THE OCCUPATIONAL, SAFETY, AND HEALTH OF FLORIDA FARM WORKERS: ENVIRONMENTAL JUSTICE IN THE FIELDS

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ABSTRACT

This study involves a survey of farm workers in two South Florida counties questioning the workers about pesticide exposure, health problems, and laws and legal rights. A finding is that the federal and state laws which are currently in place to protect the workers from pesticide exposure are not adequately implemented. Several of the health problems farm workers noted match the symptoms of moderate and mild pesticide poisoning. The study concludes with policy recommendations for federal and Florida officials to change and better enforce the current laws pertaining to farm workers.

INTRODUCTION

Since the early 1980s, environmental justice has expanded from a largely local grassroots issue. In 1982, the Warren County, North Carolina protests began what is now a national environmental justice movement. In 1994 with signing of Executive Order 12898 by former President Clinton, environmental justice became a federal policy. The four main areas of environmental justice focus on: 1) the distribution of environmental hazards and the distribution of the effects of environmental problems; 3) the policy-making process; and 4) the administration of environmental programs (U.S. EPA. 1995).

When examining the distributional impacts of environmental pollution across different racial and income groups in America, Moses (1989, 1993) argues that agricultural

workers faced an average risk of skin disease four times higher that workers in other industries. Moses state that more than 40 percent of all reported occupational diseases in the United States were disorders of the skin and the actual incidence was estimated to be ten to fifty times higher than the reported incidence of cases (*Ibid.*, 1989). Additionally, Bullard (1994a) argues that, due to existing exemptions in federal occupational health and labor regulation, office workers are afforded greater protection than farm workers.

This study will first examine the current federal and Florida state laws which protect farm workers from the harmful effects of pesticides. Next, the results of 109 interviews with Florida farm workers will be analyzed. The interviews will address the following question: Are the federal and Florida state laws in place to protect farm workers from pesticide exposure being properly implemented? Conclusions will be made based on the findings as they relate to the issue of environmental justice. Finally, policy recommendations will be made.

ENVIRONMENTAL HAZARDS IN THE US

Coye (1985) asserts that California and Florida employ more than 50 percent of U.S. farm workers who labor on farms employing more than ten workers. Additionally, 65 percent of these workers were employed in the production of vegetables, fruits, nuts, tobacco or sugar. There are all labor intensive crops that require heavy pesticide application. Coye states that, of the one billion pounds of pesticides used annually in agriculture in the United State3s, 800 million pounds are applied to approximately 20 percent of the total crop acreage and most of these crops involve seasonal field labor.

Skin disease is a major problem for farm workers. The prime causes of the high rate of skin disease with farm workers are attributed to high exposure to pesticides (Moses, 1989a, 1989b, 1993). Numerous researchers argue that pesticides are responsible for many other health problems that farm workers experience such as spontaneous abortions, still births, low sperm count, sterilization, cancer, neurological and behavioral disorders, and other related illnesses (Anger *et al.*, 1986; Dille and Smith, 1964; Heidam, 1984; Levin, 1976; Moses, 1989a, 1989b, 1993; Rodnitsky *et al.*, 1988).

Another important problem regarding pesticides and farm workers is that of pesticides drifting from the site of application (Moses *et al.*, 1993) who state that as little as 10-15 percent of applied pesticides actually reach the target pest while the remaining 85-90 percent is dispersed off-target to air, soil, and water through drift and run-off. They contend that significant concentrations of all pesticides applied aerially or by ground-rig sprayers can drift up to one mile or more from the site of application even under the best of wind conditions depending on particle size and method of application. This is one of the most comprehensive articles written on the problems of pesticide applications. However, several studies by the Spray Drift Task Force (1997a, 1997b, 1997c) reveal the varying degrees of pesticide drift depending upon wind conditions and method of application.

According to the Task Force (1997a), when pesticides are applied through ground hydraulics which is similar to a tractor, the drift levels can range from 0.1-0.5 percent. When applied through chemigation similar to a large sprinkler, pesticide drift can range for less than one percent to two percent (*Ibid.*, 1997b). The level of drift was reported to be the highest through aerial application ranging

from two-eight percent (*Ibid.*, 1997c).

The Task Force also found that pesticide drift differed depending on wind conditions and drifted up to 1,000 feet downwind revealing the great distance pesticides could travel from point of application. When comparing the results of Moses *et al.* (1993) and the Spray Drift Task Force one finds wide differences in the level of pesticide drift from each study. These two widely varying studies of pesticide drift reveal that the percentage of drift largely depends on factors such as wind conditions and method of application.

