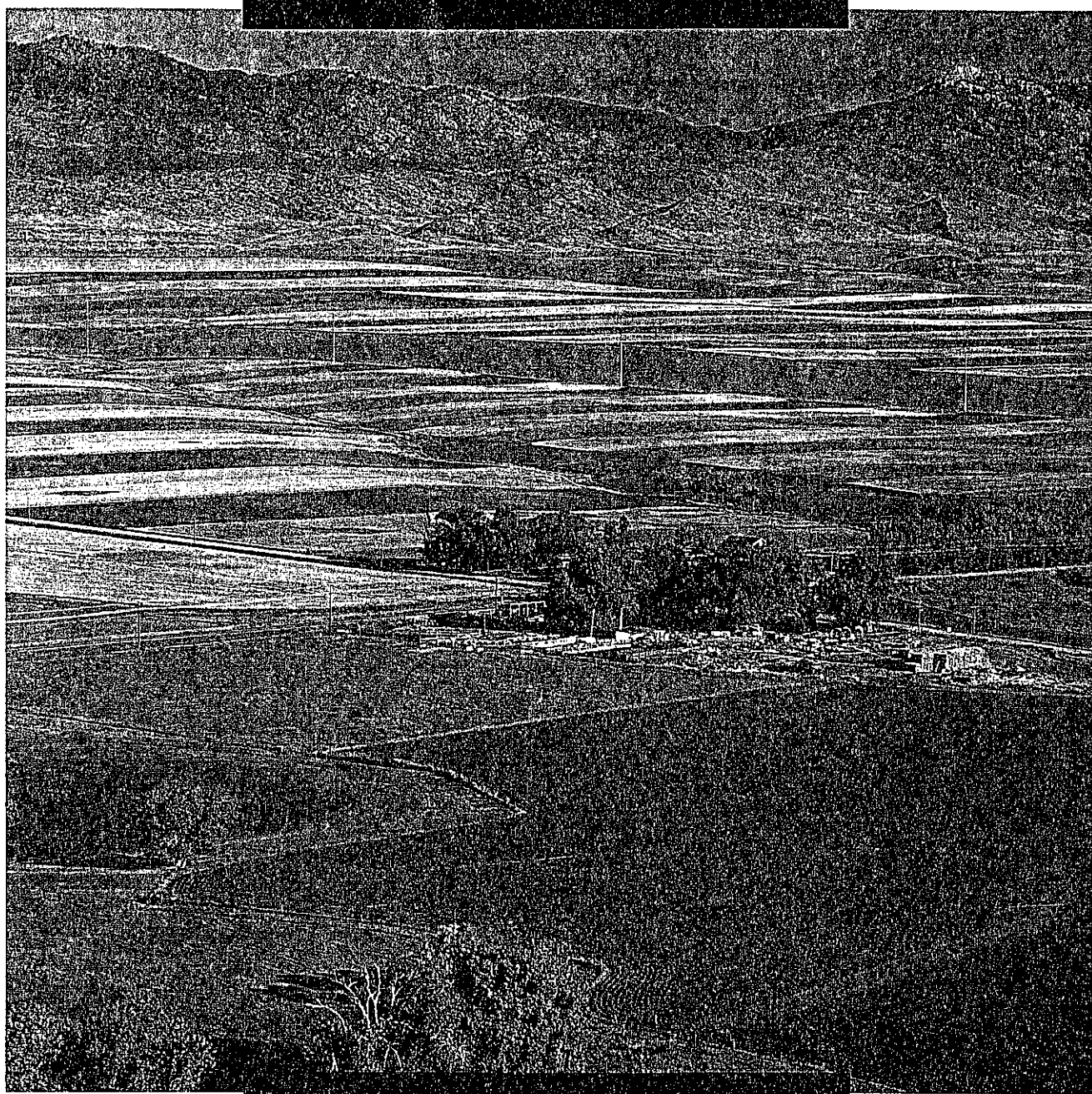


HI
CAHS
1995 ANNUAL REPORT



High Plains Intermountain
Center for Agricultural Health
and Safety

Colorado
State
University

Project Director's Statement

Agriculture is recognized as the most hazardous occupation in the United States. Thousands of farmers, ranchers, their employees, and family members experience injury, disability, occupational disease, and death every year. The only program addressing this most serious public health problem is the agricultural health and safety initiative of the National Institute of Occupational Safety and Health (NIOSH). This program currently sponsors seven national centers for agricultural health and safety. HI-CAHS is one such center serving the Rocky Mountain west and the western high plains. The cornerstone of funding for HI-CAHS is NIOSH, however support is also provided by the Occupational Safety and Health Administration and the Environmental Protection Agency. This truly unique cooperative arrangement is a testament to progressive thought and leadership on the part of all three agencies.

The mission of HI-CAHS is to

prevent disease, injury, death, and disability, and to promote the general well-being of those engaged in agriculture. This is accomplished through a growing network of farmers, ranchers, agribusinesses, and Colorado State University Cooperative Extension. The effort is multidisciplinary including engineering, medicine, industrial hygiene, social work, safety, epidemiology, toxicology, general environmental health, and the agricultural sciences. Colorado State University participants are the departments of Environmental Health, Social Work, Chemical and Bioresource Engineering, and the School of Education. Key off-campus organizations are the Greeley Clinic, Poudre Valley Hospital, and the Salud and Sunrise Migrant labor clinics.

