increases have expanded labor requirements. After taking account of improvements in worker productivity, overall labor demand in California agriculture has increased by about 20% during the past 15 years.¹²

At the same time, the farmworker population has greatly expanded, largely through immigration. The number of persons employed in a single year in California agriculture is not accurately known, but is estimated to be 700,000,¹³ accounting for more than one-fourth of the nation's estimated 2.5 million hired farmworkers.

The Immigration Reform and Control Act of 1986 stimulated a substantial influx of immigrants, both authorized and unauthorized.¹⁴¹⁵ Today, nine of every ten California farmworkers are foreign-born; most are from Mexico or Central America.

This new immigration has both broadened and deepened among the peoples of Mexico and Central America. Among the new migrants working in the fields of California, an estimated 50,000 are from indigenous groups in their countries of origin.¹⁶ The new immigrants have low levels of educational attainment; an estimated 70% are functionally illiterate.¹⁷ Difficulties are multiplied for persons from indigenous groups, who may speak neither English nor Spanish and communicate in an unwritten indigenous language.

As the number of farmers and unpaid family members working in agriculture steadily decreases, and as farms have become increasingly dominated by large businesses, California's agriculture has become more dependent on hired workers. Today, at least 80% of all work on California farms is performed by hired labor.¹⁸

The single most important development in farm employment in recent years is the rapidly growing reliance on farm-labor contractors, i.e., labor market intermediaries who match workers with farm jobs. Nationally, farmers report a 60% increase in real-dollar expenditures for contract labor since 1974, while direct-hire labor expenses, again expressed in constant dollars, have declined slightly.¹⁹ In California, this trend is even more pronounced, with reported farm-labor contractor

¹² Villarejo, D., D. Runsten (1993): *California's Agricultural Dilemma*. California Institute for Rural Studies.

¹³ Gabbard, S., E. Kissam, P. Martin (1993): "The Impact of Migrant Travel Patterns on the Undercount of Hispanic Farm Workers." Paper presented to Research Conference on Undercounted Ethnic Populations, Bureau of the Census. Washington, D.C.

¹⁴ Alarcón, R. (1996): "Immigrants or Transnational Migrants?" California Institute for Rural Studies.

¹⁵ Palerm JV (1991): "Farm Labor Needs and Farm Workers in California, 1970 to 1989." State of California, Employment Development Department. Sacramento, California

¹⁶ Zabin, C., M. Kearney, A. Garcia, D. Runsten, C. Nagengast (1993): "Mixtec Migrants in California Agriculture: A New Cycle of Poverty." California Institute for Rural Studies.

¹⁷ Rosenberg, H.R., S.M. Gabbard, E. Alderete, R. Mines (1993): "California Findings From the National Agricultural Workers Survey: A Demographic and Employment Profile of Perishable Crop Farm Workers." U.S. Department of Labor. Research Report No. 3. Washington, D.C.

¹⁸ Villarejo, D., D. Runsten (1993): "California's Agricultural Dilemma." California Institute for Rural Studies.

¹⁹ U.S. Department of Commerce (1994): "1992 Census of Agriculture. Volume 1, Geographic Area Series. Part 51: United States Summary and State Data." U.S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census. AC92-A-51. Washington, D.C.

employment doubling since 1978.²⁰ Today, one in three California farmworkers is employed by a labor contractor during the year,²⁰ and at peak season labor contractor employees are a plurality in nearly all regions of the state.

In the past 15 years most farmer-provided housing and transportation services have been eliminated.²¹ As a result, hired farmworkers are even more dependent on labor contractors for shelter and transportation to and from work. Increasingly, farm-labor contractors provide services needed by the workers they employ. For at least half of those working for labor contractors, services such as transportation or housing are provided by contractors or their agents for fees that are charged as a condition of employment,²² mimicking the company towns of the last century. This privatization of farmworker services has absolved many farm operators of the cost and responsibility for the workers they need and has added to the economic burden of individual workers.

Traditionally, enforcement agencies have relied heavily on informants; their efforts have been largely complaint-driven. The TIPP program, in contrast, generally operates by conducting "sweeps" based on industry and geographic targeting rather than pursuing specific operations identified through complaints. Staff involved in the sweep represent the various cooperating agencies. The purpose of multiagency sweeps is not only to identify violations, but also to generate leads. These leads can then be immediately pursued to find other violations.

Not surprisingly, given California's leading role in farm production and employment, the state is also the nation's leader in reported occupational injuries and fatalities in agriculture.²³ Because California has required universal workers' compensation insurance for all private-sector employees for more than 50 years, the state also has occupational injury data available from the records of workers' compensation insurance carriers. An enumeration of all paid workers' compensation insurance claims in the most recently reported five-year period (1989-93) shows that hired farmworkers experienced a total of 185,558 occupational injuries or illnesses, of which 51,098 resulted in at least one day of lost work time or other indemnity payment. In addition, there were 202 occupational fatalities.²⁴ Thus, in each of these five years, hired or contract farmworkers in California experienced an average of 37,100 occupational injuries, of which 10,200 involved at least one day of lost work time or other indemnity, and 40 occupational fatalities.

²⁰ California Department of Employment Development (1993): "Agricultural Employment, 1992." California Department of Employment Development. Report no. 882A

²¹ Peck, S. (1989): "California Farmworker Housing." California Institute for Rural Studies. Working Group on Farm Labor and Rural Poverty, Working Paper #6

²² Villarejo, D., D. Runsten, S. Vaupel, A. Garcia, J. Sherman (1996): "Farmers, Workers, and Contractors." California Institute for Rural Studies.

²³ U.S. Department of Commerce (1994): "1992 Census of Agriculture. Volume 1, Geographic Area Series. Part 51: United States Summary and State Data." U.S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census. AC92-A-51. Washington, D.C.

²⁴ Workers' Compensation Insurance Rating Bureau of California (1996): "Classification Experience Reports." Workers' Compensation Insurance Rating Bureau of California. San Francisco, California.

Other independent sources of occupational injury data are consistent with these workers' compensation insurance reports regarding hired farmworkers, but also provide data on occupational injuries to self-employed farm operators and family members. In 1992, there were a reported 705 occupational injuries to California farmers or unpaid family members that required medical attention or resulted in lost work days, and there were 15 occupational fatalities.²⁵ In 1993, a cross-sectional survey conducted for NIOSH by the U.S. Department of Agriculture found 2,679 occupational injuries to California farmers or unpaid family members that resulted in at least one-half day of lost work time.²⁶

These data sources also document that not only do California direct-hire farmworkers experience the largest number of occupational injuries of any state, but they also account for at least one-sixth²⁶ or as many as one-fourth of the total for the entire U.S.²⁷ Thus, California is arguably the nation's most important setting in which to address occupational injury among hired and contract farmworkers.

In 1992, the state's Labor Commissioner, Victoria Bradshaw, with Dr. William C. Buhl of the U.S. Department of Labor, Wage and Hour Division, initiated a collaborative effort by several federal and state agencies to vigorously enforce safety and labor laws on California farms through joint action. Commissioner Bradshaw and Dr. Buhl were also convinced that partnering with other agencies could help address severe cutbacks in staffing that resulted from the state government's fiscal crisis triggered by the California recession of the early 1990s. Known as the Targeted Industries Partnership Program (TIPP), this effort focuses resources on the agricultural and cut-and-sew garment industries.

TIPP seeks to encourage compliance through programs of public education, outreach to employers and periodic surprise enforcement sweeps involving dozens of agents. The lead agencies are the state Department of Industrial Relations—Division of Labor Standards Enforcement (state Labor Commissioner) and the U.S. Department of Labor—Wage and Hour Division. Cooperative relationships have also been established with the U.S. Internal Revenue Service, the California Department of Employment Development, and various local agencies.

According to the California Governor's Farm Workers Services Coordinating Council, "The objective of TIPP is to provide comprehensive enforcement of existing labor and employment laws that protect farmworkers and to maximize the enforcement effort through joint participation in inspection, referrals, and the targeting of systematic and flagrant violators."²⁸ The basic concept is to

²⁵ U.S. Department of Commerce (1994): "1992 Census of Agriculture. Volume 1, Geographic Area Series. Part 5, California State and County Data." U.S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census. AC92-A-5. Washington, D.C.

²⁶ Myers, J. (1996): "The Traumatic Injury Surveillance of Farmers Survey, 1993." National Institute for Occupational Safety and Health. Cincinnati, Ohio.

²⁷ U.S. Department of Commerce (1994): "1992 Census of Agriculture. Volume 1, Geographic Area Series. Part 51: United States Summary and State Data." U.S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census. AC92-A-51. Washington, D.C.

²⁸ Farm Worker Services Coordinating Council (1992): "Coordinating California's Farm Worker Services." Farm

increase the effectiveness of enforcement efforts through a more efficient use of agency resources. As many as twelve enforcement agencies may be involved in a particular sweep.

Agencies most frequently involved in TIPP efforts include the following:

Occupational Safety and Health Administration, State of California (Cal-OSHA). This agency has responsibility for enforcement of workplace safety laws. As a state agency it enforces California law. In addition, under delegated authority from the Occupational Safety and Health Administration of the U.S. Department of Labor, it also enforces federal safety laws.

California safety laws are sometimes stricter than corresponding federal laws. For example, under state law all farm employers are subject to regulation, but federal OSHA standards apply only to farms with 11 or more employees. For the past several years, Cal-OSHA has made safety law enforcement in agriculture one of its highest priorities.

Cal-OSHA participates in the federal OSHA safety and health program, which uses the IMIS database. Thus, safety and health inspection reports are entered into the federal database from the local state Cal-OSHA offices. The IMIS database uses a standardized report that includes more descriptive data (e.g., number of employees, union status) than are available in the TIPP database. In 1993, Cal-OSHA health-and-safety reports were entered into both the TIPP and IMIS database. However, in 1994 health-and-safety reports were entered only in the IMIS database.

Wage and Hour Division, U.S. Department of Labor (USDOL-WHD). This agency has responsibility for enforcement of two important federal laws: the Fair Labor Standards Act (FLSA) and the Migrant and Seasonal Agricultural Worker Protection Act. Consequently, it is responsible for the registration of farm-labor contractors and crew leaders and for ensuring compliance with federal regulations governing their employment practices, including child labor.

Labor Commissioner, Department of Industrial Relations, State of California (DIR). This agency has responsibility for enforcement of state laws governing minimum labor standards. State law requires licensing of farm-labor contractors, which involves a license examination, posting of a bond, proof of workers compensation insurance (required of all employers under California law), and certain other conditions. This is a more stringent set of requirements than those for registrants with USDOL, but applies only to labor contractors who enter into direct agreements to provide labor services for farm operators. State law does not require licensing of crew leaders, individuals who are hired by labor contractors to provide and supervise crews of workers.

County Agricultural Commissioner, State of California. The 58 county agricultural commissioners have responsibility for enforcement of laws governing pesticide use for commercial purposes. This

Worker Services Coordinating Council.

authority is delegated by the U.S. Environmental Protection Agency (US-EPA) as well as the Department of Pesticide Regulation of Cal-EPA. Since most reported commercial pesticide use is in agriculture and is associated with routine production practices, it is thought that those who are most familiar with these practices are likely to be the most qualified to carry out enforcement. This authority includes making sure that pesticides are used only for specific purposes authorized by both federal and state law as well making sure they are used safely. For the latter purpose, farm-labor contractors are required to register with the agricultural commissioner in each county where they conduct business.

We examined the characteristics of agricultural employment operations that have received notices of violation under the TIPP program and compared them to operations that have not received notices of violation. Although most previous studies have focused on the affected worker, this classic approach has important limitations. In particular, Latino/Hispanic farmworkers are difficult to study because of their high mobility, distrust of governmental authority, concern over immigration and citizenship status, and language differences.²⁹ Therefore, we feel it is appropriate to conduct an epidemiological analysis focusing on agricultural establishments rather than on individual employees. In an era of increasing focus on governmental efficiency, the information will be useful in informing agencies with jurisdiction for occupational health and safety in agriculture about epidemiological aspects of their efforts and potentially improving targeting of educational and enforcement activities.

²⁹McCurdy, S. (1995): "Occupational health status of migrant and seasonal farmworkers." In H. McDuffie, J. Dosman, K. Semchuk, S. Olenchock, A. Senthilselvan (eds.): "Agricultural Health and Safety: Workplace, Environment, Sustainability (supplement)." Chelsea, Mich.: Lewis Publications, pp. 213-216.

III. MATERIALS AND METHODS

Overview of method: The general goal of this study was to link reports of health-and-safety law violations to specific agricultural producers contained in a large database of California farm operations (Figure 1). Through this linkage, we identified agricultural producers with notices of violation and compared this group to producers without notices of violation. The results were used to develop a comparative profile of high-risk producers for the purpose of focusing educational and enforcement resources.

Three databases were used in this portion of the study: the California Farm Operators Database developed and maintained by CIRS, containing information on over 37,000 California agricultural operators, and the 1993 and 1994 TIPP databases, containing reports of operations receiving notices of violation in those years. A fourth database, the CDIR Farm Labor Contractor License File, was used to identify TIPP citation recipients licensed as farm-labor contractors. These databases and their use in this study are described below.

CALIFORNIA FARM OPERATORS DATABASE

The California Farm Operators Database, developed and maintained by CIRS, consisted of 37,631 agricultural operators with permits for pesticide use in the state. Information for each operator was the most recent available, which in nearly all cases ranged from 1992 to 1994. The database included a unique operator identification number (CIRS identification number), the type of agricultural operation (e.g., farm, dairy, nursery), the number of counties the operator farmed in, a list of the reported counties and year of report, and acreage for each crop farmed.