As the data vary on pesticide drift so do the available data on pesticide-related illnesses. Moses (1993) asserts that no reliable data exist on the extent of pesticide-related illness among U.S. farm workers. Additionally, Moses notes that no attempt had been made by any state to document, monitor, and analyze the chronic health effects of pesticide-exposed farm workers. The current data on the number of farm workers who suffer from illnesses due to pesticide exposure vary greatly. The U.S. EPA estimates that each year 20,000-30,000 acute illnesses and injuries from exposure to pesticides occurred (U.S. House of Representatives, 1991).

However, the large variation in estimated cases of exposure suggests a lack of accountability by the EPA. A report by the World Resources Institute estimates the average number of farm workers affected by pesticides in the United States at 300,000 per year (Wasserstrom and Wiles, 1985). According to a report by the U.S. General Accounting Office (1992), farm workers suffer up to 300,000 acute illnesses and injuries from exposure to pesticides each year. In 1993, the GAO issued another report which notes that the national estimates of farmers, farm workers, and their families potentially exposed to

pesticides range from 3.2 to 3 million people. Thus, these two GAO studies reveal the potential for the widespread exposure of agricultural workers to pesticides. Moreover, the wide variation in cases of farm workers possible exposed to pesticides and those who become ill from them reveals the true lack of credibility in the presently available data.

Wilk (1986) notes that the most widely used method to detect the level of pesticide exposure an individual has experienced is the use of cholinesterase inhibition as a biological index of a worker's exposure to organophosphate or carbamate pesticides. Cholinesterase is an enzyme in the blood. However, this test costs over $100 per person and, for individuals without adequate health insurance or workers compensation benefits, the test is too expensive to perform leading to numerous undetected cases of pesticide exposure (Goldstein, 1977).

Several researchers (Crosson, Phipps, and Prive, 1986; Mohl, 1981; U.S. House of Representatives, 1990, 1991a, 1991b) argue that the poor working conditions of farm workers is as prevalent in Florida as in any other agricultural state in the United States. A series of hearings before the U.S. House of Representatives Select Committee on Aging (1990, 1991a, 1991b) reveal the glaring problems which existed such as lack of federal accountability for farm workers. For example, the first hearing highlights that the federal government did not know who the farm workers were, where they are or how they live. One of the main points of the heating was the revelation that farm workers reach elderly status by age forty-five due to harsh working conditions. The hearing also revealed the fact that farm workers are undercounted in the U.S. Census due to the timing of the Census in April when migrant workers are moving north to harvest crops.

TABLE 1
NUMBER OF FARM WORKERS IN FLORIDA
AND TWO FLORIDA COUNTIES

	Federal Count	State of Florida			
Count					
Number of Farm Workers	1990	1991*	1992*	1998**	1999**
Total for Florida	**425,373**	**54,158**	**58,592**	**58,561**	**59,464**
Migrant	182,790				
Seasonal	252,583				
Palm Beach County, FL	**65,437**	**8,092**	**8,641**	**18,619**	**18,619**
Migrant	20,174				
Seasonal	45,263				
Indian River County, FL	**5,985**	**909**	**853**	**3,884**	**3,884**
Migrant	1,891				
Seasonal	4,094				

Sources: U.S. Department of Health and Human Services, Public Health Service, Migrant Health Program (1900:42); University of Florida, Bureau of Economic and Business Research, College of Business Administration, ***Florida Statistical Abstracts***. (1994:303-305; 2000:219-225).

TABLE 2
LAWS PERTAINING TO FARM WORKERS

Table 2

Title of Law	Function	Exclusions
Fair Labor Standards Act of 1938, 1967	The only child labor law applicable to farm workers. Covers age, hour, and related standards, and prohibits oppressive child labor. Also, established minimum wage for farm workers.	Excludes small farms from coverage and allows children under the age of 14 to work in the fields as long as they are with parents who are employed at the same workplace. Also, farmers can obtain a special child labor waiver from the U.S. Department of Labor t allow children under 12 years of age to work on farms.
Federal Insecticide, Fungicide, and Rodenticide Act of 1947 (FIFRA)	Requires appropriate registration of pesticides. Requires certification of private and commercial applicators and proper warnings, precautions, and safety equipment for workers. Sets guidelines for general standards of labeling, and the use of pesticides.	Applicators are not required to keep records of pesticide usage.
Occupation al Health and Safety Act of 1970	Requires field sanitation facilities (toilets, drinking water and hand washing facilities). Covers toxic substance disclosure and anhydrous ammonia safety by requiring hazardous chemical lists, labeling, material safety data sheets, employee information, and employee training.	Facilities are only enforced on farms that employ 11 or more workers (one million persons are excluded).