This report represents the accomplishments of the fourth year of HI-CAHS. The year was extremely productive in all of the program realms, service and outreach education, research, and

program evaluation. Highlights of the year were hosting the second National Conference of the Agricultural Health and Safety Centers, supporting eight research projects with five presentations at the American Industrial Hygiene Conference, and conducting a live, interactive satellite course on pesticide safety training that was aired throughout Colorado and Wyoming. Four presentations on agricultural health and safety were made in Brazil at the request of the Association of Brazilian Occupational Hygienists. We are now moving into the fifth and final year of our current grant with hopes for renewal resting on a grim budget forecast for NIOSH. Regardless of federal budget outcomes we will continue to strive to serve the agricultural community, with an eye toward saving lives and preventing significant disabilities resulting from conditions of the workplace.

HI-CAHS Advisory Committee



*Front Row: Ms. Tammy Huber, Rocky Mountain Farmers Union
Ms. Jane McCammon, Colorado Department of Health*

*Back Row: Dr. W. Dennis Lamm, Cooperative Extension
Mr. Greg Baxter for Bart Chadwick, U.S. Dept. of Labor - OSHA
Ms. Jennifer Felzein, W.I.F.E.
Mr. Buford Rice, Colorado Farm Bureau*

Not Pictured:

*Dr. Dan Farenholtz, Northern Colorado Family Medicine
Mr. Benjie Lemon, Colorado Cattle Feeders Association
Mr. Bill Johnson, Future Farmers of America
Mr. Wayne Cooley, Agronomy Extension Agent
Dr. Kirvin Knox, Associate Provost, Colorado State University*

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Center Contact Information

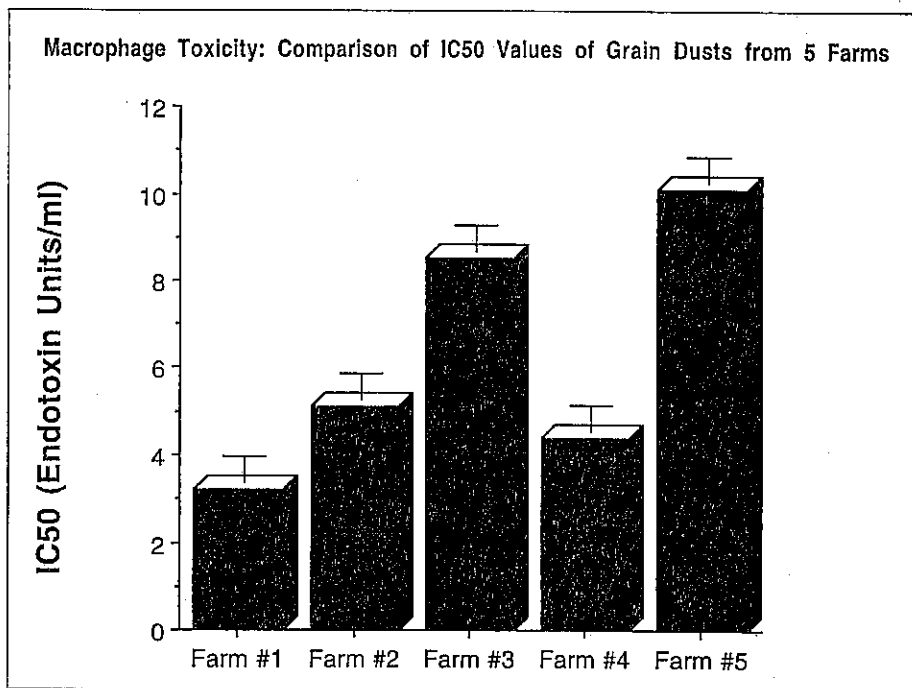
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Research: Molecular Biomarkers of Grain Dust Exposures

