



HI
CAHS

1992

Annual
Report

Colorado
State
University



PROJECT DIRECTOR STATEMENT

Perhaps the most fundamental activity in any society is food production. The products produced by farmers and ranchers are essential for survival. In the United States advanced technological developments have made it possible for a relatively few highly skilled agriculturalists to produce most of the food and fiber required to meet the Nation's needs (3% of the U.S. population). Unfortunately, many of these technical advances have placed many of these highly skilled farmers, farm workers, and farm families in harms way. Agriculture is the most hazardous occupation in America. Death or disability of a family member can have a profound effect on the social and economic wellbeing of people in any rural community.

Dr. Buchan

The HIGH PLAINS INTERMOUNTAIN CENTER FOR AGRICULTURAL HEALTH AND SAFETY (HI-CAHS) was established at Colorado State University in 1991 with funding from the National Institute for Occupational Safety and Health, (NIOSH).

HI-CAHS is dedicated to the improvement of the health, safety and wellbeing of the residents of Colorado, the high plains, and the Rocky Mountain Region. Achievement of this mission is by the application of preventive medicine through education, research, service, and evaluation.

Introduction


HI-CAHS was established to address the occupational health and safety needs of Colorado and the Rocky Mountain Region. HI-CAHS addresses health and safety through a network of farmers, ranchers, agribusinesses, Cooperative Extension, and farm organizations. The approach used is lay and professional education, research, preventive services (hazard evaluation and control), and program evaluation. The program is multi-disciplinary drawing on expertise from; the Institute of Rural Environmental Health, the Departments of Social Work, Agricultural and Chemical Engineering, the School of Occupational and Educational Studies, the Human Factors Research Laboratory, and the Cooperative Extension. Off campus participants are the Greeley Clinic (Occupational Medicine), and the National Jewish Center for Immunology and Respiratory Disease. SALUD Migrant Labor health clinic in eastern Colorado is an active participant providing direct access to farm laborers.

NIOSH was the founder and is the cornerstone of HI-CAHS programs. Another significant organizational participant in HI-CAHS is the Occupational Safety and Health Administration (OSHA). OSHA's participation is as a partner with NIOSH in the injury and disease prevention component through the 7(c)1 Consultation Program. This relationship between two federal agencies is truly unique, and a testament to progressive thought and leadership on the part of both agencies.

HI-CAHS has just completed its first year. Much of the first year has been dedicated to start up, meetings, organizing, planning, implementing and hiring of new personnel. However, there has been tremendous progress in all program areas. What follows is a view of the first year's progress.

Contents

Education & Training	1
Research.....	3
Service	5
Evaluation	7
Staff.....	9

	Advisory Committee:	
Dr. Jerry Appelbaum Corporate Medical Director Gates Clinic, Inc.	Ms. Jane McCammon Colorado Department of Health DCEED	Mr. Orville Pieper Coordinator of Young Farmer and Cooperative Education Northwestern Junior College
Mr. Bart Chadwick Regional Administrator U. S. Department of Labor - OSHA	Mr. Ben Rainbolt President Agriculture Teachers Association	Mr. Buford Rice Executive Vice President Colorado Farm Bureau
Ms. Jennifer Felzeim President Women in Farm Economics	Mr. Billy Johnson Future Farmers of America	Mr. John Stencel, President Rocky Mountain Farmers Union
Dr. W. Dennis Lamm Assistant Director Cooperative Extension	Ms. Robbie Wyckoff National Association of Wheat Growers Foundation Farm Safety Co-Chairperson	

Introduction

The Outreach Education and Training Unit was created to assist center personnel in delivering their message. During the first year of operation the team has been instrumental in designing instructional products and participating in the delivery of public presentations and workshops.



Cooperative Extension Train-the-Trainer Workshop

This workshop was designed for agents to enable them to help us promote health and safety for agricultural workers and their families. Training and delivery "best practices" for adult learners were highlighted and a specific module on **Farm and Ranch Emergency Pre-planning** was given to participants. A presentation planning template was shared to encourage agents to develop their own modules that best respond to the health and safety needs of their farm and ranch communities.