Federal Worker Protection Standards of 1992 (Amended in 1996)	Requires mandatory pesticide training of farm workers and the general reduction of farm worker exposure to pesticides through the use of protective clothing and had washing facilities. Requires notification of pesticide applications, decontamination and restricts field entry intervals after pesticide applications.	1996 amendments require pesticide training only every five years and decontamination material (water) is required for only seven days after application of certain pesticides (reduced from 30 days).
Florida Statue Chapter 487 Part I- Pesticide Law Florida Statue 1996 Supplement	Regulates the distribution, sale, and use of pesticides to protect workers, citizens, and the environment from the adverse effects of pesticides. To assure that the application of any pesticide is not directly sprayed onto, or in any manner cause any pesticide to drift onto, any person or area not intended to receive the pesticide.	In accordance with the federal Worker Protection Standards (WPS), includes same exclusions as WPS.
Florida Statue Chapter 487 Part II- Florida Agricultural Worker Safety Act(Repealed as of 1/98)	To ensure the agricultural workers employed in the state receive protection from agricultural pesticides and assure that workers receive information concerning pesticides. Assures that any worker who has been retaliated against for exercising any right under the EPA WPS by any agricultural employer may seek relief under ss 448.102-448.104.	

Table 1 reflects the number of farm workers in Florida and the two counties used for this study. The most current data collected by the State of Florida reveal the discrepancy in the number of farm workers in each county. As noted in Table 1, in 1999 the federal government counted 65,437 farm workers in Palm Beach County and 5,985 in Indian River County. However, in 1991 and 1992, the State of Florida counted 8,092 and 8,641 workers in Palm Beach County respectively and 909 and 853 in Indian River County respectively.

Then in 1998 and 1999, Florida lumped the occupations involved in agriculture, fishing, and forestry into one category making it difficult to distinguish between each individual occupation. Therefore, it is difficult to determine the number of farm workers in each county of the state. For the category of agriculture, fishing, and forestry in 1998 and 1999 Florida counted 18,619 workers in Palm Beach County and 3,884 in Indian River County.

This inconsistency in the data reflects the true lack of valid data on farm workers at the state and federal level. Due to the migratory nature of farm workers it is difficult to obtain consistent data on the number of workers within each county of the U.S. Although the data on the number of farm workers in Florida is inconsistently reported, one consistency is that Florida is one of the three largest agricultural states in the United States, as measured by number of workers.

Among Florida's 67 counties, Palm Beach County has the greatest number of agricultural workers as of 1992, accounting for 14.7 percent of all Florida's agricultural workers (University of Florida, 1994). In Florida, the farm workers are a mix of Haitians, Jamaicans, Latinos, and other minority groups. The large number of foreign non-English speaking farm workers presents a problem because

most information distributed by the federal government describing protective guidelines for workers is printed in English.

EXCLUSION FROM PROTECTIVE LAWS

Bechtel, Shepherd, and Rogers (1995) note that, because of the migratory nature of farm workers, they reside in their state of legal residency fewer than four months out of the year thus having little voice and limited power to influence the local decision-making process. As a result, few avenues are available for farm workers to change their working and living conditions which the authors compared to those in Third World countries. Table 2 provides the overview of some of the laws that pertain to farm workers and the existing exclusions.

In 1974, the EPA promulgated the Worker Protection Standards (Florida Rural Legal Services, 1980). Among other things, this law prohibited exposing farm workers directly or through spray drifts to pesticides. In August of 1992, the EPA promulgated the 1992 Worker Protection Standards (WPS) for Agricultural Pesticides. As noted by the EPA (1992:38151) the purpose of those standards is:

> to reduce the risk of illness or injury resulting from workers' and handlers' occupational exposures to pesticides used in the production of agricultural plants on farms or in nurseries, greenhouses, and forests and also from the accidental exposure of workers and other persons to such pesticides. It requires workplace practices designed to reduce or elimimi-nate exposure to pesticides and establishes procedures for responding to exposure-related emergencies.

Specifically, these standards require employers to

adhere to strict regulations designed to ensure the safety of the agricultural workers. Among other things, these regulations require farmers to: 1) provide written or oral information to agricultural workers stating the type of pesticide used on the crops being harvested; 2) provide persons protective equipment (devices and apparel worn to protect the body from contact with pesticides or pesticide residue including but not limited to coveralls, chemical-resistant gloves, chemical-resistant footwear, respiratory protection devises, chemical-resistant aprons, chemical-resistant headwear, and protective eyewear) for each farm worker; 3) restrict reentry of the workers into the fields after pesticides have been sprayed on the fields and advise each worker where they can wash their hands to clean them of pesticide residue and use in case emergency rinsing of the eyes and mouth is needed.