Toxicology researchers at HI-CAHS are developing methods for detecting pulmonary injury in agricultural workers exposed to organic dusts. The central aim of these studies is to develop more sensitive detection methods for occupational disease prevention and surveillance. The research project is completing the first of three planned stages:

- 1) identification of lung cell pro-inflammatory responses to grain dusts.
- 2) development of human cell biomarkers to grain dust exposures.
- 3) performance of field studies to validate biomarkers in exposed agricultural workers.

In the first phase, pro-inflammatory responses were detected in lung macrophages and epithelial cells following exposures to grain dust samples that were collected in the HI-CAHS project "Acute Respiratory Effects and Endotoxin Exposure During Wheat Harvest." In addition, we have confirmed suspicions of our NIOSH collaborators at Morgantown, WV, that bacterial endotoxins are not the only toxic agents present in organic



dusts. The graph demonstrates the lack of correlation between endotoxin levels and cell toxicity, as measured by 50% growth inhibition (IC50 values), in dust samples collected at 5 different farm sites.

The severity of these responses in lung cells suggest that repeated exposures to organic dusts may trigger pulmonary injury and

disease in chronically exposed workers. We are currently measuring similar responses in human peripheral blood monocyctic cells in order to develop biomarkers that can be used in field studies of exposed agricultural workers so that early detection and prevention of pulmonary disease can be accomplished.

Research: Tuberculosis Among Migrant Farm Workers In Northeastern Colorado

Tuberculosis (TB) is again emerging as a serious public health problem. Migrant farm workers may be especially at risk for this debilitating and difficult to treat disease because of the poverty, lack of consistent health care, close and substandard living quarters, and difficult working and traveling conditions inherent in this population. It has been estimated that the migrant farm population is six times more likely to develop TB than the general population of employed workers.

Positive TB test rates of 31 to 47 percent have been reported among the migrant populations working on the east and west coasts of the United States. The rate of

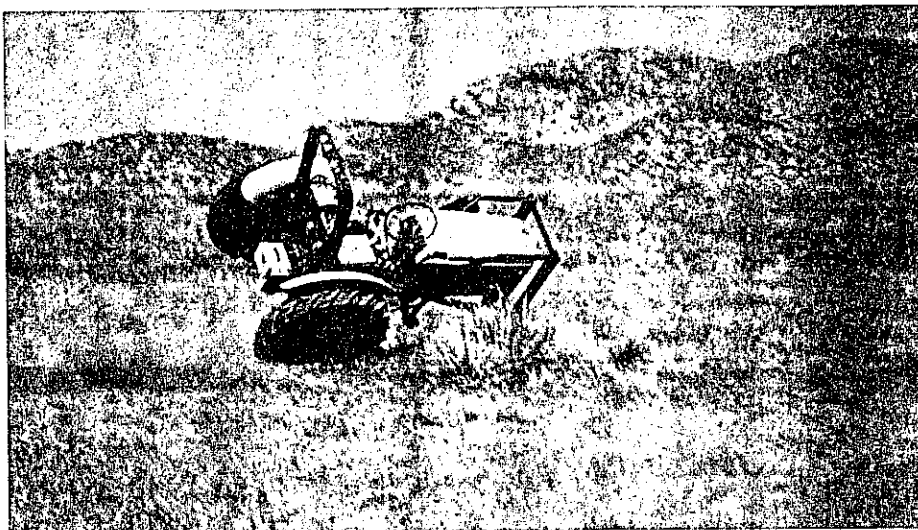
positive TB tests in the Midwest migrant stream, the main source of migrant workers in Colorado and the high plains, was unknown. A positive test indicates likely exposure to TB and not necessarily active infection. During 1994, HI-CAHS and the Salud Migrant Health Clinic conducted a study to determine the prevalence of positive TB tests among the migrant farm workers in northeastern Colorado. In all, 213 workers were tested for TB at 14 labor camps. The Salud Clinic provided counseling and appropriate follow-up treatment for the 51 participants who tested positive for TB.