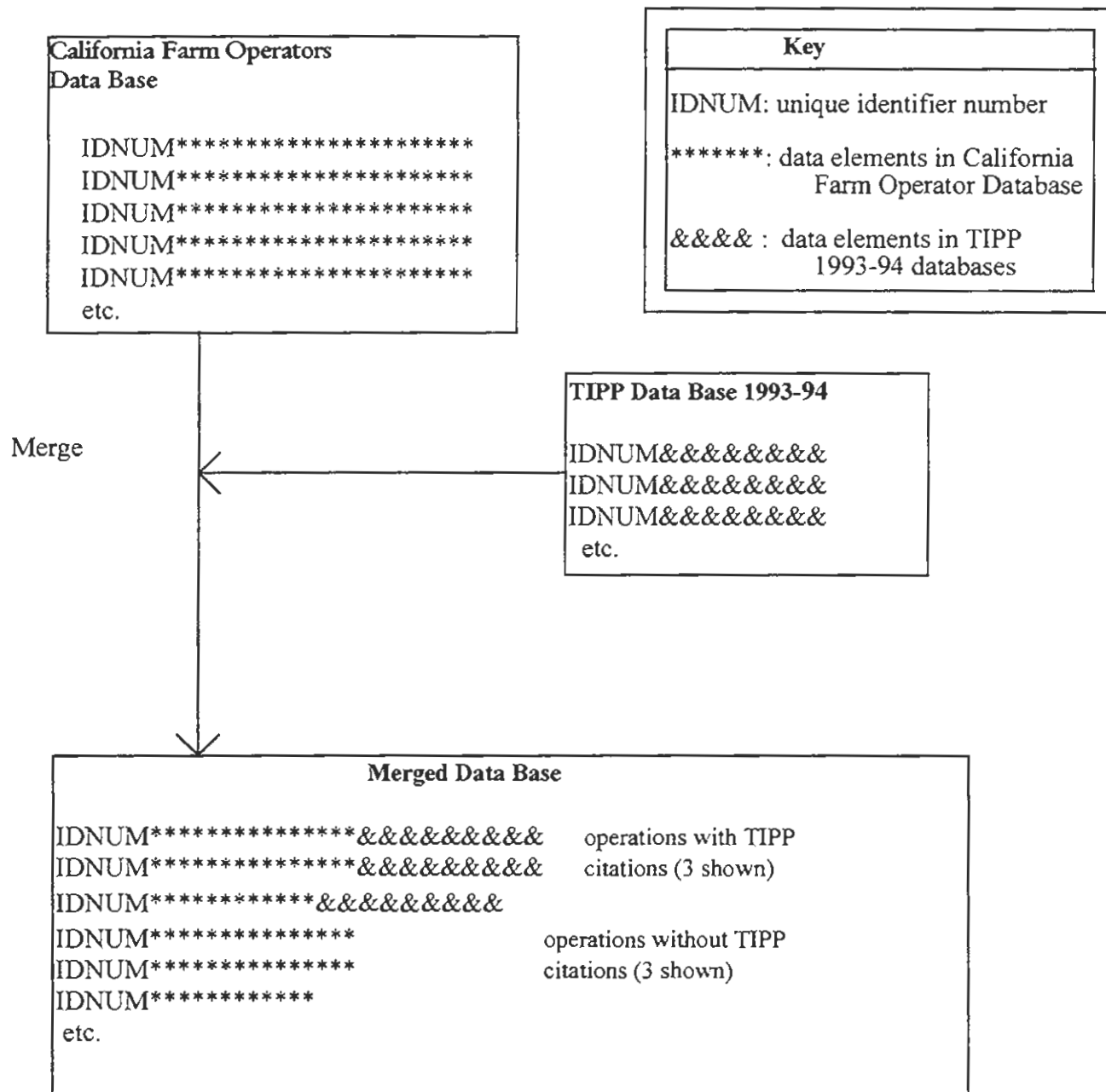
TIPP 1993 AND 1994 DATABASES

The TIPP 1993 and 1994 databases contain records of notices of violation for health-and-safety and labor-law violations. This information was collected differently for 1993 and 1994. The 1993 TIPP reports included report number, name of business, type of business, date of report, and 34 violation categories (see the Appendix: 1993 TIPP Report Form). Each report could contain more than one violation, and an agricultural operation could receive more than one report through the year.

The 1994 TIPP data included report number, name of business, type of business, and date of report, violation code and description, and a comments field. The TIPP 1994 data did not have the same violation categories used in the 1993 TIPP database. The violation codes and descriptions were used to categorize the information in a format similar to that of the 1993 TIPP reports. During 1994,

the TIPP program ceased collecting information separately on health-and-safety violations. Health-and-safety violations for 1994 and subsequent years were recorded separately by Cal-OSHA using the federal OSHA's IMIS system. Thus, only seven health-and-safety violations were recorded in 1994 vs. 124 in 1993.

Figure 1: Schematic Overview of Method



Note: The schematic illustrates merging of the TIPP databases for 1993 and 1994 with the California Farm Operators Database. A similar merge of the TIPP databases was performed with the CDIR Farm Labor Contractor License file.

CDIR FARM LABOR CONTRACTOR LICENSE FILE

The Farm Labor Contractor License file was provided to CIRS by the CDIR License branch. It is a compilation of all farm-labor contractors holding a license at any time in the previous six years (1990-1995). The file contained 2,600 entries, including 1,050 active license holders for 1995.

DATA MANAGEMENT

The agricultural operator database and the TIPP 1993 and 1994 databases were obtained as text files and input into a VAX 3100 computer with Statistical Analysis System (SAS) software³⁰ for analysis. The California Farm Operators Database is so large that it was provided in three separate files. Each of the three substituent files was read into SAS and then combined into one file. The 1993 TIPP database was converted to a SAS dataset and then merged with the California Farm Operators Database file. The 1994 TIPP file was also converted to a SAS dataset and then required recoding to match the format for the TIPP 1993 dataset. Once this step was completed, the TIPP 1994 SAS dataset was merged with the California Farm Operators Database file for subsequent analysis.

LINKING THE TIPP DATABASES WITH THE CALIFORNIA FARM OPERATORS DATABASE

The first step in linking TIPP reports to the CIRS California Farm Operators Database was to identify cited operations (i.e., operations receiving a notice of violation) within the CIRS database. Staff at the California Institute for Rural Studies used several sources to make this identification. These included Red Book Credit Services listing (P.O. Box 400, Prairieview, IL), Dun and Bradstreet Reference Book of American Business (One Diamond Hill Road, Murray Hill, NJ 07974-0030), Western Growers Association Membership Directory 1995-1996 (WGA Service Corp, 17620 Fitch St., Irvine CA 92714), and Phonedisc (Digital Directory Assistance, Inc., 693 Arlington Rd, Suite 405, Bethesda, MD 20814). When the cited operation was identified in the California Farm Operators Database, the unique CIRS identification number was added to the TIPP report. This number was then used during a merge of the CIRS and TIPP databases to link the information in the two databases. This process is shown graphically in Figure 1.

In both 1993 and 1994 some operators received notices of violation more than once, so the results reported from TIPP 1993 and 1994 individually reflect the total number of reports, which does not coincide with the number of operators receiving notices. In 1993 a total of 318 operators received notices of violation; 4 operators received notices on more than one inspection. In 1994 a total of 205 operators received notices of violation; 52 operators received notices of multiple violations, but the records are not clear regarding whether these were from a single inspection or from several inspections through the year. Since the matching with the California Farm Operators Database was done by CIRS

³⁰ SAS Institute Inc. (1989): "SAS Proprietary Software Release." Cary, North Carolina: SAS Institute Inc.

identification number, operators with more than one violation were combined into one record. Over the 1993-1994 period, 172 TIPP reports matched with the California Farm Operators Database, representing 169 farm operators.

STATISTICAL METHODS

The linkage and merging process described above allowed us to identify operations within the California Farm Operators Database that had been cited and to compare them with those that had not been cited. Analysis involved standard statistical methods available with the SAS software library of procedures.^{31,32} For categorical variables, we present frequencies and cross-tabulations; statistical significance is evaluated using the chi-squared or Fisher's exact test.³³ For continuous variables such as farm acreage, group data are summarized using medians and percentiles or means and standard deviations; group comparisons used the Wilcoxon rank-sum test for nonnormally distributed data.^{31,32} Associations between categories of violations are expressed using the Spearman nonparametric correlation coefficient, r_s^2 . All p values are presented without correction for multiple comparisons.

³¹ SAS Institute Inc. (1985): "SAS User's Guide: Statistics, Version 5 Edition." Cary, North Carolina: SAS Institute Inc.

³² SAS Institute Inc. (1989): "SAS Proprietary Software Release." Cary, North Carolina: SAS Institute Inc.

³³ Fleiss JL (1981): "Statistical methods for rates and proportions." New York: John Wiley and Sons.

IV. RESULTS

LINKAGE STUDY OF 1993-1994 TIPP REPORTS AND CALIFORNIA FARM OPERATORS DATABASE

California Farm Operators Database

The California Farm Operators Database contains data on 37,631 operations (Table 1). Of these, 33,209 (88.3%) were crop farms, 2,148 (5.7%) were nurseries, and 1,731 (4.6%) were dairies. Over 95% of the operations were registered in one county only (Table 2). Fresno County held the largest number of operations, with 4,599, or 12.9% of the total (Table 3). Operations from the California Farm Operators Database matched with a TIPP violation during 1993 or 1994 were in 21 counties (Table 4); Fresno county held the most of this group (26, or 18.2% of the total). Among the farm operations, a wide range of crops were grown. The most commonly reported crop was alfalfa, reported by 12.3% of operations (tables 5 and 6).

TIPP 1993 Database

The 1993 TIPP database recorded 1,125 notices of violation involving 323 reports (Table 7). This figure excludes 17 reports with incomplete information. Nearly half of the operations were farms, and over one-quarter were licensed farm-labor contractors. Over two-thirds of reports included more than one notice of violation (Table 8).

Nearly half (528/1,125; 47%) of the violations involved Industrial Welfare Commission Orders (Table 9). The largest group of these violations (178/528; 34%) related to posting of orders. Over 18% of the total were wage violations and over 15% were workers' compensation violations. Violations of farm-labor contractor laws represented 8.3% of the total, and the most common infraction in this group involved compensation rate (68/93; 73%).

There were 124 (11%) notices were for health-and-safety violations involving 43 operations. Of these, the most common was inadequate wash facilities for food-crop workers (64/124; 52%), followed by inadequate toilet facilities (32/124; 26%) and inadequate medical kit (26/124; 21%). Among the 43 operations with notices of violations for health and safety, over two-thirds received a single health-and-safety-related notice of violation; the remainder received two or more such notices (Table 10).

TIPP 1994 Database

The 1994 TIPP database recorded 400 notices of violation involving 278 reports (Table 11). Over 40% of the operations were farms, and over one-quarter were licensed farm-labor contractors. Over 80% of reports comprised a single notice of violation (Table 12).

Over half (242/400; 61%) of the violations involved Industrial Welfare Commission Orders (Table 13). Of these, violations related to minors were the largest group (70/242; 29%), and unlicensed day-hauling violations comprised over 22% (54/242). Workers' Compensation violations comprised over 20% (83/400) of the total.

Seven (1.8%) notices of violation were for health-and-safety infractions. Of these, the most common was inadequate wash facilities for food-crop workers (6/7; 86%). One violation (14%) was for an inadequate medical kit.

Association Between Categories of Violations

We examined the pattern of violations within reports. Associations between categories of violations with Spearman correlation coefficients greater than 0.3 are shown in Table 14 (for 1993) and Table 15 (for 1994). Among the health-and-safety violations for 1993, correlations were noted within the group of health-and-safety violations (e.g., absence of wash facility and absence of toilet facility; $r_s^2 = 0.51$) and with non-health-and-safety violations (e.g., absence of medical kit and violation related to meal periods; $r_s^2 = 0.49$). The highest correlation was seen for violations related to rest periods and meal periods ($r_s^2 = 0.69$). Similarly, the highest correlation among the 1994 reports was for violations related to rest periods and meal periods ($r_s^2 = 0.85$).

Group Comparisons

Operations receiving notices of violation were compared to operations not receiving notices of violation for several variables. There was no significant difference with respect to the type of operation; farms represented nearly 90% of operations in both the cited and noncited groups (Table 16). Cited farms reported more acreage than noncited farms (mean 8,675.7 vs. 7,424.2, $p < 0.01$).

Table 17 shows the percentage of farms growing specified crops for cited and noncited operations. Among the cited operations, the most frequently reported crop was strawberries (grown by 28.4% of cited operations, vs. 1.7% of noncited operations), followed by raisin grapes (16.6% of cited operations vs. 8.2% of noncited operations) and broccoli (grown by 15.4% of cited operations vs. 1.5% of noncited operations). For each of these three crops, the difference in reported frequency between cited and noncited operations is statistically significant. Cited farms were more likely than noncited farms to have operations in more than one county (16.6% vs. 4.4%, $p < 0.001$; Table 18).

Within the group of 169 operations receiving TIPP reports in 1993 and 1994 and matched to the California Farm Operators Database, we compared operations receiving a single notice of

violation with those receiving notice of more than one violation. No significant difference in business type was noted (Table 19). Multiply cited operations were more likely to farm in more than one county, but this difference was not statistically significant (18.8% vs. 12.3%, $p < 0.3$; Table 20.) Table 21 shows the percentage of farms growing specified crops for cited and noncited operations. Although statistical significance is shown, small numbers make interpretation difficult.