The 1992 WPS superseded the 1974 WPS and expanded the WPS to include not only workers performing hard labor operations in fields treated with pesticides but also workers in greenhouses, farms, forests, nurseries, and pesticide handlers who mix, load, apply or otherwise handle pesticides. In 1996, the EPA amended the 1992 WPS after receiving comments from various farm workers and grower associations. In the new amendment, the EPA decided to maintain the five-year pesticide retaining interval for farm workers and handlers but created a five-day grace period for the training of new workers; that is, workers who had not received pesticide training within five years could work for five days without any pesticide training. The EPA cited the need for flexibility to address the practical concerns of growers with regard to the training and cost of training.

Additionally, the EPA cited the costs associated with retraining workers on an annual basis could be too burdensome for small farmers who would pay a significant

amount for trainers and interpreters. The new standards also reduced the number of days for decontamination material (one gallon of water per person) from thirty days to seven days for pesticides that have reentry intervals (REIs) of four hours or less. The REI is based on the pesticides that require a minimum number of hours as a waiting period after application on the fields before individuals are allowed to reenter the fields. Thus, the new amendment does not require any decontamination material after seven days for pesticides with REIs of four hours or less. The EPA noted that, for smaller farms exempt from having OSHA hand washing facilities, these decontamination supplies may be the only water source available for workers in case of an emergency.

Another 1996 amendment to the 1992 WPS was the inclusion of the statement by the EPA to address Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Population (Clinton, 1994). As stated in the amendment, "the Agency had considered environmental justice related issues with regard to the potential impact of this action on the environmental and health conditions and minority communities (EPA, 1996:33207). No specifics on how the EPA would implement the Executive Order were provided.

In compliance with the Federal Worker Protection Standards, states must adopt policies to enforce he federal laws. Florida Statute Chapter 487 Section I (the Florida Pesticide Law) and Section II (the Florida Agricultural Worker Safety Act) are the key state laws that pertain to WPS (***Florida Statutes***, 1997a). Effective January 1, 1998, Section II of Florida Statute Chapter 487 was repealed and was no longer enforced by the state. The statute had a sunset clause when first introduced which means that, if not reintroduced, the law would no longer be enforced and

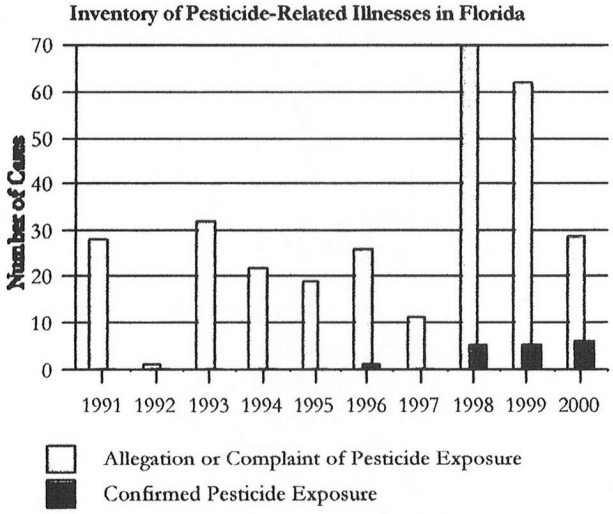
Florida will continue to enforce the federal WPS. The purpose of the Florida WPS was to ensure that agricultural workers employed in the state receive protection from agricultural pesticides and to assure that agricultural workers be given information concerning agricultural pesticides.

According to the Chief of the Florida Bureau of Pesticides, there are only two differences between the Florida law (Chapter 487, Section II) and the federal WPS law. The Florida law requires that: 1) pesticide trainers give workers copies of pesticide information brochures at pesticide training sessions and 2) language to be included on where to workers would go for help in filing a grievance against an employer (Fuller, 1998). Dr. Marion Fuller, Chief of the Florida Bureau of Pesticide stated that she did not feel that the repealing of the Florida Agricultural Worker Safety Act significantly weakened the Worker Protection Standards. However, it should be noted that the Florida law did provide the farm workers with two extra protectionary measures and was not reintroduced by the State Legislature.

Several studies indicate a lack of proper reporting of pesticide-related illnesses in Florida. A study conducted by the Florida Rural Legal Services (1980) found that 48.5 percent of the 400 farm workers surveyed reported having been sprayed directly at least once while working and more than 50 percent had also experienced one or more symptoms of pesticide poisoning.