Almost one in four workers skin tested (24%) were positive for TB.

Although the results were slightly lower than those reported for migrant workers on the east and west coasts, they were well above TB infection rates noted in the general population of Colorado. The presence of TB infection shown in this study has serious implications not just for the health and well-being of the migrant workers who live and work together but for persons in the communities where migrants live and work as well. The results suggest the need for consistent medical health care, increased health education, and improved living conditions for this region's, and the Nation's, migrant farm workers.

Research: Development Of Stability Index For Tractors

Agricultural tractor overturns are a leading cause of fatalities in the agricultural industry. Although the application of Rollover Protective Structures (ROPS) can significantly decrease the seriousness of injury during field upsets, it does not prevent the accident from occurring. In addition, tractor operators are not inclined to wear seat belts which aid in protecting the operator during an upset. Tractor overturns need to be reduced, and operators need to be alerted to conditions that are potentially hazardous.



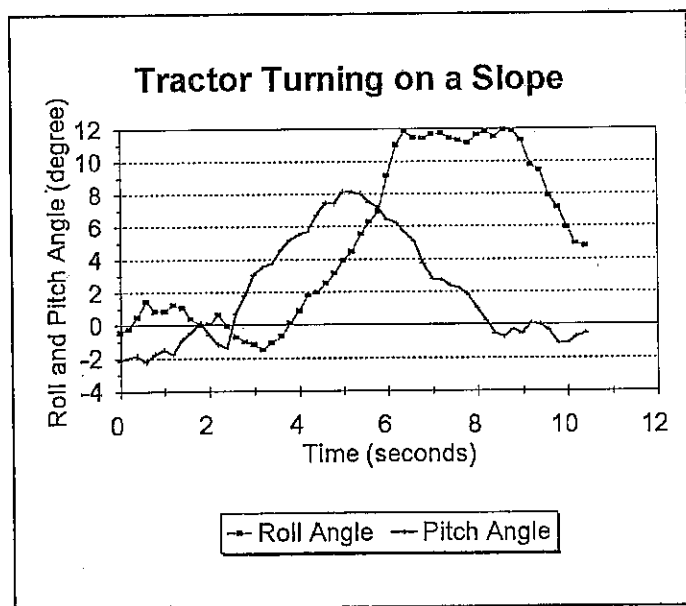
The factors involved in tractor stability include speed, slope, center of gravity, wheel base, tread width, and turning radius. Dynamic stability measurements include ground speed, yaw rate (turning radius), and pitch and roll (reference, rate, and acceleration). These factors and the physical characteristics of the tractor (center of gravity, wheel base, and tread width) can be used to determine the degree of stability of the tractor. These factors have been used to develop a stability index to determine the degree of stability of tractor operations. The stability index determination incorporates the dynamic measurements, physical tractor characteris-

tics and stability models to produce an index from 0 to 100. A stability index of 100 indicates high stability (tractor on level terrain with no velocity). A stability index of 0 indicates a tractor operating under conditions where an upset is likely.