CAL-OSHA IMIS REPORTS AND TIPP 1993-1994 REPORTS RELATIVE TO LABOR EXPENSE

Although they were not part of the original specific aims for this project, we examined data from all cases associated with fines for serious violations reported by Cal-OSHA to the IMIS database during 1993-1995 and evaluated TIPP data in the context of labor expense as an index of labor demand. From the standpoint of improving compliance with licensing and registration requirements, the TIPP program has been highly successful. In 1995, about 96% of farm labor contractors licensed by the State of California are also registered with the U.S. Department of Labor, as compared with just 72% in 1990, before the TIPP program began.³⁴ It is likely that this is the result of the program's educational efforts, coupled with the realistic risk of fines for noncompliance. In addition, there is joint liability for farm operators who contract with unlicensed farm-labor contractors. This may encourage operators to contract only with licensed farm-labor contractors and encourage farm-labor contractors to obtain a license. More than 2,000 citations have been issued and millions of dollars of fines for serious violations have been assessed since the program's inception (Table A below). In addition, about \$1.5 million in back wages owed to employees has been recovered.

Table A. Summary of TIPP Enforcement Activity in Agriculture
California DLSE and U.S. DoL Wage and Hour Division

Year	Total Inspections	Child Labor Citations	Civil Citations	Criminal Citations	Penalties Assessed	Wages Recovered
1992-93	647	153	282	144	\$2,044,755	\$529,042
1994	589	74	173	87	\$998,300	\$414,557
1995	362	64	111	28	\$897,855	\$583,178

To analyze the impact of TIPP on safety law enforcement in agriculture, we used specific case records for all fines issued by Cal-OSHA for serious violations of OSHA standards during the period 1993-1995 as well as CDIR's own records of citations issued. Since the TIPP program actually began in November 1992 it is likely that records referring to the period subsequent to January 1, 1993 most

³⁴ California Department of Employment Development (1993): "Agricultural Employment, 1992." California Department of Employment Development. Report no. 882A

accurately reflect activities after the startup.

Cal-OSHA assessed 839 fines for serious violations to a total of 722 agricultural employers during the period 1993-1995. For purposes of this analysis only those agricultural employers who are directly engaged in tasks resulting in the production of a farm commodity for sale are considered (employers assigned to agricultural SIC codes corresponding to veterinary or other pet services, or lawn and gardening services have been carefully identified and excluded).

Figure 2 summarizes these fines according to specific OSHA standards. About 78% of these fines (656 fines) were for violations of OSHA Standard 3457 (field sanitation). The next highest frequency of fines amounted to just 10% of the total, for violations of OSHA Standard 3441 (operation of equipment). The number of fines for violations of other OSHA standards were, in each case, half or less of this frequency, corresponding to 5% or less of the total.

We have used databases developed by CIRS to assign each employer fined for serious OSHA violations to one of the following three categories: farm operator, licensed farm-labor contractor, other labor contractor. The results are shown in Figure 3. The largest single group of employers who were fined were found to be farm operators. Of the 722 employers fined during 1993-1995, 275 were farm operators (38%), 230 were licensed labor contractors (32%), and 217 were other labor contractors (30%), including unlicensed farm-labor contractors. Taken together, the licensed and "other" farm-labor contractors account for the majority of employers who were fined (62%).

Assignment to one of the three categories was accomplished in the following manner. To qualify for the first category, the employer must be a "farmer," i.e., placing capital at risk for the purpose of producing an agricultural commodity for sale. These were identified using the California Farm Operators Database described earlier in this report. Matching against this database was accomplished using name, county, address, and other information as obtained from the Cal-OSHA IMIS database.

Licensed farm-labor contractors were identified by comparison of individual Cal-OSHA records with the files of license holders. As described previously, electronic files of all such licensed contractors were obtained by CIRS from CDIR.

Records of businesses fined for serious violations of OSHA standards were assigned to the category "Other labor contractors" if they could not be identified through matches with the two databases described above but were providing labor services on farms. Many of these employers are unlicensed farm-labor contractors. Using standard business reference sources, such as the records of Dun & Bradstreet Credit Services, we independently verified that a substantial number of employers in this category were nonfarm agricultural businesses.

In the period 1993-1995 an average of 1,055 farm-labor contractors were licensed to operate in California. From the previous findings concerning the number of licensed farm-labor contractors among those employers who were fined, there were an average of 77 per year (230 fined in three

years/3 years). Hence, these data suggest one of every fourteen licensed farm-labor contractors in California was fined annually for serious OSHA violations.

To determine the relative frequency at which farm operators are fined, recall that a cumulative total of 275 farm operators were fined in three years (91.7 per year). While the number of farm operators who are employers is not accurately known, the *Census of Agriculture* reports that 38,347 California farms were reportedly incurring a hired-labor expense associated with directly employing workers. If this figure represents the number of farm-operator employers during the period 1993-1995, then we estimate that, each year, about one in 400 farm operators was fined for serious OSHA standard violations.

These data suggest that farm-labor contractors licensed to operate in California were about 30 times more likely than farm operators to be fined for serious OSHA violations. It is not possible to comment on the third category, "Other labor contractors," because the number of unlicensed labor contractors is not accurately known.

The geographic distribution of violators by agricultural region was also examined. We follow the definitions used by the California Department of Employment Development, which assigns each county to one of six Agricultural Regions (North Coast, Sacramento Valley, Central Coast, San Joaquin Valley, South Coast, Desert). As shown in Table B below, the greatest number of violators, accounting for half of the total, were located in the San Joaquin Valley. The next largest number of employers, about one-fifth of the total, were South Coast employers. Central Coast employers ranked third, with one-eighth of the state total, followed by Desert with about one-ninth.

Table B. Number of Agricultural Employers Fined for Serious OSHA Violations
California, by Agricultural Region, 1993-95

Agricultural Region	Number of Violators	Per Cent of State Total
North Coast	13	1.8
Sacramento Valley	38	5.2
San Joaquin Valley	363	49.7
Central Coast	91	12.4
South Coast	146	20
Desert	80	10.9

It is possible that the geographic distribution noted above may reflect the degree of effort of the TIPP agencies in different regions. On the other hand, if violations reflect the volume of labor activity (total person-hours of labor demand), then the reported regional distribution of violators would be expected to be similar to that of labor demand.

Using reported expenditures by farmers for both hired and contract labor as a surrogate for hours of labor, we calculated shares of statewide farm-labor activity in the six regions: North Coast, 4%; Sacramento Valley, 8.7%; San Joaquin Valley, 43.7%; Central Coast, 16.0%; South Coast, 18.9%; Desert, 8.7%.³⁵ When the distribution of fines levied, shown in Table B, is compared with this calculated share of labor expense, it is apparent that there is an approximate correspondence between labor demand and fine distribution. For the four last-named regions, where an aggregate of 87% of all farm-labor expenditures are made, the proportion of fines assessed closely parallels the amount of farm-worker activity. Only the North Coast and Sacramento Valley appear to have lower fine assessment relative to labor demand: a total of 12.7% in labor activity but 7% in fines. It is not clear whether this represents lower enforcement activity or greater compliance in these regions.

TIPP Reports for 1993-1994

TIPP reports for 1993-1994 were examined with respect to Standard Industrial Classification (SIC) codes, farm sales, and geographic location. Figure 4 shows the distribution of cited farm operators by SIC code and the corresponding distribution of farm labor expense. Farm labor expense is a surrogate for hours of labor demand, a measure of occupational hazard exposure.

The most important finding is that a clear majority of farm-operator TIPP citations were issued to fruit and nut farmers (SIC code, 017). Next in frequency were vegetable farms (SIC code, 016). In both cases the proportion of citations exceeded the corresponding shares of hired labor expense. In all other SIC code categories, the frequency of TIPP citations was less than the corresponding share of hired labor expense.

Figure 5 shows a more detailed analysis of fruit and nut farm operator TIPP citations (SIC codes, 017x). Berry farms (SIC code, 0171) accounted for a very large share of all farm operator TIPP citations (25%), and a disproportionately large share as compared with the berry-farm share of hired-labor expense. Berry farms appear to have a disproportionately high frequency of labor- and safety-law violations, at least four times larger than their share of hired-labor expense. Grape farms were next in frequency, and their share of TIPP citations corresponded closely to their respective share of hired farm-labor expense.

Farm operators cited under the TIPP program were also analyzed with respect to imputed farm size, assigned by estimating revenues from crop marketings based on county agricultural commissioners' reports. Each farm's planted acreage was valued according to the three-year average crop-specific revenues per acre within the county where the crop field is located. Figure 6 shows the estimated revenue distribution of farm operators cited by the TIPP program and the corresponding

³⁵ U.S. Department of Commerce (1994): "1992 Census of Agriculture. Volume 1, Geographic Area Series. Part 5, California State and County Data." U.S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census. AC92-A-5. Washington, D.C.

shares of hired-labor expense.

Clearly, a majority of TIPP citations were issued to large farms (those with estimated crop revenues of \$1 million or more). However, the large-farm share of TIPP citations was somewhat smaller than its share of hired-labor expense. At the other extreme, small farms (those with less than \$100,000 of estimated crop revenues) accounted for about 15% of TIPP citations. However, the small-farm share of TIPP citations was nearly four times larger than its share of hired-labor expense. Comparison of the relative frequency of TIPP citations with labor expense reveals that smaller farms have a disproportionately high share of TIPP citations relative to labor expense. It is not clear whether small farms are subjected to higher enforcement activity or whether larger farms are able to allocate a larger share of their resources for compliance than can smaller farms.

Figure 7 shows the regional distribution of farm-operator TIPP citations and corresponding shares of hired-labor expense. In this case, each county was assigned to one of six EDD crop regions, and farm operators were classified according to the county in which their farm is located.

The frequency of TIPP citations issued to farmers was highest in the South Coast region of the state, followed by the San Joaquin Valley. However, this is the reverse of their respective shares of hired-labor expense. It is not known whether the TIPP effort is allocated in proportion to labor demand or whether the relative frequency of farm-operator TIPP violations is greater in the South Coast as compared with the San Joaquin Valley.

V. DISCUSSION

We present the findings of a study of notices of violation for identified by the Targeted Industries Partnership Program during 1993 and 1994. The major findings of this study are that farms represented the largest share of reports, over 40%. The majority of operations receiving notices of violation had more than one violation. Health-and-safety violations comprised a minority of violations, just over 10%. The most common health-and-safety violation involved washing facilities. When farms with a TIPP report were compared to those without, larger farms and those operating in more than one county were at higher risk. Fruit-and nut-producing operations, especially berry producers, were at increased risk for TIPP citation relative to labor expense. Based on Cal-OSHA data, farm-labor contractors appear to be at increased risk for TIPP citation compared to farm operators.

This project represents the first attempt to examine data from the TIPP program from an epidemiological perspective. We were successful in characterizing and summarizing the TIPP violations within the constraints of the data available. However, we had only limited success in developing a profile of high-risk operations in comparison with operations that had not received notices of violation. The limitations are imposed by the character of the databases, which contained only limited information on variables of major epidemiological interest, such as operator characteristics (e.g., age, gender, ethnicity, education, duration of work in farming) and farm characteristics.

We note that the TIPP records are separate from those maintained by Cal-OSHA in the IMIS system. As such, the distribution of violations noted may be different. For example, Cal-OSHA records indicate that the most commonly cited violation in agriculture for 1993 and 1994 was failure to establish and maintain a written Illness and Injury Prevention Plan. Because Cal-OSHA renders citations outside the auspices of the TIPP program, distributions of violations may differ.

We were able to examine and compare reported acreage and crop. The finding of larger acreage among cited farms compared with noncited farms may rest on several factors. First, larger farms may be more likely to have violations, either because of an inherently more hazardous environment, or because the large farms simply encompass more workers and hazardous conditions because of their size. However, if larger farms are simply more likely than smaller farms to be inspected, this finding may represent the results of selection bias.

Although large farms were at greater risk than small farms for notices of violation, when TIPP citations were examined with respect to labor expense, smaller farms had an increase in citations

relative to larger farms. Although at first glance these findings may appear to conflict, in fact they do not. Although, on average, large farms were more likely than small farms to receive TIPP notices of violation, small farms use much less labor than do large farms; hence, the number of citations to small farms relative to the number of workers they hire is greater. Thus, from the farm owner's or manager's standpoint, larger farms are at greater risk for TIPP notices of violation. From the individual worker's standpoint, however, persons working on small farms are at greater risk for working in an operation with citable conditions.

We also noted that operations receiving notices of violation were nearly four times more likely to have farms in more than one county than were noncited operations. Similarly, operations with multiple violations were approximately 50% more likely to have farms in more than one county than were operations with a single violation.

Several aspects of the program and resultant data limit use for epidemiological purposes. First is the sampling procedure. Ideally, one would have a valid list of all California agricultural operations using hired farm labor, from which a random sample of farms could be selected for inspection. From this sample one could obtain valid estimates for the frequency of workplace violations and the characteristics of operations at which they are found. Currently, no universal listing of California farm operations exists. We used the California Farm Operators Database developed and maintained by CIRS. This database is not a comprehensive listing of all farm operators in California, and it is likely that smaller operations are underrepresented in the CIRS database. National data suggest that smaller farms have higher injury rates.³⁶ However, larger farms are more likely to employ farmworkers. The likely effect of the selection against small farms on the observed results is unclear.

Although the lack of a universal listing of agricultural operations does not present insurmountable difficulties, the nonrandom nature of the sampling process does present significant problems for epidemiological use. Whether or not an operation is targeted for inspection may be influenced by its past practices, location, size of workforce, and other factors. Consequently, the study sample of farms with citations may not be representative of all farms with violations, and the study sample of farms without citations may not be representative of all farms without violations. The end result is that there may be real differences that we are unable to detect.

In addition, the California Farm Operators Database data were from the most recent year available, i.e., not necessarily from 1993 and 1994, the two years of TIPP data. There were also several limitations to the acreage reported by agricultural operators. In some cases, the operator did not report acreage, so the database indicated only that the crop was grown. For these cases, no comparisons on acreage could be made. Operators could also report several crops that would be grown over the course

³⁶ Hoskin, A.F., T.A. Miller, W.D. Hanford, S.R. Landes (1988): "Occupational Injuries in Agriculture: A 35-State Summary." National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services. PB89-12170

of the year. In some instances the operator may have reported total farm acreage for each crop reported, so the reliability of total farm acreage for each operator is limited.