Several presentations were developed and delivered to these groups. Topics ranged from equipment safety to emergency pre-planning.

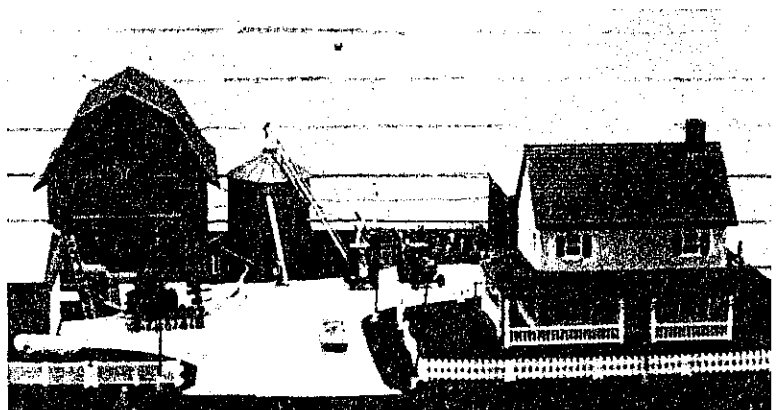
- Agricultural Health & Safety Workshop
- Young Farmers Associations
- Vocational Agricultural High School Programs
- Front Range Community College - Agricultural Education Programs
- Rural Emergency Medical Technician Programs
- National Association of Wheat Growers
- Kids Farm Safety Day Camps
- Colorado Cooperative Council
- Platte Junior High School
- Colorado Fur Trappers Association



Products

The following products were developed to support education and training.

- Farm and Ranch Emergency Pre-Planning Module (including overhead transparencies)
- Brochure explaining HI-CAHS services
- Newsletter format
- Farm Electrification Model- see photo (fold-up 3' x 4' model farm that identifies common electrical hazards)
- Review of the literature related to Exhibit Booth Design and Staffing



HI-CAHS is currently conducting research to improve the safety and health of the families that work on farms and ranches. The research at HI-CAHS includes investigating the adaption of older tractors for the mounting of rollover protective structures (ROPS), monitoring grain dust exposures on farms and elevators during harvest and investigating carbon monoxide exposures at high altitudes.

ROPS Design, Construction and Testing for Pre - ROPS Tractors

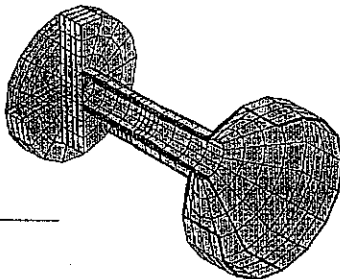
Tractor rollover is a major cause on fatalities on farms and ranches. Over 200 tractor rollover fatalities occur on U.S. farms annually. Although rollover protective structures (ROPS) can reduce the possibility of serious injury during a tractor rollover, many tractors are not designed to support a ROPS. The objective of this project is to use ROPS testing simulation and laboratory and field testing of ROPS performance to develop a suitable modification so that ROPS can be successfully attached to pre-ROPS tractors (tractors not designed to support a ROPS).

A laboratory ROPS-frame testing apparatus was designed and constructed. The maximum loading capacity of the structure was designed at 20,000 pounds. Six ROPS tests have been conducted. Two tests were used to verify the recording instruments and investigate the deflection of the support structure under load. Two tests, using the same ROPS, were utilized to reproduce the ASAE ROPS test procedure (ASAE Standard 5519). Two tests were conducted to evaluate the ROPS performance when attached to an unmodified pre-ROPS frame (axle housing of a Ford 800 series tractor).