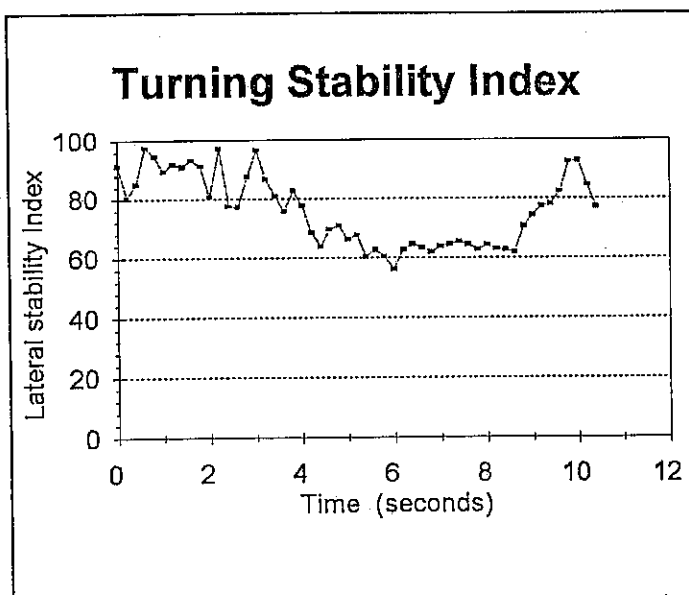
The objective of this research project is to evaluate the relative stability of tractors during typical agricultural operations. A quantitative value, referred to as a stability index, will be determined from the tractor's dimensions and operating conditions. The stability indices developed are: 1) static longitudinal stability index, 2) static lateral

stability index, and 3) lateral steady-state turning stability index.

A data acquisition system has been developed to monitor and record the dynamic stability measurements listed above. The measurement system was placed on a radio-controlled Ford 800 tractor and stability index values were determined during various tractor maneuvers (including a tractor rollover). Preliminary analysis reveals the stability index as a valid determination of relative tractor stability. More exact dynamic vehicle models are being investigated.



Tractor roll and pitch angles vs. time.



Lateral stability index at steady-state turn vs. time.

NIOSH Conference: HI-CAHS Hosts Second Annual Conference of NIOSH Sponsored Agricultural Centers



Dr. Don Beard of HI-CAHS discusses his poster during the conference.

On March 27 and 28, 1995, over ninety participants from the six Agriculture Centers gathered on the campus of Colorado State University for a conference on agricultural health and safety. Hosted by the staff of HI-CAHS, and supported by a grant from NIOSH, the goals of the conference included exchanging information on current research and model intervention programs, and facilitating increased contacts between Centers for collaborative efforts.

The Director of the Division of Respiratory Disease Studies at NIOSH, Dr. Gregory Wagner, opened the conference. He outlined the goals and priorities of NIOSH and described budgetary threats to NIOSH and other programs. He concluded, "NIOSH is devoted to continuing our strong commitment to prevention-focused activities directed toward improving the health and safety of agricultural workers. The comprehensive regional and national work of the Agricultural Centers for Health and Safety will remain critical to the accomplishment of our goals."

The comprehensiveness of Center work was reflected in the 28

presentations and 21 posters presented at the conference. Dr. Stephen Olenchok of NIOSH commented on the diversity in his closing address. "We were taken from hog barns to golf courses, from pristine molecular biology labs to standing in the back of a grain truck while the grain was being unloaded. We were taken from issues involving children's safety to depression and suicide. From farm



Del Sandford awards Debbie Merchant for "Most Informative Poster" at the Banquet.

safety demonstrations to university curricula to education and training in our target population."

Richard Lamm, director of the Center for Public Policy and Contemporary Issues and former three-term governor of Colorado, gave a provocative banquet address urging those attending to begin thinking of "how to grow health" rather than



Dr. Olenchok of NIOSH gives closing plenary.

seeking technological answers to prolonging life.