Limitations also exist for the TIPP data relating to the information collected and the manner in which it was collected and stored. For example, report forms did not include adequate identifying information or descriptive characteristics of the operation (e.g., crop, acreage, current employment). TIPP developed a data collection form in 1993 (Appendix) that facilitated information gathering. We recommend that this concept be further expanded to include more identification information and descriptive characteristics. A form could be developed reflecting the needs of participating agencies. To facilitate computer entry and analysis, these forms could be put on media suitable for reading by optical mark readers.

We recognize that choice of information to be collected must reflect primarily regulatory rather than epidemiological considerations. Nevertheless, we feel that it would aid the regulatory mission by having specific information and having it collected and stored in a manner that facilitates analysis. From our results and experience with these data, we make six recommendations.

RECOMMENDATIONS

Recommendation 1. The State Labor Commissioner and U.S. Department of Labor should encourage and expand the TIPP model of interagency collaboration.

The TIPP model of interagency cooperation has demonstrated its effectiveness in the large percentage of TIPP reports that include multiple citations from different agencies. However, in some areas collaboration is incomplete. For example, the database of TIPP reports for 1994 and subsequent years does not include health-and-safety violations, which are reported to the OSHA IMIS database.

The TIPP program should make a concerted effort to engage all agencies with regulatory responsibility in this effort. For example, the California Highway Patrol should be involved to address vehicular safety concerns, such as those related to transportation of field workers to and from work.

Increased interagency collaboration is helpful in maximizing the utility of existing resources. However, the program and the agricultural community would benefit by increases in resources devoted to preventive education and field enforcement activities. Credibility and effectiveness of the program would be advanced by assuring that participating staff have linguistic fluency, cultural knowledge, and an understanding of the local agricultural employment systems.

Recommendation 2. Data collection procedures should be designed to facilitate timely data management and computer analysis suitable to the needs of participating agencies.

Data collection forms can be designed to facilitate data collection and accurate entry into

computer systems for analysis. Design should include appropriate categories of violations. This process should be guided by considerations of how the data will be used. In particular, whether categories are broad and inclusive vs. narrow and precise will depend on how the data will be used from a regulatory standpoint. If it is important to distinguish different types of violations, then a greater number of narrower categories will be required. Data forms can be prepared on optically readable forms. These forms have a major advantage in that the completed form can simply be fed into a device that automatically reads the data and enters it into a computer for analysis. This process can save significant time, reduce data errors, and facilitate analysis and report writing.

Laptop computers for on-site data entry would also improve program efficiency; they could hold databases, such as insurance records and violation histories, that would be useful in the field.

The utility of reports could be greatly increased by including further descriptive information relevant to the participating agencies. In the IMIS system used by Cal-OSHA, for example, information on number of employees and union status is included. Inclusion of descriptive information deemed relevant by the participating agencies would aid in understanding patterns of violation.

Comment: Improved use of computers would allow more timely review of data and facilitate planning of agency activities. For example, data we analyzed for this report showed a high level of violations among berry producers. However, more recent information, conveyed to us in personal communications by Department of Industrial Relations personnel during the preparation of this report, suggests that current compliance among strawberry producers is high. Improved use of computers with short turnaround time for data review would allow agencies to react to changes as they occur.

Recommendation 3. Develop standardized reports showing inspection activity.

Basic reports documenting prevalence and characteristics of specified infractions could be developed and to a large extent automated by computer. Although in-depth analyses may subsequently be required, the basic descriptive report could be developed relatively easily. In addition, a computer-readable report form would reduce the amount of valuable administrative staff time needed for generating real-time data and reports, leaving more time for interpreting and developing policy and preventive and educational measures. The design of descriptive reports should be customized to meet the unique needs of each participating agency.

Recommendation 4. Target groups at increased risk for violation with educational programs to help them understand the law, resources for maintaining compliance, and enforcement efforts.

According to these data, this group includes farm-labor contractors, larger farms, and farmers operating in more than one county. Fruit- and nut-producing operations, in particular berry-producing operations, appear to be at higher risk than others. We caution, however, that identification of specific high-risk groups is subject to error because the data are not from a randomly selected, representative sample of agricultural operations. In addition, they represent the time frame 1993-1994. (See comment under Recommendation 2.)

Recommendation 5. Regularize follow-up of cited operations to assure subsequent compliance and determine impact of enforcement actions.

Follow-up for cited operations is an important part of maintaining subsequent compliance with regulatory requirements. Clearly, maintaining staff for this purpose represents a budgetary and personnel demand for agencies that may have insufficient resources. However, collaboration with partnered agencies offers potential efficiencies that may allow increased follow-up inspections.

Recommendation 6. Consider developing a program to provide unbiased information on the prevalence of infractions, using a representative sample of local operations employing farmworkers directly or through contractors.

An inspection program using an unbiased (i.e., representative) sample of local operations employing farmworkers directly or through contractors would allow agencies to determine how commonly or frequently specific infractions occur. This would provide a truer picture than currently available of infractions among operations and allow agencies to base educational and enforcement strategies on a more realistic view of infractions within the industry.

In contrast, when information is based on complaints, the resulting data represent a group of agricultural operations for which complaints have been lodged; such a group is a biased sample—i.e., it is not representative of all agricultural operations. Similarly, operations that have not generated complaints may still have infractions of health-and-safety laws that have simply not been reported. Information on the true prevalence of specific infractions would be invaluable for developing policy and focusing resources, and information on true prevalence can be obtained only from a valid sampling system.

A valid, unbiased sampling system ideally would involve random sample selection from a complete list of area operations. Although various state agencies maintain lists of agricultural operations for their purposes (e.g., tax collection, crop production, etc.), the state does not maintain a comprehensive listing of operations using farm labor. Developing and maintaining such a list requires ongoing commitment of resources. Currently, the California Farm Operator Database, maintained by CIRS and developed from several existing source databases, appears to be the most comprehensive

available.

We note that a program to provide information on the prevalence of infractions represents a departure from the original purpose of the TIPP program. Specifically, such a program would entail inspection of a random sample of operations, rather than focusing on those with complaints or at high risk for infractions. Whereas employers support the original TIPP model because it lessens unfair competition from operators who reduce their costs through noncompliance, employers may be less likely to support a random-inspection program intended to provide unbiased information on the prevalence of infractions.

CONCLUSION

We present an analysis based on data from the Targeted Industry Partnership Program for 1993 and 1994 focused on agriculture. The report describes reports of violations and characteristics of agricultural operations receiving notices of violation. From our experience with these data and the results of our analyses, we have formulated recommendations for improving the utility of the program. The basic premise of the program—a sharing of resources in partnership to achieve economies—is sound and likely to be used in the future, as growth of service demands outstrip available resources. Improving the utility and efficiency of the program can serve as a model for future partnerships among governmental agencies.

VI. Appendix: 1993 TIPP Report Form

VII. BIBLIOGRAPHY

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VIII. TABLES

TABLE 1: Agricultural operations, by type.
California Farm Operators Database

Agricultural Operation	Frequency	Percent
Farm	33,209	88.3
Nursery	2,148	5.7
Dairy	1,731	4.6
Other	543	1.4
Total Operators	37,631	100.0

TABLE 2: Number of counties of farm operation.
California Farm Operators Database

Number of Counties	Number of Operators	Percent
1	35,784	95.1
2	1,462	3.9
3	145	0.4
4	30	0.1
5-10	26	0.0
11-20	3	0.0
Unknown	181	0.5
Total Operators	37,631	100.0

TABLE 3: Distribution of agricultural operations, by county.
California Farm Operators Database

County	Frequency of Operations	Percent
Alameda	148	0.4
Alpine	1	0.0
Amador	75	0.2
Butte	991	2.8
Calaveras	59	0.2
Colusa	591	1.7
Contra Costa	277	0.8
Del Norte	13	0.0
El Dorado	169	0.5
Fresno	4,599	12.9
Glenn	836	2.3
Humboldt	164	0.5
Imperial	471	1.3
Inyo	1	0.0
Kern	905	2.5
Kings	654	1.8
Lake	190	0.5
Lassen	72	0.2
Madera	814	2.3
Marin	57	0.2
Mariposa	44	0.1
Mendocino	334	0.9
Merced	1,727	4.8
Modoc	135	0.4
Monterey	622	1.7
Napa	575	1.6
Nevada	88	0.2
Orange	314	0.9
Placer	213	0.6
Plumas	6	0.0
Riverside	1,131	3.2
Sacramento	363	1.0
San Benito	228	0.6
San Diego	2,313	6.5
San Francisco	29	0.1
San Joaquin	2,285	6.4
San Luis Obispo	695	1.9

TABLE 3 (Con't.): Distribution of agricultural operations, by county.
California Farm Operators Database

County	Frequency of Operations	Percent
San Mateo	136	0.4
Santa Barbara	670	1.9
Santa Clara	213	0.6
Santa Cruz	382	1.1
Sierra	658	1.8
Siskiyou	225	0.6
Solano	308	0.9
Sonoma	1,076	3.0
Stanislaus	2,912	8.1
Sutter	677	1.9
Tehama	474	1.3
Trinity	3	0.0
Tulare	3,824	10.7
Tuolumne	27	0.1
Ventura	1,216	3.4
Yuba	189	0.5
Yolo	435	1.2
Total	35,784	100.0

For operators in one county only.

**TABLE 4: Distribution of agricultural operations with a violation, by county.
1993 and 1994 TIPP Database**

County	Number of Operations with Violations	Percent
Fresno	26	18.4
Imperial	6	4.3
Kern	3	2.1
Kings	3	2.1
Madera	4	2.8
Mendocino	1	0.7
Modoc	1	0.7
Monterey	19	13.5
Napa	1	0.7
Orange	3	2.1
Riverside	11	7.8
Santa Barbara	15	10.6
Santa Cruz	5	3.6
San Benito	1	0.7
San Diego	13	9.2
San Joaquín	3	2.1
San Luis Obispo	8	5.7
Sonoma	2	1.4
Sutter	2	1.4
Tulare	4	2.8
Ventura	10	7.1
Total	141	100.0

TABLE 5: Crops produced by California agricultural operations.
California Farm Operators Database

Crop	Number of Operators Growing Crop	Percent	Range of Acreage
Alfalfa	4,616	12.3	0.1 - 21,714.7
Almonds	1,286	3.4	0.1 - 2,545
Apples	713	1.9	0.1 - 1,001
Artichokes	68	0.2	0.1 - 10,968
Asparagus	149	0.4	0.1 - 10,968
Avocado	2,079	5.5	0.1 - 2,610.1
Barley	1,033	2.7	0.6 - 16,672
Beans, Dry	1,306	3.5	0.1 - 10,968
Beans, Green	359	0.9	0.1 - 2,378
Beans, Lima	63	0.2	0.3 - 1,100
Beans & Seeds, Oil	28	0.0	1.0 - 1,323
Beets, Red	98	0.3	0.1 - 10,868
Berries	212	0.6	0.1 - 156
Bok Choy	156	0.4	0.1 - 10,968
Broccoli	571	1.5	0.1 - 10,728
Brussels	60	0.1	0.1 - 3,610
Cabbage	388	1.0	0.1 - 10,468
Cantaloupe	356	0.9	0.1 - 4,963
Carrots	344	0.9	0.1 - 10,968
Cauliflower	435	1.1	0.1 - 10,948
Celery	259	0.7	0.1 - 10,778
Cherries	615	1.6	0.1 - 635
Citrus-Kumquats/Pineapple	329	0.9	0.1 - 87
Clover	77	0.2	0.5 - 938
Corn-Grain/Field/Seed	383	1.0	0.1 - 4,201
Corn, Silage	1,907	5.1	0.3 - 4,932
Cotton	2,302	6.1	1.0 - 92,424
Cotton/Pima	12	0.0	40 - 1,188.5
Cover Crop	0	0	
Cucumbers	342	0.9	0.1 - 10,968
Dairy	1,755	4.7	
Dates	125	0.3	0.1 - 788
Eggplant	334	0.9	0.1 - 1,287
Endive	74	0.2	0.3 - 10,968
Fiber Crops-Hemp/Ramic/Flax	0	0	
Figs	75	0.2	0.1 - 3,648
Fruit-Miscellaneous/Tropical Fruit	144	0.4	0.1 - 161
Fruit Trees/Orchard Floors	55	0.1	0.3 - 140
Garlic	183	0.5	0.1 - 6,582
Grain, Misc.	80	0.2	0.1 - 540
Grape Juice	0	0	

TABLE 5 (Con't): Crops produced by California agricultural operations.
California Farm Operators Database