A study by Davis and Schleifer (1998) found that no accurate data exist to reflect the number of farm workers injured due to pesticide poisoning in Florida. The authors note that other agricultural states such as Washington and California had much higher ratios of confirmed pesticide-related illnesses per number of cases reported in comparison to Florida. Additionally, the authors contend that

FIGURE 1
INVENTORY OF PESTICIDE-RELATED
ILLNESSES IN FLIRIDA



Source: Florida Department of Agriculture and Consumer Services, Division of Agricultural Environment Services (1998, 2001)

there is a problem with underreporting the number of cases of pesticide-related illnesses among farm workers due to such factors as a lack of access to medical facilities, health professionals not recognizing and correctly diagnosing pesticide-related ailments, and farm workers often not reporting pesticide-related illnesses for fear of being fired.

The EPA is responsible for monitoring pesticide exposure among humans, animals, and the environment on the national level (Florida Rural Legal Services, 1980). In 1978, the U.S. EPA (GAO, 1993) implemented a formal Pesticide Incident Monitoring System (PIMS) established to collect information on the adverse effects of pesticide use. PIMS reports originated from various state and local agencies, poison control centers, health clinics, hospitals, and other sources.

In a 1993 GAO study, three problems with Florida's pesticide-related illness tracking system was noted: 1) a lack of awareness on the part of physicians regarding the reporting requirements; 2) an unfamiliarity regarding the diagnosis and management of pesticide poisoning; and 3) an inability of the tracking forms to properly represent the physician's evaluation of the case. Figure 1 reflects the data provided by the Florida Department of Agriculture of the cases of pesticide-related illnesses reported to the State of Florida from 1991 to 2000. The data in Figure 1 reveal the few number of confirmed cases of pesticide exposure reported to the state during that period.

From 1991 to 1995 there were no confirmed cases of pesticide-related illnesses in Florida. In 1996 there was only one confirmed case. From 1999-2000 the number of allegations or complaints of pesticide exposure increased significantly. However, the number of confirmed cases remained proportionately low. The data in the figure also reveal that the number of complaints and allegations of

pesticide has varied greatly from 1991 to 2000, from a low of two cases in 1992 to a high of 70 cases in 1998. During telephone conversations with Florida officials in the Department of Agriculture's Bureau of Pesticides, Division of Compliance, officials have acknowledged that the pesticide reporting system does not accurately reflect the number of pesticide-related illness currently occurring in Florida (Hainge, 1997, 2001).

Thus far this study has clearly revealed the lack of regulations protecting farm workers in Florida and the national government. These factors are important because they highlight the lack of statutory protection that farm workers have as an occupational group. The study will now focus on a sample group of farm workers in two South Florida counties.

METHODS

South Florida is an ideal place to gather data on farm workers. As noted previously, Florida is one of the top three agricultural states in the United States and Palm Beach County has more farm workers than any county in Florida (University of Florida, 1994). Accessing farm workers to participate in a study of this nature was an intricate problem. Most farm workers live on the farms where they work and employers do not allow researchers in the fields or near the workers' homes. For this study, access to the farm workers was made possible because of the collaboration of two non-profit organizations, Redlands Christian Association and East Coast Migrant Head Start, which provide day care facilities for the children of farm workers throughout Florida.

The farm workers who were interviewed for this study lived and worked in Palm Beach and Indian River counties.

The interviews were completed in February, March, and April of 1997 which is the peak of the South Florida agricultural season. Each survey question was preceded with the phrase, "In the last year," referring to 1996. The survey administration sites were located in Belle Glade, Delray, South Bay, and Pahokee in Palm Beach County and Fellsmere in Indian River County.

Dr. Marion Moses, a national expert on the issue of pesticides and farm workers, reviewed a draft of the survey. She suggested that the questions be rewritten using more elementary language because of the low reading skills of farm workers. The questions were revised and the survey was pretested in Belle Glade at the Ockeechobee Housing site.

Due to the difficulty in gaining access to the farm workers, it was impossible to obtain a random sample. Surveys were administered to all the farm workers present at the sites. The results should be interpreted in a case-study context. Caution should be paid to generalizations drawn from this study to the larger population of farm workers. For this reason, measures of association are not included. With all things considered, this is the best sample possible for a study of this nature.

RESULTS

Demographics of Sample Population

Ninety-five percent of the farm workers asked to participate in the study answered the questions in the survey and the final number of cases was 109 (Worker Survey, 1997). Since not every subject answered every question on the survey, the number of cases in the analysis varies. Of those interviewed, fifty-six percent were male and forty-four

female. The majority (eighty percent) were Hispanic; seventeen were black (16.2%), two were mixed (1.9%), and one was white (9%).