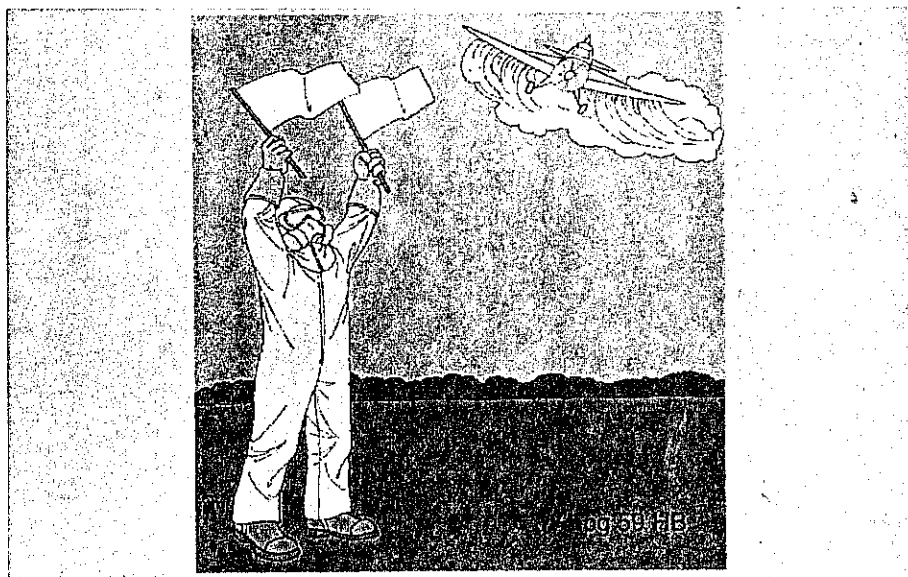
Conference Proceedings were published by HI-CAHS in the fall of 1995. Additionally, HI-CAHS staff conducted two evaluation efforts, one immediate and one six months later. The enthusiastic response of attendees confirmed that goals and objectives were accomplished. Suggestions for future conferences were passed on to the hosts of the next conference slated for March, 1996, in Iowa City.

Outreach: Satellite Downlink Pesticide Training

Under contract by EPA and with NIOSH cooperation, HI-CAHS has produced two train-the-trainer courses to assist the agricultural community in preparing for the Worker Protection Standard (WPS) for Agricultural Pesticides. On April 3, 1995, HI-CAHS broadcast a six-hour, interactive video satellite course from Colorado State University. The session reached 309 participants in 26 different locations across Colorado and Wyoming. Personnel from other organizations, including the Cooperative Extension services of Colorado and Wyoming, served as on-site coordinators at the various locations, and were crucial to the program's success.



HI-CAHS television rookies, Sarah Bramble and Don Beard, broadcasting the six-hour WPS course to the 26 locations across Colorado and Wyoming.



This is one of the 193 computer-generated slides broadcast during the downlink, created by Michael Salasek, a valuable member of the project.

Outreach: Training

HI-CAHS staff members conducted 69 training and education sessions impacting 2,612 individuals during 1995. These were in addition to migrant camp visits and pesticide training sessions. Activities were varied and ranged from highly specific training on chemical safety and personal protective equipment to general health and safety issues in agriculture. The recipients of these services were as diverse as the

topics. Farm and ranch kids, agricultural workers and business owners, health care providers, college students, and government employees all received training provided by HI-CAHS.

A health and safety specialist from HI-CAHS was invited to attend a national conference in Brazil and provide training. Staff members acted as primary reviewers

During the first two years of the WPS training program, 697 persons have participated, and are now designated by EPA to train agricultural workers and pesticide handlers about pesticide safety and other WPS requirements. Evaluative feedback has been consistently positive. Session attendees expressed their intention to provide training and WPS protections to agricultural workers, pesticide handlers, and family members.

(consultants) for health and safety information published in a major agricultural trade association newsletter. The Center also sponsored the Colorado FFA Foundation Health and Safety Awards. Although the primary focus of outreach service efforts is Colorado, Center staff members continue to expand their activities into states with similar agricultural activities.