Crop	Number of Operators Growing Crop	Percent	Range of Acreage
Grapefruit	570	1.5	0.1 - 2,666.8
Grapes, Raisin	3,103	8.2	0.1 - 2,146
Grapes, Table	931	2.5	0.1 - 7,325
Grapes, Unspecified	162	0.4	0.5 - 1,697
Grapes, Wine	3,675	9.8	0.1 - 9,772.4
Hay	237	0.6	3 - 3,772
Herbs & Spice	178	0.5	0.1 - 16,252
Honeydew	86	0.2	0.1 - 1785
Kiwi	403	1.1	0.1 - 421
Leeks	36	0.0	0.1 - 664
Legumes, Other	0	0	
Lemons	1,128	3.0	0.1 - 4,282
Lettuce, Head (Unspecified)	519	1.4	0.1 - 10,948
Lettuce, Leaf	445	1.2	0.1 - 10,828
Melons	398	1.1	0.1 - 6,582
Miscellaneous-Cocoa/Coffee/Tobacco	2	0.0	1
Mushrooms	36	0.0	0.1 - 81.6
Napa Cabbage	118	0.3	0.1 - 10,968
Nectarines	960	2.6	0.1 - 1,458
Nursery Plants (Outdoor)	2,859	7.6	0.1 - 6,612
Nuts, Other-Macadamia/Chestnuts	62	0.2	0.1 - 142
Oats-Hay/Grain/Forage/Fodder/Seed	2,580	6.9	0.5 - 8,512.7
Okra	88	0.2	0.1 - 44.2
Olives	851	2.3	0.1 - 1,456.8
Onions, Bulb	558	1.5	0.1 - 10,968
Onions, Green	86	0.2	0.1 - 6,572
Oranges	3,786	10.1	0.1 - 9,762.7
Oriental Vegetables	250	0.7	0.1 - 13,164
Ornamentals-Xmas Trees/Lawns	464	1.2	0.1 - 10,000
Parsley	118	0.3	0.1 - 10,968
Parsnips	10	0.0	1 - 4,891
Pasture-Irrigated/Sudan/Bermuda Grass	1,282	3.4	0.3 - 30,000
Peaches	1,970	5.2	0.1 - 1,317
Peanuts	5	0.0	1 - 960
Pears	653	1.7	0.1 - 742
Peas	240	0.6	0.1 - 6,582
Peas, Sugar	186	0.5	0.2 - 620.5
Pecans	127	0.3	0.1 - 720
Peppers, Bell	462	1.2	0.1 - 10,968
Peppers, Chili	368	1.0	0.1 - 10,968
Peppers, Unspecified	3	0.0	1 - 2

TABLE 5 (Con't): Crops produced by California agricultural operations.
California Farm Operators Database

Crop	Number of Operators Growing Crop	Percent	Range of Acreage
Persimmons	395	1.0	0.1 - 638
Pimentos	18	0.0	1 - 10,968
Pistachios	358	1.0	0.2 - 14,615
Plums	1,516	4.0	0.1 - 2,570.1
Pomegranates	62	0.4	0.1 - 651
Popcorn	8	0.0	0.5 - 433
Potatoes	238	0.6	0.1 - 5,826
Potatoes, Sweet	86	0.2	0.1 - 1,488.5
Prunes	963	2.6	0.2 - 1,428
Pumpkins	239	0.6	0.1 - 6,582
Radishes	91	0.2	0.1 - 10,828
Rangeland	1,641	4.4	0.1 - 183,857
Rappini	11	0.0	2 - 3,610
Rice	1,475	3.9	0.1 - 4,029.3
Rutabagas	9	0.0	0.5 - 6,582
Rye	65	0.2	3.0 - 1,081
Safflower	509	1.4	1.0 - 25,020
Silage	54	0.1	0.3 - 1,678
Sorghum/Grains/Silage	25	0.0	4.0 - 4,387
Spinach	246	0.6	0.1 - 10,968
Squash	797	2.1	0.1 - 10,968
Strawberries	676	1.8	0.1 - 10,968
Sugar Cane	5	0.0	0.3 - 155
Sugarbeets	759	2.0	0.5 - 6,582
Sunflowers	107	0.3	0.1 - 1,503
Tangelos	69	0.2	0.3 - 235
Tangerines	225	0.6	0.1 - 1,174
Tomatoes, Cherry	69	0.2	0.1 - 15.0
Tomatoes, Fresh	779	2.1	0.1 - 10,968
Tomatoes, Processed	499	1.3	0.1 - 4,989
Tomatoes, Unspecified	16	0.0	0.5 - 524
Turnips/Turnip Greens	65	0.2	0.1 - 6,582
Vegetable: Fruit Seed-Soybeans	245	0.7	0.1 - 21,796
Vegetable: Leaf/Stem-Collards/Kale	130	0.3	0.1 - 21,896
Vegetable: Root-Jicama/Taro	17	0.0	0.1 - 532
Vegetable: Seed for Planting (Unspecified)	107	0.2	0.1 - 3,338.8
Vegetables, Combined Major	76	0.2	0.5 - 10,968
Vines (Unspecified)	7	0.0	3.0 - 441
Walnuts	4,034	10.7	0.1 - 2,509
Watermelon	327	0.9	0.1 - 1,466
Wheat	2,382	6.3	0.6 - 11,779
Yams	9	0.0	0.1 - 643

TABLE 6: Crops produced by California agricultural operations, by frequency.
California Farm Operators Database

Crop	Numbers of Operators Growing Crop	Percent	Range of Acreage
Alfalfa	4,616	12.3	0.1 - 21,714.7
Walnuts	4,034	10.7	0.1 - 2,509
Oranges	3,786	10.1	0.1 - 9,762.7
Grapes, Wine	3,675	9.8	0.1 - 9,772.4
Grapes, Raisin	3,103	8.2	0.1 - 2,146
Nursery Plants (Outdoor)	2,859	7.6	0.1 - 6,612
Oats-Hay/Grain/Forage/Fodder/Seed	2,580	6.9	0.5 - 8,512.7
Wheat	2,382	6.3	0.6 - 11,779
Cotton	2,302	6.1	1.0 - 92,424
Avocado	2,079	5.5	0.1 - 2,610.1
Peaches	1,970	5.2	0.1 - 1,317
Corn, Silage	1,907	5.1	0.3 - 4,932
Dairy	1,755	4.7	
Rangeland	1,641	4.4	0.1 - 183,857
Plums	1,516	4.0	0.1 - 2,570.1
Rice	1,475	3.9	0.1 - 4,029.3
Beans, Dry	1,306	3.5	0.1 - 10,968
Almonds	1,286	3.4	0.1 - 2,545
Pasture-Irrigated/Sudan/Bermuda Grass	1,282	3.4	0.3 - 30,000
Lemons	1,128	3.0	0.1 - 4,282
Barley	1,033	2.7	0.6 - 16,672
Prunes	963	2.6	0.2 - 1,428
Nectarines	960	2.6	0.1 - 1,458
Grapes, Table	931	2.5	0.1 - 7,325
Olives	851	2.3	0.1 - 1,456.8
Squash	797	2.1	0.1 - 10,968
Tomatoes, Fresh	779	2.1	0.1 - 10,968
Sugarbeets	759	2.0	0.5 - 6,582
Apples	713	1.9	0.1 - 1,001
Strawberries	676	1.8	0.1 - 10,968
Pears	653	1.7	0.1 - 742
Cherries	615	1.6	0.1 - 635
Broccoli	571	1.5	0.1 - 10,728
Grapefruit	570	1.5	0.1 - 2,666.8
Onions, Bulb	558	1.5	0.1 - 10,968
Lettuce, Head (Unspecified)	519	1.4	0.1 - 10,948
Corn, Sweet	518	1.4	0.1 - 6,582
Safflower	509	1.4	1.0 - 25,020
Tomatoes, Processed	499	1.3	0.1 - 4,989
Ornamentals-Xmas Trees/Lawns	464	1.2	0.1 - 10,000
Peppers, Bell	462	1.2	0.1 - 10,968

TABLE 6 (Con't): Crops produced by California agricultural operations, by frequency.
California Farm Operators Database

Crop	Numbers of Operators Growing Crop	Percent	Range of Acreage
Lettuce, Leaf	445	1.2	0.1 - 10828
Cauliflower	435	1.1	0.1 - 10,948
Kiwi	403	1.1	0.1 - 421
Melons	398	1.1	0.1 - 6,582
Persimmons	395	1.0	0.1 - 638
Cabbage	388	1.0	0.1 - 10,468
Corn-Grain/Field/Seed	383	1.0	0.1 - 4,201
Peppers, Chili	368	1.0	0.1 - 10,968
Beans, Green	359	0.9	0.1 - 2,378
Pistachios	358	1.0	0.2 - 14,615
Cantaloupe	356	0.9	0.1 - 4,963
Carrots	344	0.9	0.1 - 10,968
Cucumbers	342	0.9	0.1 - 10,968
Eggplant	334	0.9	0.1 - 1,287
Citrus-Kumquats/Pineapple	329	0.9	0.1 - 87
Watermelon	327	0.9	0.1 - 1,466
Celery	259	0.7	0.1 - 10,778
Oriental Vegetables	250	0.7	0.1 - 13,164
Spinach	246	0.6	0.1 - 10,968
Vegetable: Fruit Seed-Soybeans	245	0.7	0.1 - 21,796
Peas	240	0.6	0.1 - 6,582
Pumpkins	239	0.6	0.1 - 6,582
Potatoes	238	0.6	0.1 - 5,826
Hay	237	0.6	3 - 3,772
Tangerines	225	0.6	0.1 - 1,174
Berries	212	0.6	0.1 - 156
Peas, Sugar	186	0.5	0.2 - 620.5
Garlic	183	0.5	0.1 - 6,582
Herbs & Spice	178	0.5	0.1 - 16,252
Grapes, Unspecified	162	0.4	0.5 - 1,697
Pomegranates	162	0.4	0.1 - 651
Bok Choy	156	0.4	0.1 - 10,968
Asparagus	149	0.4	0.1 - 10,968
Fruit-Miscellaneous/Tropical Fruit	144	0.4	0.1 - 161
Vegetable: Leaf/Stem-Collards/Kale	130	0.3	0.1 - 21,896
Pecans	127	0.3	0.1 - 720
Dates	125	0.3	0.1 - 788
Napa Cabbage	118	0.3	0.1 - 10,968
Parsley	118	0.3	0.1 - 10,968
Sunflowers	107	0.3	0.1 - 1,503
Vegetable: Seed for Planting (Unspecified)	107	0.2	0.1 - 3,338.8

TABLE 6 (Con't): Crops produced by California agricultural operations, by frequency.
California Farm Operators Database

Crop	Numbers of Operators Growing Crop	Percent	Range of Acreage
Beets, Red	98	0.3	0.1 - 10,868
Okra	88	0.2	0.1 - 44.2
Honeydew	86	0.2	0.1 - 1,785
Onions, Green	86	0.2	0.1 - 6,572
Potatoes, Sweet	86	0.2	0.1 - 1,488.5
Grain, Misc.	80	0.2	0.1 - 540
Clover	77	0.2	0.5 - 938
Combined Major Vegetables	76	0.2	0.5 - 10,968
Figs	75	0.2	0.1 - 3,648
Endive	74	0.2	0.3 - 10,968
Tangelos	69	0.2	0.3 - 235
Tomatoes, Cherry	69	0.2	0.1 - 15
Artichokes	68	0.2	0.1 - 10,968
Rye	65	0.2	3.0 - 1,081
Turnips/Turnip Greens	65	0.2	0.1 - 6,582
Beans, Lima	63	0.2	0.3 - 1,100
Nuts, Other-Macadamia/Chestnuts	62	0.2	0.1 - 142
Brussels	60	0.1	0.1 - 3,610
Fruit Trees/Orchard Floors	55	0.1	0.3 - 140
Silage	54	0.1	0.3 - 1,678
Leeks	36	0.0	0.1 - 664
Mushrooms	36	0.0	0.1 - 81.6
Beans & Seeds, Oil	28	0.0	1 - 1,323
Sorghum/Grains/Silage	25	0.0	4 - 4,387
Pimentos	18	0.0	1 - 10,968
Vegetable: Root/Jicama/Taro	17	0.0	0.1 - 532
Tomatoes, Unspecified	16	0.0	0.5 - 524
Cotton/Pima	12	0.0	40 - 1,188.5
Rappini	11	0.0	2 - 3,610
Parsnips	10	0.0	1 - 4,891
Rutabagas	9	0.0	0.5 - 6,582
Yams	9	0.0	0.1 - 643
Popcorn	8	0.0	0.5 - 433
Vines (Unspecified)	7	0.0	3 - 441
Peanuts	5	0.0	1 - 960
Sugar Cane	5	0.0	0.3 - 155
Peppers, Unspecified	3	0.0	1 - 2
Miscellaneous-Cocoa/Coffee/Tobacco	2	0.0	1
Cover Crop	0	0	
Fiber Crops-Hemp/Ramie/Flax	0	0	
Grape Juice	0	0	
Legumes, Other	0	0	

TABLE 7: Type of business with 1993 TIPP notice of violation.
TIPP 1993 Database

Business Type	Number of Reports	Percent
Farm	157	48.6
Farm Labor Contractor	87	26.9
Raitero	39	12.1
Shipper/Grower Shipper/Packer	3	0.9
Unknown	37	11.5
Total Reports	323	100.0

1,125 notices of violations among 323 reports

TABLE 8: Number of 1993 TIPP notices of violation per farm operation.
TIPP 1993 Database

Number of Violations	Number of Reports	Percent
1	100	31.0
2	35	10.8
3	45	13.9
4	38	11.8
5	46	14.2
6	21	6.5
7	18	5.6
8-10	16	5.0
11-13	4	1.2
Total Reports	323	100

TABLE 9: Frequency of 1993 notices of violation, by citation category.
TIPP 1993 Database

Citation Category	Notices of Violation		
	Frequency	Percent	
Wages	Subtotal:	206	18.5
Payday Law		15	1.5
Payday Notice		167	14.8
Wage Deduction Statement		22	2.0
Paycheck Law		2	0.2
Health & Safety	Subtotal:	124	11.0
Wash Facilities/Food Crop		64	5.7
Toilet Facilities		32	2.8
Ventilation		0	0
Unsuitable Place of Employment		2	0.2
Medical Kit		26	2.3
Farm Labor Contractor Laws	Subtotal:	93	8.3
License: Possession, Address		19	1.7
Vehicle Insurance		3	0.3
Vehicle Identified & Registered		1	0.1
Driver Properly Licensed		2	0.2
Rate of Compensation		68	6.0
Bona Fide Order		0	0
Workers' Compensation			
Workers' Compensation Ins.		174	15.5
Industrial Welfare Commission Order	Subtotal:	528	47.0
Minimum Wage		12	1.1
Overtime Wage		21	1.9
Split Shifts		0	0
Reporting Time Pay		0	0
Records (Not Specified)		6	0.5
Records: Name/Address/SSN		12	1.1
Records: Birthdate of Minors		46	4.1
Records: Time in/out, Meal Periods		64	5.7
Records: Payroll Records, Wages by Period		10	0.9
Records: Total Hours by Day		17	1.5
Cash Shortage & Breakage		1	0.1
Uniforms & Equipment		8	0.7
Meal or Lodging Agreements		1	0.1
Meal Periods		20	1.8
Rest Periods		32	2.8
Posting of Order		178	15.8
Minors		58	5.2
Unlicensed Day Haul		42	3.7

Total Number of 1993 Violations = 1125

TABLE 10: Frequency of 1993 health-and-safety violations among agricultural operations.
1993 TIPP Database

Number of Violations Per Operation	Frequency	Percent
1	30	69.8
2	11	25.6
3	2	4.6
Total Reports	43	100%

Five citation categories within Health and Safety

TABLE 11: Type of business with 1994 TIPP notices of violation.
1994 TIPP Database

Business Type	Number of Reports	Percent
Agricultural Operator	104	41.7
Farm Labor Contractor	74	26.6
Raitero	12	2.2
Unknown	82	29.5
Total Reports	278	100.0

400 notices of violations among 278 reports

**TABLE 12: Number of 1994 notices of violation per farm operation.
1994 TIPP Database**

Number of Violations	Number of Reports *	Percent
1	217	80.4
2	17	6.3
3	7	2.5
4	9	3.3
5	6	2.2
6	9	3.3
7-10	5	1.9
Total Reports	270	100

* For 8 reports, the specific notices of violations could not be identified.