At the request of the subjects, seventy-four (68%) surveys were administered in Spanish, twenty-five (23%) in English, and ten (9%) in Kreyol. Therefore, over 77 percent of the surveys were administered in a language other than English. The largest portion of the subjects (35%) made between $5,000 to $9,000 in 1996 and twenty-three percent made under $5,000.

The average household income varied with twenty-six (29.9%) of the families earning between $7,000 to $13,999 and thirty-two (36.8%) earning between $14,000 and $20,999. The average number of years of schooling completed by the subjects was 8.5 years.

The sample highlights several important factors represented by the farm workers. As noted, 23 percent earned a yearly income below $5,000. The official U.S. poverty level for an individual at the time of the survey was $7,710 (Department of Commerce, 1996).

Thus, 23 percent of the subjects earned a yearly income below the official U.S. poverty level. The official poverty level for a family of four at the time of the survey was $15,141 (*Ibid.*). Thirty-one percent of the subjects' household income was below $14,000. Since the majority of the subjects responded as having two or more children, the data reveal that a signifi-cant number of farm worker households is below the official U.S. poverty level.

Due to the migratory nature of farm workers, most do not own a home or apartment. Although not included in the survey, on-site observations revealed that most farm workers lived either in public housing or in temporary housing (trailers) provided by farm owners.

TABLE 3
TYPES OF PESTICIDE TRAINING

Types Pesticide Training

N=55

Training Type	**Percentage**	**Number**
Information Booklet	21.8%	12
Posted Sign	20.0%	11
Provided Orally	20.0%	11
Information Video	14.5%	8
Other	23.7%	13
Total	100.0%	55

EFFECTIVENESS OF PESTICIDE LAWS

Pesticide Training

The 1996 Worker Protection Standards require the employers to post signs informing workers of pesticide applications in both Spanish and English and must include symbols to demonstrate the potential hazards of pesticides. The majority of the WPS that pertain to training is written in Spanish and English; little is provided in other languages. The percentage of subjects who received pesticide training in different forms is noted in Table 3.

These data illustrate two important points. First, over forty percent of the information was provided by the farm workers in written form and, considering the low literacy rate of this population, this method of delivery could be a problem. Second, there are inconsistent forms of pesticide training.

Health of Farm Workers

When asked whether the farm workers felt that their work impacted their health, twenty-two (20.1%) felt that their work in the fields affected their health, eighty-four (77.1%) believed their work did not impact their health, and three (2.8%) responded "don't know." Overall, this section illustrates that approximately twenty percent of the subjects felt that pesticides had impacted their health. Of the subjects who noted health problems they attributed to pesticide exposure, the majority indicated symptoms related to mild organophoshate and carbimate poisoning such as dizziness, skin irritation, headache, and poor eyesight. However, a small percentage of the subjects responded that they had chest pains, a symptom of

TABLE 4
FARM WORKERS WHO EXPERIENCED
SPRAYING WHILE WORKING IN THE FIELDS
(N=84)

Experienced Spraying	**Percentage**	**Number**
Never	78.5%	66
Seldom	2.3%	2
Often	3.5%	3
Very Often	15.7%	13
Total	100.0%	84

moderate organophosphate and carbamate poisoning. Due to the fact that a large percentage of the subjects had not visited a doctor within the last year, there is a likely possibility that many pesticide-related health problems are not reported and treated medically.

Pesticide Exposure

The following data reflect the percentage of subjects who responded that they had been exposed to pesticides. Table 4 illustrates the percentage of subjects who had experienced spraying neat where they were working in the fields in Florida in the last year. Of those subjects working in the fields of Florida, 15.7% had experienced spraying near to where they were working "very often"; 3.5 percent often; and 2.3 "seldom." Nearly 80 percent of the subjects responded that they had never experienced spraying while working in the fields.

When asked whether they had or had not seen an airplane or tractor spraying near where they were working, approximately half (47.9%) indicated they had seen an airplane or tractor spray near the place they worked while 52.1% responded they had not seen an airplane or tractor spray near them. The data on pesticides drifting from point of application varies from 10 percent (Moses, 1981) to 90 percent (Spray Drift Task Force, 1997) reaching the target site. Thus, it is important to know if spraying a nearby field while workers are working is occurring due to the possibility of pesticide drifting.

The 1996 Worker Protection Standards require farm workers to be informed about the last time the fields were sprayed before they reenter the fields to harvest crops. Of those 91 respondents, 85.7 percent did not know when the fields had last been sprayed with pesticides before entering

TABLE 5
FARM WORKERS' KNOWLEDGE OF
PESTICIDE SPRAYING IN FIELDS

Pesticide Knowledge	**Percentage**	**Number**
Yes	14.3%	13
No	85.7%	78
Total	100.0%	91

the fields and only 14.3 percent did know. These findings indicate that the majority of those currently working in the fields do not know when the fields were last sprayed with pesticides.