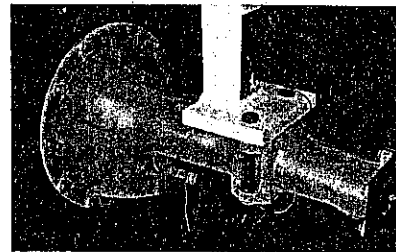
A finite element model of a ROPS-frame combination was developed using a pre-ROPS tractor (Ford 800 Series) and a commercially available ROPS. The finite element testing revealed high loads at the point of connection of the ROPS to the frame (axle housing).

The results of the laboratory testing and finite element simulation were comparable, indicating the maximum loads are exhibited at the connection of the ROPS to the axle housing. Strain gauges, mounted at the appropriate locations on the ROPS and axle housing, were used to verify the high stress levels.

Based on the results of these two tests, an adaption to mounted between the ROPS and the axle housing has been designed to reduce the stress levels. This adaption is designed to allow existing commercially available ROPS to be mounted to the pre-ROPS Ford 800 series tractor. Test results indicate improved ROPS supporting capability of the axle housing with the adaption.



Tractor Axle
Deflection
Analysis
Using
Finite
Elements



Tractor
Axle

A Characterization of the Potentially Pulmonary Toxic Components of Winter Wheat Grain Dust ON Farms and Elevators During Harvest

Acute and chronic respiratory distress due to conditions such as grain fever syndrome, asthma, allergic alveolitis and chronic bronchitis following occupational exposure to grain dust has been reported. The etiologic agent(s) in grain dust causing these conditions are as yet not well defined. Most scientific information on the health effects of grain dust has come from grain elevators. Analysis of dust at harvest should produce different components of health significance. In order to better characterize the potentially pulmonary toxic components of winter wheat grain dust, industrial hygiene surveys were conducted at 8 farms and 7 elevators in northeast Colorado during the 1992 wheat harvest.

Airborne dust samples were analysed for microbiological content, pesticide insect and mite fauna, silica and endotoxins. The different microbiological airborne concentrations measured in colony forming units per cubic meter (CFU/M³)(± standard error) included total bacterial plate count (TPC), fungi, gram negative bacteria (GNB), and thermophilic organisms (Therm.). In addition, the percent respirable silica using the 10 mm cyclone, organophosphate pesticides using a fiberglass filter cassette and a XAD absorption tube and a particle distribution and total mass concentration in mg of dust per cubic meter of air using the Marple cascade impactor was done.

Agents	Farms		Elevators	
	CFU/M ³	(±S.E.)	CFU/M ³	(±S.E.)
TPC	76,860	(15,418)	1,432,699	(194,537)
Fungi	20,522	(±2,899)	196,687	(±26,291)
GNB	30,385	(±5,665)	448,577	(±13,516)
Therm.	7,771	(±3,475)	14,688	(±3,488)

Table 1. Mean Values of Grain Dust Microbiology Parameters Measured during the Colorado Wheat Harvest 1992

Fungi	Percent of Total	
	Farms	Elevators
Alternaria	71	42.5
Cladosporium	17	14
Aspergillus	2.1	5.3
Polyscytalum	2.6	1.9
Penicillium	1.0	10
GNB Species		
Enter. agglomerans	69	65
Pseudo. maltophilia	12	25
Actino. calco	9.5	7.5
P. aeruginosa	4.8	0

Table 2. Primary Genera Identified and Percent Total (%)

Thermophiles included both actinomycetes and bacteria, but were only counted as a group and ranged from nondetectable to 17,862 CFU/M³ on farms, while elevators had a mean count of 13,872 (±3388) CFU.

Pesticide analysis found l-Naphthyl isothiocyanate at 3 farms (mean value = 77.6 mg/M³), while 2 elevators had a mean of 27.5 mg/M³. All respirable silica levels were below 0.1 mg/M³ quartz. Total dust mass concentration exceeded in all cases the TLV of 4 mg/M³, with mean concentrations of 8.5 and 18.6 mg/M³ occurring on farms and elevators, respectively. Microbial levels and dust particle characteristics were such that adverse respiratory effects could result.