TABLE 13: Frequency of 1994 TIPP notices of violation, by citation category.
1994 TIPP Database

Citation Category	Notices of Violation	
	Frequency	Percent
Wages	48	12.1
Subtotal:		
Payday Law	6	1.5
Payday Notice	20	5.0
Wage Deduction Statement	9	2.3
Paycheck Law	13	3.3
Health & Safety	7	2.5
Subtotal:		
Wash Facilities/Food Crop	6	2.2
Toilet Facilities	0	0
Ventilation	0	0
Unsuitable Place of Employment	0	0
Medical Kit	1	0.3
Farm Labor Contractor Laws	20	5.2
Subtotal:		
License: Possession, Address	10	2.5
Vehicle Insurance	3	0.8
Vehicle Identified & Registered	1	0.3
Driver Properly Licensed	0	0
Rate of Compensation	3	0.8
Bona Fide Order	3	0.8
Workers' Compensation		
Workers' Compensation Insurance	83	20.8
Industrial Welfare Commission Order	242	60.8
Subtotal:		
Minimum Wage	26	6.5
Overtime Wage	1	0.3
Split Shifts	0	0
Reporting Time Pay	4	1.0
Records (Not Specified)	20	5.0
Records: Name/Address/SSN	0	0
Records: Birthdate of Minors	0	0
Records: Time in/out, Meal Periods	15	3.8
Records: Payroll Records, Wages by Period	1	0.3
Records: Total Hours by Day	2	0.5
Cash Shortage & Breakage	0	0
Uniforms & Equipment	10	2.5
Meal or Lodging Agreements	1	0.3
Meal Periods	7	1.8
Rest Periods	7	1.8
Posting of Order	24	6.0
Minors	70	17.5
Unlicensed Day Haul	54	13.5

Total Number of 1994 Violations = 400

TABLE 14: Correlations between TIPP 1993 types of violation.

TIPP 1993 Variable	Items with Correlation > 0.3	Correlation
Payday Law	Paycheck Law	0.36
Payday Notice	Posting of Order	0.66
	Workers Compensation Insurance	0.55
	Compensation Rate	0.41
	Unlicensed Day Haul	-0.36
Paycheck Law	Minimum Wage	0.40
	Payday Law	0.36
Wash Facility/Food Crop	Toilet Facilities	0.51
	Posting of Order	0.31
Toilet Facilities	Wash Facilities/Food Crop	0.51
Medical Kit	Meal Periods	0.49
	Rest Periods	0.47
	Record: Time in/out Meal Split	0.37
Compensation Rate	Payday Notice	0.41
	Workers Compensation Insurance	0.39
	Posting of Order	0.36
	Record: Minor Birthdate	0.33
Workers Compensation Insurance	Payday Notice	0.55
	Posting of Order	0.45
	Unlicensed Day Haul	-0.40
	Compensation Rate	0.39
Minimum Wage	Paycheck Law	0.40
Record: Name/Address/SSN	Record: Total Hours	0.32
Record: Minor Birthdate	Compensation Rate	0.33
Record: Time in/out Meal Split	Record: Total Hours	0.37
	Medical Kit	0.37
	Meal Periods	0.32
	Record: Payroll	0.31
Record: Payroll	Record: Total Hours	0.52
	Uniforms & Equipment	0.32
	Record: Payroll	0.31
	Cash Shortage & Breakage	0.31
	Meal/Lodging Agreements	0.31
Record: Total Hours	Record: Payroll	0.52
	Record: Time in/out Meal Split	0.37
	Record: Name/Address/SSN	0.32
Cash Shortage & Breakage	Uniforms & Equipment	0.35
	Record: Payroll	0.31

TABLE 14 (Con't.): Correlations between TIPP 1993 types of violation.

TIPP 1993 Variable	Items with correlation > 0.3	Correlation
Uniforms & Equipment	Cash Shortage & Breakage	0.35
	Record: Payroll	0.32
Meal/Lodging Agreements	Record: Payroll	0.31
Meal Periods	Rest Periods	0.69
	Medical Kit	0.49
	Record: Time in/out Meal Split	0.32
Rest Periods	Meal Periods	0.69
	Medical Kit	0.47
Posting of Order	Payday Notice	0.66
	Workers' Compensation Insurance	0.45
	Unlicensed Day Haul	-0.43
	Compensation Rate	0.36
	Wash Facility/Food Crop	0.31
Unlicensed Day Haul	Posting of Order	-0.43
	Workers Compensation Rate	-0.40
	Payday Notice	-0.36

TABLE 15: Correlations between TIPP 1994 types of violation.

TIPP 1994 Variable	Items with correlation > 0.3	Correlation
Payday Law	Record: Payroll	0.40
	Record: Time in/out Meal Split	0.40
Payday Notice	Posting of Order	0.71
	Record: Time in/out Meal Split	0.49
Wage Deduction Statement	Record: Payroll	0.33
Wash Facility/Food Crop	Medical Kit	0.40
Medical Kit	Wash Facility/Food Crop	0.40
License/Possession/Address	Compensation Rate	0.54
Compensation Rate	License/Possession/Address	0.54
Workers' Compensation Insurance	Minor	-0.34
	Unlicensed Day Haul	-0.32
Records	Meal Periods	0.49
	Rest Periods	0.49
	Posting of Order	0.41
	Uniforms & Equipment	0.39
Record: Time in/out Meal Split	Payday Notice	0.49
	Payday Law	0.40
	Posting of Order	0.38
Record: Payroll	Payday Law	0.40
	Wage Deduction Statement	0.33
Uniforms & Equipment	Rest Periods	0.46
	Records	0.39
	Meal Periods	0.34
Meal Periods	Rest Periods	0.85
	Records	0.49
	Posting of Order	0.46
	Uniforms & Equipment	0.34
Rest Periods	Meal Periods	0.85
	Records	0.49
	Uniforms & Equipment	0.46
	Posting of Order	0.44
Posting of Order	Payday Notice	0.71
	Meal Periods	0.44
	Rest Periods	0.44
	Records	0.41
	Record: Time in/out Meal Split	0.38
Minor	Workers Compensation Insurance	-0.34
Unlicensed Day Haul	Workers Compensation Insurance	-0.32

TABLE 16: Agricultural operation by violation status for 1993 and 1994.

Agricultural Operation	Violation Report		No Violation Report	
	Frequency	Percent	Frequency	Percent
Farm	151	89.3	33,058	87.8
Nursery	15	8.9	2,133	5.7
Dairy	1	0.6	1,730	4.6
Other/Unknown	2	1.2	710	1.9
Total Reports	169	100.0	37,407	100.0

TABLE 17: Comparison between farm operators growing particular crops and violation status.

CROPS	Violation		No Violation		Statistical Significance
	Number of Growers	Percent	Number of Growers	Percent	
Alfalfa	4	2.37	4,612	12.31	0.000
Almonds	8	4.73	1,278	3.41	0.345
Apples	9	5.33	704	1.88	0.001
Artichokes	2	1.18	66	0.18	0.002
Asparagus	3	1.78	146	0.39	0.004
Avocado	2	1.18	2,077	5.54	0.013
Barley	6	3.55	1,027	2.74	0.521
Beans, Dry	13	7.69	1,293	3.45	0.003
Beans, Green	4	2.37	355	0.95	0.058
Beans, Lima	0		63	100	
Beans & Seeds, Oil	0		28	100	
Beets, Red	4	2.37	94	0.25	0.000
Berries	10	5.92	202	0.54	0.000
Bok Choy	9	5.33	147	0.39	0.000
Broccoli	26	15.38	545	1.45	0.000
Brussels	3	1.78	57	0.15	0.000
Cabbage	17	10.06	371	0.99	0.000
Cantaloupe	5	2.96	351	0.94	0.007
Carrots	10	5.92	334	0.89	0.000
Cauliflower	18	10.65	417	1.11	0.000
Celery	11	6.51	248	0.66	0.000
Cherries	3	1.78	612	1.63	0.885
Citrus-Kumquats/Pineapples	2	1.18	327	0.87	0.665
Clover	0		77	100.00	
Corn-Grain/Field/Seed	2	1.18	381	1.02	0.830
Corn, Silage	2	1.18	1,905	5.08	0.021
Corn, Sweet	9	5.33	509	1.36	0.000
Cotton	10	5.92	2,292	6.12	0.913
Cotton/Pima	0		12	100.00	
Cucumbers	13	7.69	419	1.12	0.000
Dairy	1	0.59	1,754	4.68	0.000
Dates	4	2.37	121	0.32	0.000
Eggplant	4	2.37	330	0.88	0.040
Endive	5	2.96	69	0.18	0.000
Figs	3	1.78	72	0.19	0.000
Fruit-Misc./Tropical Fruit	0		144	100.00	
Fruit Trees/Orchard Floors	0		55	100.00	
Garlic	2	1.18	181	0.48	0.192
Grain, Misc.	1	0.59	79	0.21	0.283
Grapefruit	4	2.37	566	1.51	0.363
Grapes, Raisin	28	16.57	3,075	8.21	0.000

TABLE 17 (Con't): Comparison between farm operators growing particular crops and violation status.

CROPS	Violation		No Violation		Statistical Significance
	Number of Growers	Percent	Number of Growers	Percent	
Grapes, Table	10	5.92	921	2.46	0.004
Grapes, Unspecified	5	2.96	157	0.42	0.000
Grapes, Wine	12	7.10	3,663	9.78	0.242
Hay	0		237	100.00	
Herbs & Spice	7	4.14	171	0.46	0.000
Honeydew	1	0.59	85	0.23	0.322
Kiwi	2	1.18	401	.07	0.887
Leeks	2	1.18	34	0.09	0.000
Lemons	4	2.37	1,124	3.00	0.630
Lettuce, Head (Unspecified)	18	10.65	501	1.34	0.000
Lettuce, Leaf	19	11.24	426	1.14	0.000
Melons	4	2.37	394	1.05	0.095
Miscellaneous- Cocoa/Coffee/Tobacco	0		2	100.00	
Mushrooms	5	2.96	31	0.08	0.000
Napa Cabbage	6	3.55	112	0.30	0.000
Nectarines	15	8.88	945	2.52	0.000
Nursery Plants	25	14.79	2,834	7.56	0.000
Nuts, Other	1	0.59	61	0.16	0.170
Oats-Hay/Grain/Forage	6	3.55	2,574	6.87	0.088
Okra	4	2.37	84	0.22	0.000
Olives	0		851	100.00	
Onions, Bulb	9	5.33	549	1.47	0.000
Onions, Green	2	1.18	84	0.22	0.009
Oranges	11	6.51	3,775	10.08	0.124
Oriental Vegetables	9	5.33	241	0.64	0.000
Ornamentals-Christmas Trees	2	1.18	462	1.23	0.953
Parsley	9	5.33	109	0.29	0.000
Parsnips	0		10	100.00	
Pasture-Irrigated	4	2.37	1,278	3.41	0.455
Peaches	22	13.02	1,948	5.20	0.000
Peanuts	0		5	100.00	
Pears	2	1.18	651	1.74	0.582
Peas	9	5.33	231	0.62	0.000
Peas, Sugar	4	2.37	182	0.49	0.001
Pecans	0		127	100.00	
Peppers, Bell	16	9.47	446	1.19	0.000
Peppers, Chili	5	2.96	363	0.97	0.009
Peppers, Unspecified	0		3	100.00	
Persimmons	3	1.78	392	1.05	0.354
Pimentos	0		18	100.00	

TABLE 17 (Con't): Comparison between farm operators growing particular crops and violation status.