Chapter 487 of the Florida Statutes (the Worker Protection Standards) requires employers to make agricultural pesticides information available to workers yet the findings of this study reveal that few workers are aware if pesticides were used on they crops they harvested, when the fields were last sprayed, and what types of pesticides had been used on the crops they harvested. Thus, the findings reveal the lack of pesticide-related information provided by farm owners to farm workers.

The Worker Protection Standards require farmers to provide decontamination material (one gallon of water per person) for seven days after the application of pesticides with a reentry interval (REI) of four hours or less. After these seven days, no water is required by law for small farms which are exempt from having OSHA hand washing facilities. This study did not determine the REI for the pesticides used on the farms mainly because the majority of subjects had little knowledge of whether pesticides were used on the crops they harvested. Of those who did have knowledge, few knew the type of pesticide used on the crops they harvested making REI determination difficult. To protect the confidentiality of the subjects, this study did not inquire about the size of the farm or the name of the farm on which the subjects worked. Thus, from the data, it is difficult to determine how many farmers were in violation of the decontamination material requirement since farm size was not revealed in the study.

Table 5 illustrates those who did and did not have knowledge of when the fields had last been sprayed with pesticides before entering the fields. The data reveal that the

majority, almost 86 percent had no knowledge of when the fields had been sprayed before they entered them.

Finally, the Occupational Health and Safety Act requires employers of 11 or more farm workers to provide hand washing facilities at work. When asked if there was a place to wash their hands at work, 18.1 percent responded there was not while 81.8 percent responded there was. While the majority of workers were provided hand-washing facilities at work nearly 20 percent were not provided basic sanitation facilities such as a place to wash one's hands. Hand washing is not only important for personal hygiene but also to protect the workers from pesticide exposure when eating their food, smoking or any other contact they would have with their hands.

The data reveal that the current federal and state laws designed to protect farm workers from exposure to pesticides, the Worker Protection Standards, and Chapter 487 of the Florida Statutes are not being properly implemented. These findings also reveal the vulnerability of this occupational group to other pesticide-related problems which include the lack of hand-washing facilities to rinse off pesticides before eating or smoking. Thus, the findings indicate that the farm workers are uninformed and underprotected in several areas pertaining to pesticide use in the fields. This emphasizes the vulnerability of this occupational group.

CONCLUSION

This study has led to several conclusions about the current working conditions of farm workers in Florida. This study reveals that farm workers have a low-education level, low-income level, poor working conditions, lack of the use of English, lack of property ownership, and lack of

information on laws and legal rights. Additionally, one could argue that, because of the numerous exemptions that exclude many farm workers from statutory protection, farm workers are not provided equal environmental protection by the federal and state laws.

As revealed by the results of this study, weak policy design and inadequate policy implementation have allowed many farm workers to be exposed to environmental hazards during their work in the fields. Because farm workers lack the necessary skills and opportunities to find a less hazardous employment, they are locked into a cycle of poverty with poor health and low-educational levels. The migratory nature of their work does not afford them the luxury of completing high school education. Therefore, the demands of their work forces them to choose between education and work. This is not a fair choice for any occupational group.

The findings indicate that the current laws designed to protect farm workers from pesticide exposure need to be more effectively implemented in order to provide the full protection of farm workers from hazardous pesticide applications. While roughly 80 percent of the subjects responded they had never experienced spraying, nearly 20 percent had at some point experienced spraying while working in the fields. In order to achieve environmental justice, all farm workers must be provided the same protectionary rights as workers in other occupations that deal with hazardous materials.

As noted in the beginning of this article, the four main areas of environmental justice focus on 1) the distribution of environmental hazards; 2) the distribution of the effects of environmental problems; 3) the policy-making process; and 4) the administration of environmental programs (EPA. 1995). In relation to these principle areas of the environmental justice issue, this study highlights the problems with

the policy-making process in the review of the Worker Protection Standards. One problem is that the OSHA laws allowing farm workers on small farms to work without basic sanitation facilities.

The problems of the administration of environmental programs, as with compliance with the Worker Protection Standards and the loopholes in several federal statutes, were reviewed in this study. Some of the problems cited were lack of compliance with the laws by farm owners pertaining to the vicinity of pesticide spraying near farm workers and the improper use of protective clothing by farm workers. Other problems point to the loopholes in existing federal and state laws. This researcher concludes that the environmental risks farm workers face during their work in the fields result from the exclusionary provisions which exist in the current federal and Florida laws and the improper enforcement of these laws.