Altitude and Carbon Monoxide Exposure

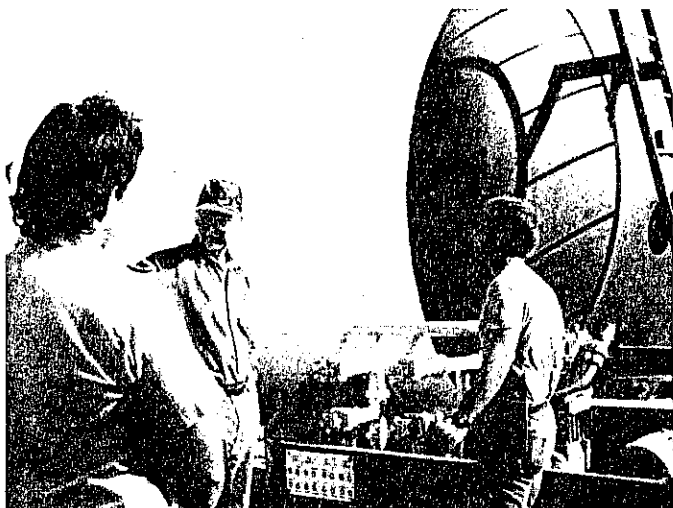
Carbon monoxide (CO) exposure in agricultural work may occur through use of gasoline-powered equipment, a situation that is likely to be worsened by operation in confined spaces (barns, sheds, etc.). The toxic effects of CO are a result of combination with hemoglobin in the blood, preventing it from carrying the normal amount of oxygen to the tissues. At high altitudes, less oxygen is available to reverse this effect. This project seeks to examine the effects of occupational exposure to CO on blood concentrations in individuals living and working at different altitudes. The impact of physiological adaptation to altitude on blood CO has not been considered in previous studies.

Approval has been obtained from CSU's Human Research Committee for the protocol to be used in this study. Breath and capillary blood samples will be collected from each subject prior to the work shift. Ambient CO levels will be measured during the work shift with a small electric monitoring device (Drager 190). Another breath sample will be collected at the end of the work shift. Breath CO concentrations correlate with blood levels and may be used as a surrogate measurement so that blood samples need only be obtained once from each subject. The blood sample will allow measurement of total and CO-bound hemoglobin.

Development of an acceptable method for measuring CO in exhaled air has focused on the use of the Drager monitors (for ease in completing field work at distant sites). Although tests in the laboratory have demonstrated that the monitors are probably suitable for measurement of CO in human breath samples, their accuracy and reproducibility when taken into the field (for other projects) has been unsatisfactory. This has raised doubts about the use of these monitors in this project. If better performance of the monitor cannot be obtained on a consistent basis, development of a more reliable method (using IR chromatography) will be considered.

The design of the study includes obtaining data from people that live and work at the highest altitudes in Colorado (> 9,500 ft). It is important to obtain results from individuals living over as broad a range of altitudes as possible in order to test the critical hypothesis of this study. In order to obtain sufficient number of subjects at the highest altitude, some individuals working in occupations other than agriculture (with significant CO exposure) are included in the study. High altitude research in farming is unique to the HICAHS project.

An act of assistance or benefit to another or others.



Center industrial hygienists and safety specialists conducted 45 visits to these businesses at which a total of 468 workers were employed. The average workforce at each site was 24 employees.

Through consultation with employers and employees, Center safety specialists identified 206 hazards to which workers were exposed. Two (2) conditions were imminent dangers which were corrected immediately in a cooperative effort between Center staff members and workplace representatives. One hundred thirty six (136) conditions were identified that represented serious risks to exposed workers. Through ongoing assistance and consultation, these conditions were eliminated or modified resulting in the protection of more than 400 agricultural workers. The remaining 68 conditions identified were non-serious in nature, but were violations of regulatory standards. Figure 1 is a summary of the types of hazards identified during on-site consultation.