CROPS	Violation		No Violation		Statistical Significance
	Number of Growers	Percent	Number of Growers	Percent	
Pistachios	3	1.78	355	0.95	0.269
Plums	13	7.69	1,503	4.01	0.015
Pomegranates	0		162	100.00	
Popcorn	0		8	100.00	
Potatoes	4	2.37	234	0.62	0.004
Potatoes, Sweet	0		86	100.00	
Prunes	5	2.96	958	2.56	0.742
Pumpkins	4	2.37	235	0.63	0.005
Radishes	3	1.78	88	0.23	0.000
Rangeland	2	1.18	1,639	4.38	0.043
Rappini	1	0.59	10	0.03	0.000
Rice	0		1,475	100.00	
Rutabagas	0		9	100.00	
Rye	0		65	100.00	
Safflower	1	0.59	508	1.36	0.391
Silage	0		54	100.00	
Sorghum/Grains/Silage	0		25	100.00	
Spinach	12	7.10	234	0.62	0.000
Squash	18.93	4.02	2,04	95.98	0.000
Strawberries	48	28.4	628	1.68	0.000
Sugar Cane	0		5	100.00	
Sugarbeets	1	0.59	758	2.02	0.187
Sunflowers	0		107	100.00	
Tangelos	0		69	100.00	
Tangerines	3	1.78	222	0.59	0.047
Tomatoes, Cherry	0		69	100.00	
Tomatoes, Fresh	19	11.24	760	2.03	0.000
Tomatoes, Processed	3	1.78	496	1.32	0.609
Tomatoes, Unspecified	0		16	100.00	
Turnips/Turnip Greens	5	2.96	60	0.16	0.000
Vegetable: Fruit Seed- Soybeans/Sprouts	10	5.92	235	0.63	0.000
Vegetable: Leaf/Stem- Collard/Kale	7	4.14	123	0.33	0.000
Vegetable: Root-Jicama/Taro	0		17	100.00	
Vegetable: Seed for Planting	1	0.59	106	0.28	0.452
Vegetables, Combined Major	9	5.33	67	0.18	0.000
Vines (Unspecified)	0		7	100.00	
Watermelon	7	4.14	320	0.85	0.000
Wheat	12	7.10	2,370	6.33	0.680
Walnuts	10	5.92	4,024	10.74	0.043
Yams	1	0.59	8	0.02	0.000

TABLE 18: Percent of operators with TIPP violation farming in one county compared to operators in more than one county.

Number of Counties	Violation		No Violation		Statistical Significance
	Frequency	Percent	Frequency	Percent	
1	141	83.4	35,643	95.6	
> 1	28	16.6	1,638	4.4	$X^2 = 58.662$ p-value=0.0
Total Reports	169	100	37,281	100	

TABLE 19: Comparisons of operation type for singly cited vs. multiply cited agricultural operations.

Operation Type	One Violation		> One Violation	
	Frequency	Percent	Frequency	Percent
Farm	52	91.2	99	88.4
Nursery	3	5.2	12	10.7
Dairy	1	1.8	0	0.0
Other/Unknown	1	1.8	1	0.9
Total Reports	57	100.0	112	100.0

TABLE 20: Comparison of number of counties farmed for singly cited vs. multiply cited operations.

Number of Counties	One Violation		> One Violation		Statistical Significance
	Frequency	Percent	Frequency	Percent	
1	50	87.7	91	81.3	$\chi^2 = 1.144$ p-value = 0.285
> 1	7	12.3	21	18.8	
Total Reports	57	100.0	112	100.0	

TABLE 21: Comparison of crops produced for singly cited vs. multiply cited operations.

CROPS	One Violation		> One Violation		Statistical Significance
	Number of Growers	Percent	Number of Growers	Percent	
Alfalfa	0	0.0	4	3.57	0.149
Almonds	2	3.51	6	5.36	0.593
Apples	0	0.0	9	8.04	0.028
Artichokes	0	0.0	2	1.79	0.310
Asparagus	3	5.26	0	0.0	0.014
Avocado	1	1.75	1	0.89	0.624
Barley	1	1.75	5	4.46	0.368
Beans, Dry	4	7.02	9	8.04	0.814
Beans, Green	2	3.51	2	1.79	0.486
Beets, Red	0	0.0	4	3.57	0.149
Berries	5	8.77	5	4.46	0.262
Bok Choy	5	8.77	4	3.57	0.155
Broccoli	7	12.28	19	16.96	0.425
Brussel Sprouts	1	1.75	2	1.79	0.988
Cabbage	7	12.28	10	8.93	0.493
Cantaloupe	1	1.75	4	3.57	0.510
Carrots	3	5.26	7	6.25	0.797
Cauliflower	6	10.53	12	10.71	0.970
Celery	4	7.02	7	6.25	0.848
Cherries	0	0.0	3	2.68	0.212
Citrus-Kumquats/ Pineapples	1	1.75	1	0.89	0.624
Corn-Grain/Field/ Seed	1	1.75	1	0.89	0.624
Corn, Silage	2	3.51	0	0.0	0.046
Corn, Sweet	3	5.26	6	5.36	0.979
Cotton	1	1.75	9	8.04	0.102
Cucumbers	3	5.26	10	8.93	0.398
Dairy	1	1.75	0	0.0	0.160
Dates	1	1.75	3	2.68	0.709
Eggplant	2	3.51	2	1.79	0.486
Endive	1	1.75	4	3.57	0.510
Figs	0	0.0	3	2.68	0.212
Garlic	0	0.0	2	1.79	0.310
Grain, Misc.	0	0.0	1	0.89	0.474
Grapefruit	3	5.26	1	0.89	0.077
Grapes, Raisin	8	14.04	20	17.86	0.527
Grapes, Table	2	3.51	8	7.14	0.344
Grapes, Unspecified	0	0.0	5	4.46	0.105
Grapes, Wine	1	1.75	11	9.82	0.054
Herbs & Spice	3	5.26	4	3.57	0.602
Honeydew	1	1.75	0	0.0	0.160
Kiwi	0	0.0	2	1.79	0.310
Leeks	1	1.75	1	0.89	0.624
Lemons	3	5.26	1	0.89	0.077
Lettuce, Head (Unspecified)	6	10.53	12	10.71	0.970
Lettuce, Leaf	7	12.28	12	10.71	0.761

TABLE 21 (Con't): Comparison of crops produced for singly cited vs. multiply cited operations.

CROPS	One Violation		> One Violation		Statistical Significance
	Number of Growers	Percent	Number of Growers	Percent	
Melons	4	7.02	0	0.0	0.005
Mushrooms	3	5.26	2	1.79	0.207
Napa Cabbage	3	5.26	3	2.68	0.391
Nectarines	0	0.0	15	13.39	0.004
Nursery Plants	7	12.28	18	16.07	0.512
Nuts, Other	0	0.0	1	0.89	0.474
Oats-Hay/Grain/ Forage	1	1.75	5	4.46	0.368
Okra	2	3.51	2	1.79	0.486
Onions, Bulb	4	7.02	5	4.46	0.485
Onions, Green	0	0.0	2	1.79	0.310
Oranges	4	7.02	7	6.25	0.848
Oriental Vegetables	4	7.02	5	4.46	0.485
Ornamentals-Xmas Trees	0	0.0	2	1.79	0.310
Parsley	6	10.53	3	2.68	0.032
Pasture-Irrigated	1	1.75	3	2.68	0.709
Peaches	5	8.77	17	15.18	0.242
Pears	1	1.75	1	0.89	0.624
Peas	2	3.51	7	6.25	0.453
Peas, Sugar	2	3.51	2	1.79	0.486
Peppers, Bell	5	8.77	11	9.82	0.826
Peppers, Chili	1	1.75	4	3.57	0.510
Persimmons	0	0.0	3	2.68	0.212
Pistachios	0	0.0	3	2.68	0.212
Plums	1	1.75	12	10.71	0.039
Potatoes	0	0.0	4	3.57	0.149
Prunes	2	3.51	3	2.68	0.763
Pumpkins	2	3.51	2	1.79	0.486
Radishes	0	0.0	3	2.68	0.212
Rangeland	0	0.0	2	1.79	0.310
Rappini	0	0.0	1	0.89	0.474
Safflower	0	0.0	1	0.89	0.474
Spinach	6	10.53	6	5.36	0.216
Squash	10	17.54	22	19.64	0.742
Strawberries	17	29.82	31	27.68	0.770
Sugarbeets	1	1.75	0	0.0	0.160
Tangerines	2	6.51	1	0.89	0.223
Tomatoes, Fresh	7	12.28	12	10.71	0.761
Tomatoes, Processed	1	1.75	2	1.79	0.988
Turnips	0	0.0	5	4.46	0.105
Vegetable: Fruit Seed-Soybeans/ Sprouts	3	5.26	7	6.25	0.797
Vegetable: Leaf/Stem- Collard/Kale	3	5.26	4	3.57	0.602

TABLE 21 (Con't): Comparison of crops produced for singly cited vs. multiply cited operations.

CROPS	One Violation		> One Violation		Statistical Significance
	Number of Growers	Percent	Number of Growers	Percent	
Vegetable: Seed for Planting	1	1.75	0	0.0	0.160
Vegetables, Combined Major	3	5.26	6	5.36	0.979
Walnuts	3	5.26	7	6.25	0.797
Watermelon	4	7.02	3	2.68	0.181
Wheat	2	3.51	10	8.93	0.195
Yams	0	0.0	1	0.89	0.474

IX. FIGURES

Figure 2. Serious violations of Cal-OSHA Standards, by Type of Standard, 1993-1995, U.S. Dept. Of Labor, 839 Violations

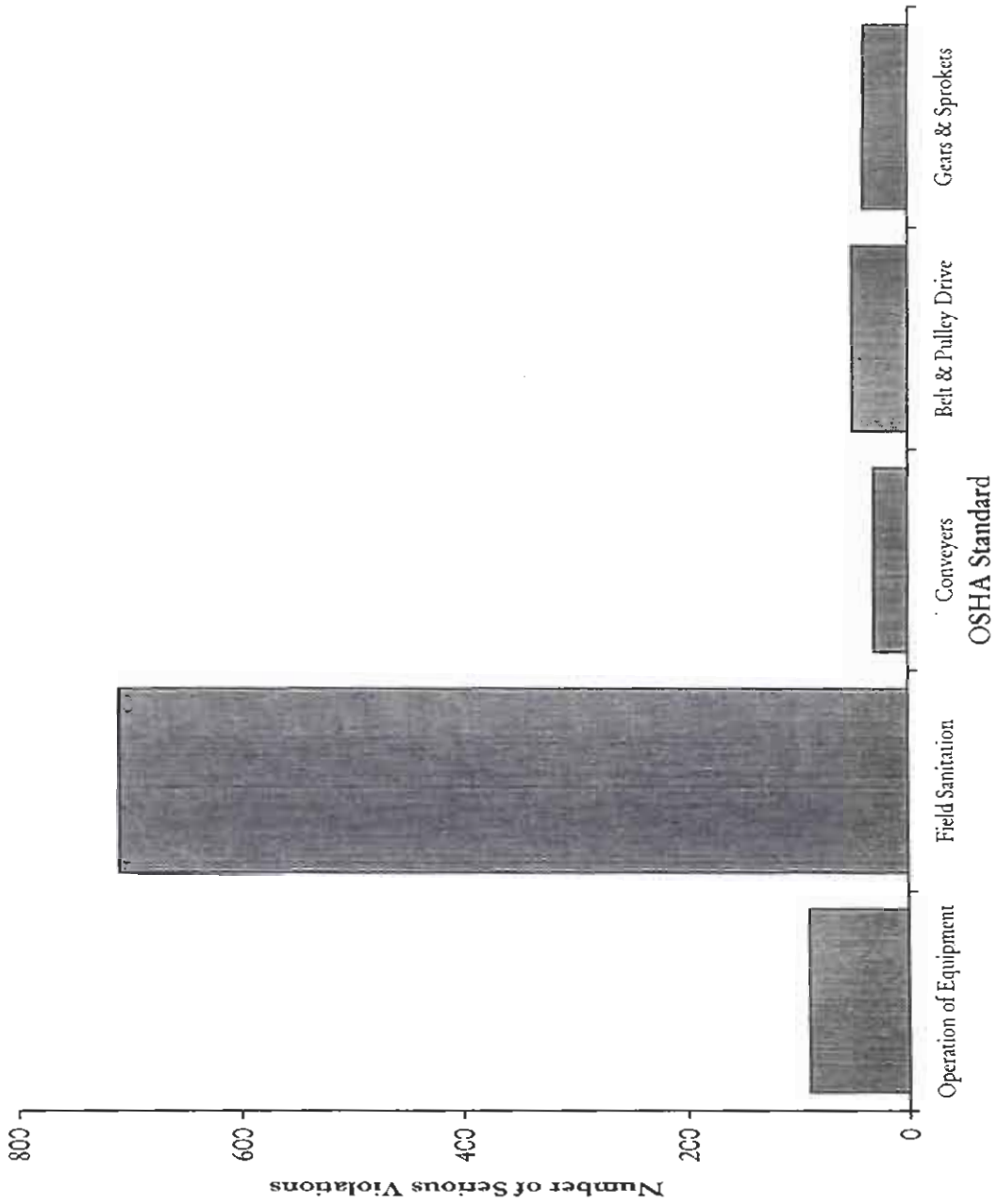


Figure 3. Serious violations of Cal-OSHA Standards,
by Type of Employer, 1993-1995, U.S. Dept. of Labor, 722 Case Reports