POLICY RECOMMENDATIONS

After completing a thorough analysis of the demographic makeup and current work environment of a select number of farm workers in South Florida, several policy recommendations will now be made that address the evident federal and state policy shortcomings. Additional state funding should be provided to rural health clinics and other places where farm workers receive medical care to test for pesticide exposure through cholinesterase testing in a longitudinal study over a five to ten year period. This would allow state officials to develop a better understanding of the level of pesticide exposure farm workers experience over an extended period of time. Another method of testing for pesticide would be to provide a mobile clinic for farm workers to receive cholinesterase

testing.

Another recommendation is for the Occupational Health and Safety Act (OSHA) to be amended to include all farm workers. Currently, OSHA excludes farms that employ few workers from having to provide basic field sanitation such as toilets, drinking water, and hand-washing facilities in the fields. The provision of such field sanitation would decrease the likelihood of farm workers transferring pesticides from their hands to their mouths when eating or smoking and would also decrease the likelihood of farm workers urinating or defecating in the fields where they work. The lack of field sanitation facilities leaves farm workers vulnerable to exposure to pesticides even if protective clothing is worn.

Another policy recommendation is that Florida improve its pesticide reporting system. One method would be to make a better attempt to inform physicians of their requirement to report to local health officials all illnesses they determine to be the result of pesticide exposure. Additionally, this researcher recommends that Florida state officials work more closely with local officials in gathering these data on pesticide exposure cases.

As noted by Kovach and Hamilton (1997), the unsuccessful attempts by Congress to weaken the Occupational Safety and Health Act in 1995 displayed the desire for business interests to take precedence over workers interests. If successful, these changes would have had severely negative impacts on migrant workers by exempting small farms from random OSHA safety inspections and by reducing the mandatory reporting and recording of injuries and illnesses to only reporting those that result in one or more days of lost or restricted work. It is this researcher's recommendation to strengthen not weaken OSHA as indicated in the previously-stated policy recommendations.

FUTURE RESEARCH

Future research is needed in several areas. First, a comprehensive study is needed to determine the actual number of farm workers there are in America today. Each state should be mandated to provide an accurate count of workers. As noted in Table 1, federal and state figures reveal drastically different numbers of workers. In 1990, federal data indicated that the total number of farm workers in Florida was 425,373. However, in 1991, the Florida data indicated that there were 54,158 farm workers and in 1992 there were 58,592. This researcher concludes that it is unlikely for the number of farm workers in Florida to drop by 371,215 workers from 1990 to 1991 as indicated by the discrepancy in the federal and state data. A more accurate count of the current number of farm workers would lead to better policy serving the many needs of farm workers. The current inaccurate count of migrant farm workers in Florida hinders the ability of policy-makers to adequately address the social, economic, and political needs of the workers. Thus, an accurate count of the total number of farm workers in Florida would help lead to environmental justice for the workers.

Additionally, future research is needed to determine the effectiveness of the inventory of pesticide-related illnesses reported to the State of Florida. As discussed earlier, a cholinesterase test is an effective method of determining levels of pesticide exposure for farm workers. Federal funds are needed to provide a comprehensive study of the number of workers in Florida with abnormal cholinesterase levels. Additional research is also needed to perform a longitudinal study of the health of farm workers over a period of five to ten years. This would determine health problems associated with long-term exposure to pesticides.

Further research is also needed in the area of pesticide training. When farm workers are first hired they should be verbally asked questions by their employers in a language with which they are familiar: When was the last time you received pesticide training? And was pesticide training provided to you in a language and a manner you could understand?

The farm workers' responses to these questions should be documented and kept on file by the employers. Due to the low education levels of the farm workers, written information about pesticide exposure should not be considered the only method of providing information to workers. Since farm workers may be illiterate, pesticide training should be provided orally or by video in a language with which they are familiar, whenever possible, in addition to the use of symbols on signs posted in farming areas.

In summary, this study demonstrated that there is a need for further research in many areas regarding farm workers. This occupational group of the United States which picks the vegetables and fruits that keep Americans healthy is among the least statutorily protected occupational group in American today.

Therefore, farm workers are provided unequal protection under the law in comparison to other occupations groups, leading to environmental injustice. If more regulatory attention is not given to these hard-working individuals, they will continue to suffer from pesticide exposure, a lack of protection under the law, and health problems which keep them on the periphery of society and continue to allow them to be one of America's most vulnerable occupational groups. This study has demonstrated that environmental injustice exists for farm workers in South Florida.

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