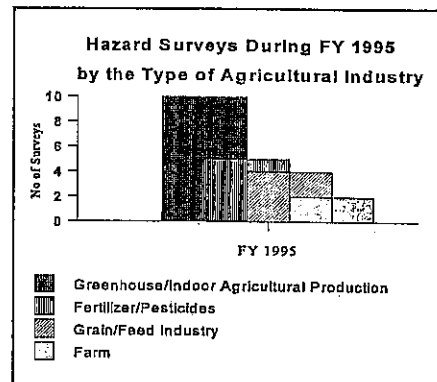
Outreach: On-Site Health and Safety Services

Safety and health audits performed on request at farms or agricultural businesses are a vital component of the outreach services provided by the HI-CAHS staff. This strictly confidential service is provided free of charge to clients to point out potential hazards and to train owners and managers in hazard assessment and correction. This service can involve a comprehensive workplace safety hazard audit, health/industrial hygiene audit, and evaluation of any written company safety programs. This survey can be in the form of on-site, hand-written notes or a more formalized, written,

standard-referencing report. Once the clients understand that our program is not regulatory and that they are the only recipients of the report, the latter format is by far the most requested. During the survey and in the report, our effort is educational and reference appendixes are often included.

The enclosed bar chart provides an overview of the types of agricultural facilities that requested our services in FY 1995. During the past year, 21 comprehensive health or safety audits were completed. A total of 209 hazards were pointed out and corrective recommendations

were made for the facilities. The two most consistently prevalent hazard categories were machine guarding and electrical issues.



Outreach: Migrant Worker Activities

HI-CAHS continued interactions with migrant worker populations. During the summer, the program focus was offering pesticide safety classes for agricultural field workers. The service was directly beneficial to both migrants and agricultural producers. The EPA Worker Protection Standard (WPS) for agricultural pesticides requires agricultural workers be trained in basic pesticide safety and other WPS requirements.

HI-CAHS student interns, Lori Berberet and Sara Murphy, conducted training to provide the WPS information to workers, and to relieve producers from the entire training burden. HI-CAHS used



HI-CAHS student interns, Lori Berberet and Sara Murphy, participate in "Migrant Family Appreciation Night" as part of migrant worker outreach activities.



The pesticide safety training session for agricultural workers.

EPA approved, bilingual training materials for the fourteen sessions conducted both at private farms and the migrant labor camps in Boulder, Weld, and Larimer counties. This outreach effort impacted 362 agricultural field workers and was appreciated by the migrant workers and agricultural producers. The student interns also made more than 60 visits to eleven different migrant camps to help resolve additional occupational health and environmental issues.

Outreach: Education and Training Product Development

Evaluation of Learning

During 1994, five monographs were developed for the purpose of assisting the agricultural health and safety specialist evaluate learning. The titles include: *Evaluation of Instruction: An Overview*, *Legal Implications of Testing Learners*, *Constructing Criterion-Referenced Tests*, *Validity in Criterion-Referenced Testing*, and *Reliability in Criterion-Referenced Testing*. During 1995 these monographs were externally reviewed and enhanced for distribution to the other centers, extension agents, or trainers in agricultural health and safety.

Interactive (Hands-on) Learning

The HI-CAHS Education and Training staff created a product entitled *Experiential Learning: Theoretical Underpinnings*. This document reviews the literature related to the concept of experiential

learning. At the basis of this "learning-by-doing" approach to education and training are experiential learning theories, models, and methods. Several models of learning through experience by David Kolb, Laura Joplin, Gary Dean, and others are presented. The monograph strongly recommends that learning has the potential to increase if the facilitator uses a learner-centered approach, where they utilize the learners' experiences and knowledge in the learning process and where the facilitator develops methods where the learners interact with, and reflect on, the subject matter. Other products are expected to be developed in the coming year on how the specialist can design booths and workshops using experiential and interactive techniques.

Working with Subject Matter Experts

Farm workers and their families and those in rural communities receive training from many sources.

How this training is organized and delivered greatly affects whether practices are adopted and used on the farm. The person who organizes and delivers technical information may not be an expert in all of the fields from which content is delivered. A training program developer can work with a subject matter expert (SME) to design instruction for rural communities. The results can be accurate and effective instruction that will encourage good farm practices. HI-CAHS has developed a product, *Program Development Techniques for Agricultural Health and Safety Specialists: Working with Subject Matter Experts*, that discusses the important characteristics of the relationship between the SME and the program developer, and emphasizes the significance of using consultation process techniques when working with SME's. It is currently out for external review and should be available for distribution in 1996.

HI-CAHS Staff



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Front Row: Lori Berberet, Sarah Robbins Bramble, Bart Beaudin, Vicky Buchan, Michel Lynn Muraski