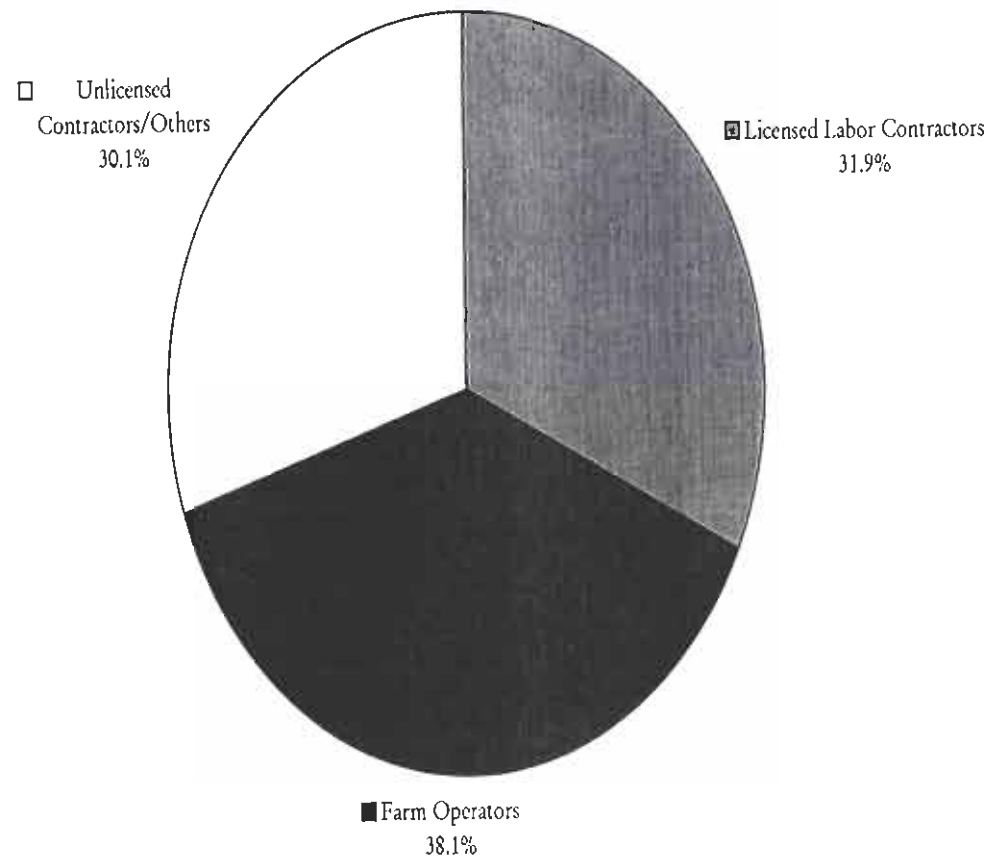


Figure 4. Farm Operator TIPP Citations and Labor Expense by SIC Code, TIPP (1993-1994), and Census of Agriculture (1992)

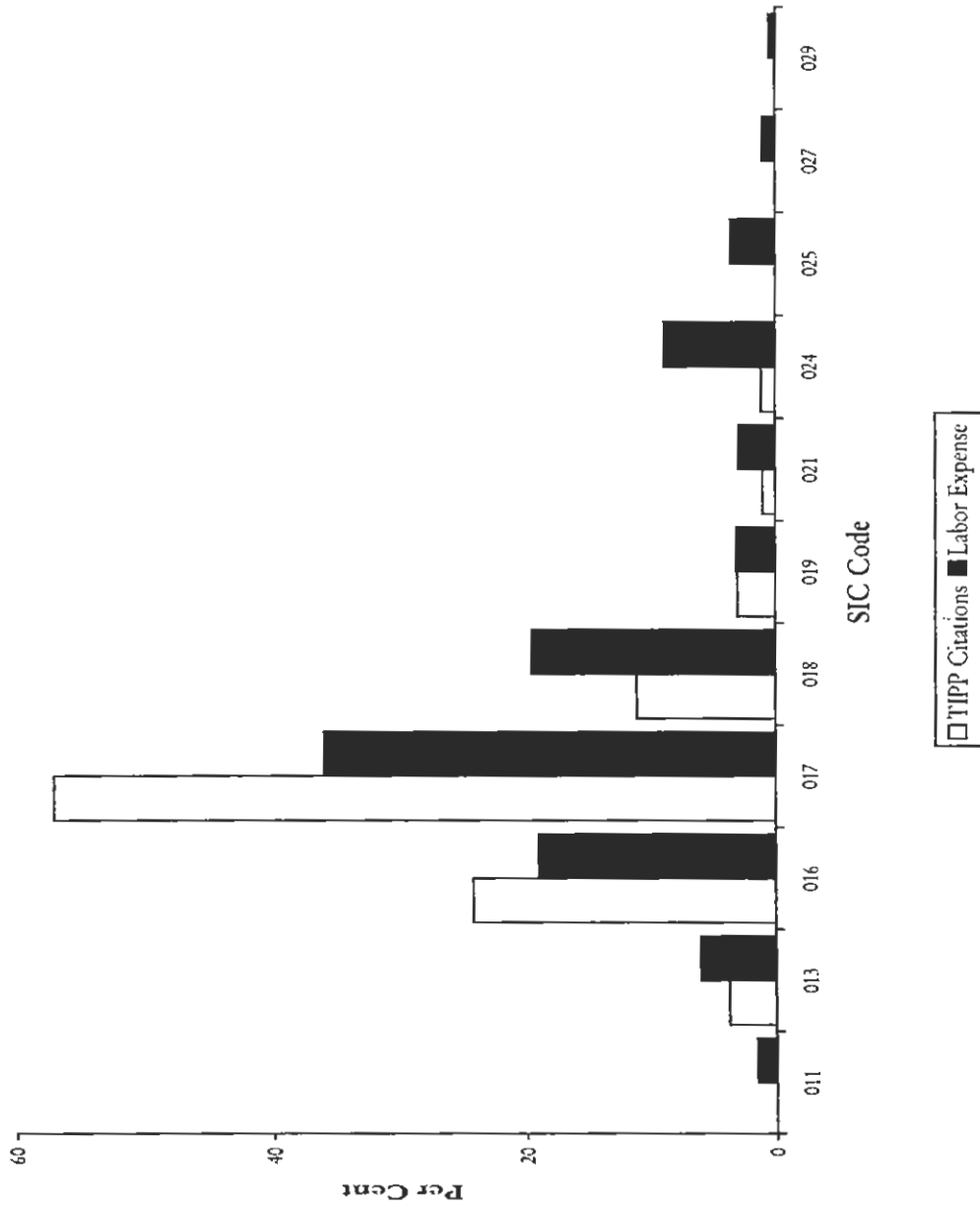


Figure 5. Farm Operator TIPP Citations and Labor Expense Fruit Farms
TIPP (1993-1994) and Employment Development Dept. Wages (1991)

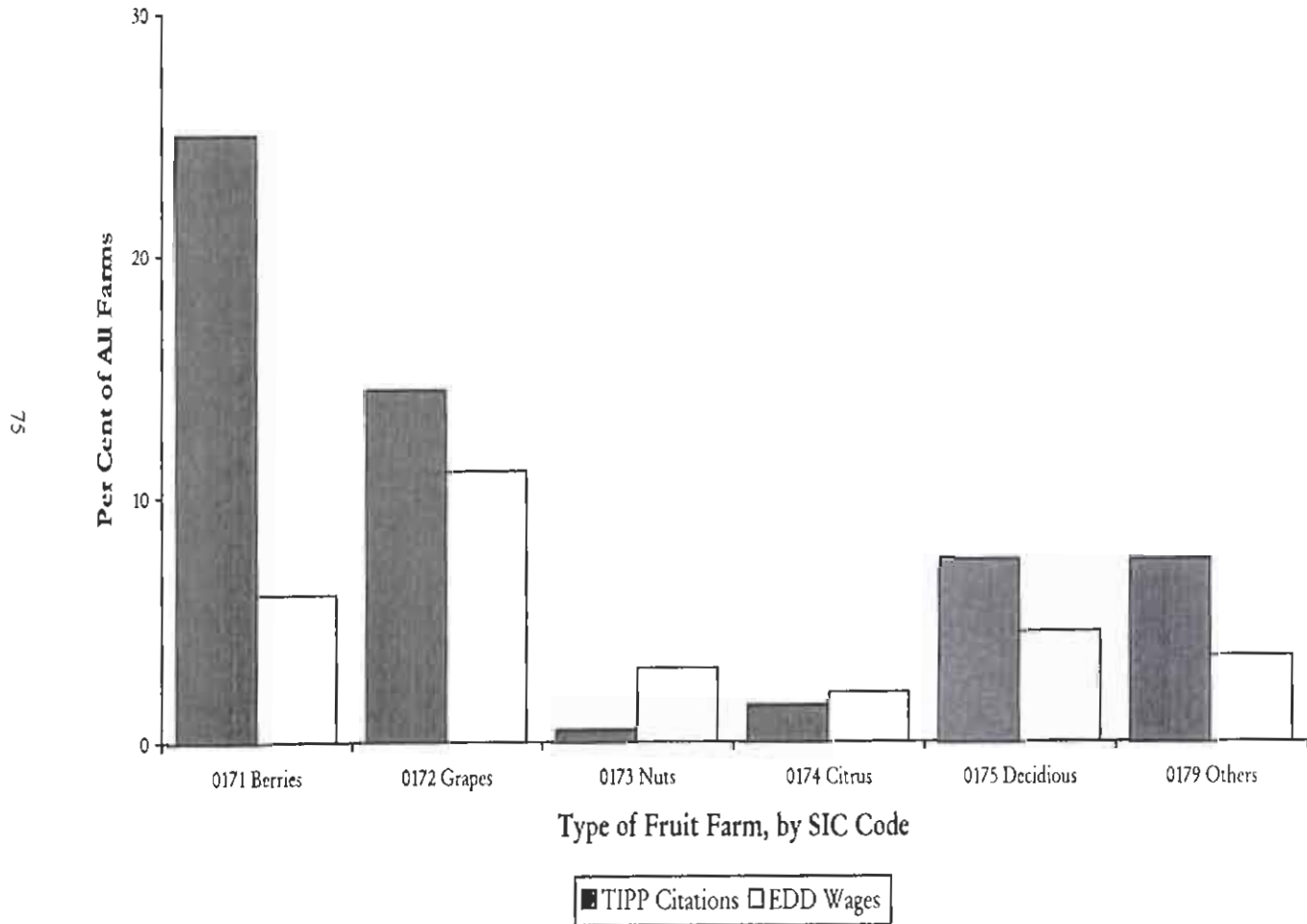


Figure 6. Farm Operator TIPP Citations and Labor Expense by Farm Size, TIPP (1993-1994) and Census of Agriculture (1992)

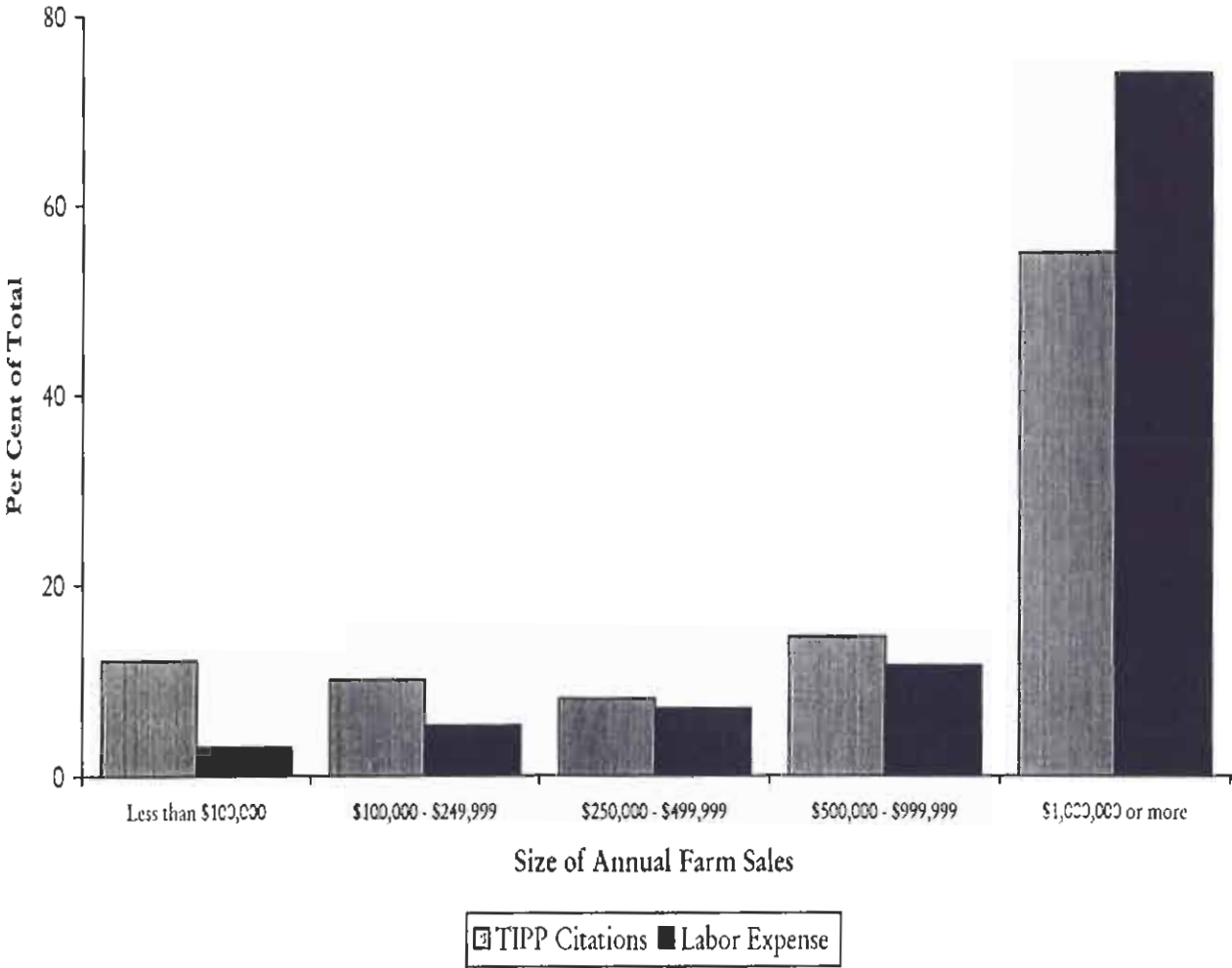


Figure 7. Farm Operator TIPP Citations and Labor Expense by Region, TIPP (1993-1994) and Census of Agriculture (1992)