Hazard Evaluation



Promotional activities early in the year resulted in a high level of interest in on-site services available through the center. Owners and operators of a variety of agbusinesses requested health and safety assistance at their workplaces.

These businesses included:

- Farmer COOPs
- Dry Bean Processing Facilities
- Feedlots
- Nurseries
- Sawmills
- Other Agricultural Services

On-site hazard evaluation was a series of events designed to define the scope of services that were to be provided; assist the owner and/or operator in the identification of hazards at his or her workplace; and, to provide a written summary of on-site activities including details on how to eliminate hazardous conditions. Follow-up visits, when needed, were also conducted to assist in hazard correction.

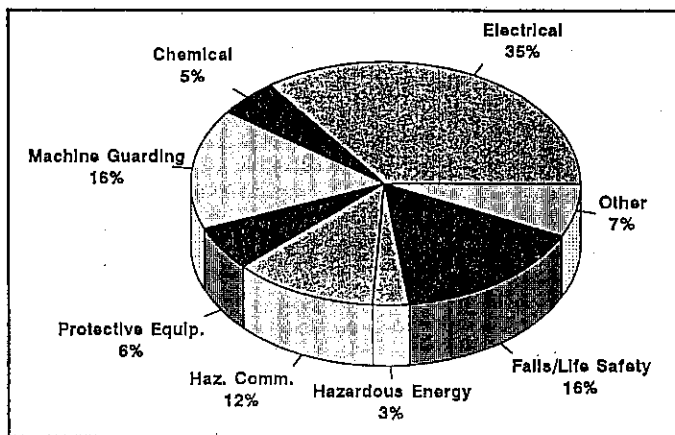


Figure 1.

General Classes of Hazards (as per cent of all hazards identified)

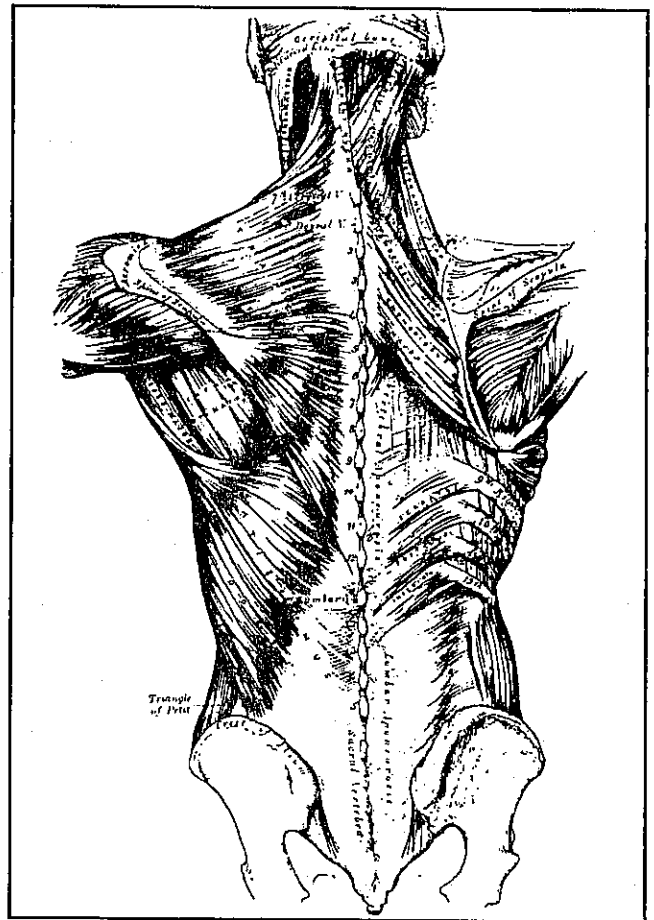
Formal and informal training was also conducted as an integral part of hazard evaluation visits. Forty-four (44) employers and 73 employees took part in training sessions designed to reduce or eliminate hazard potential through education. These training sessions were conducted in response to needs identified during hazard evaluation.

Special Projects

Hazard Warnings

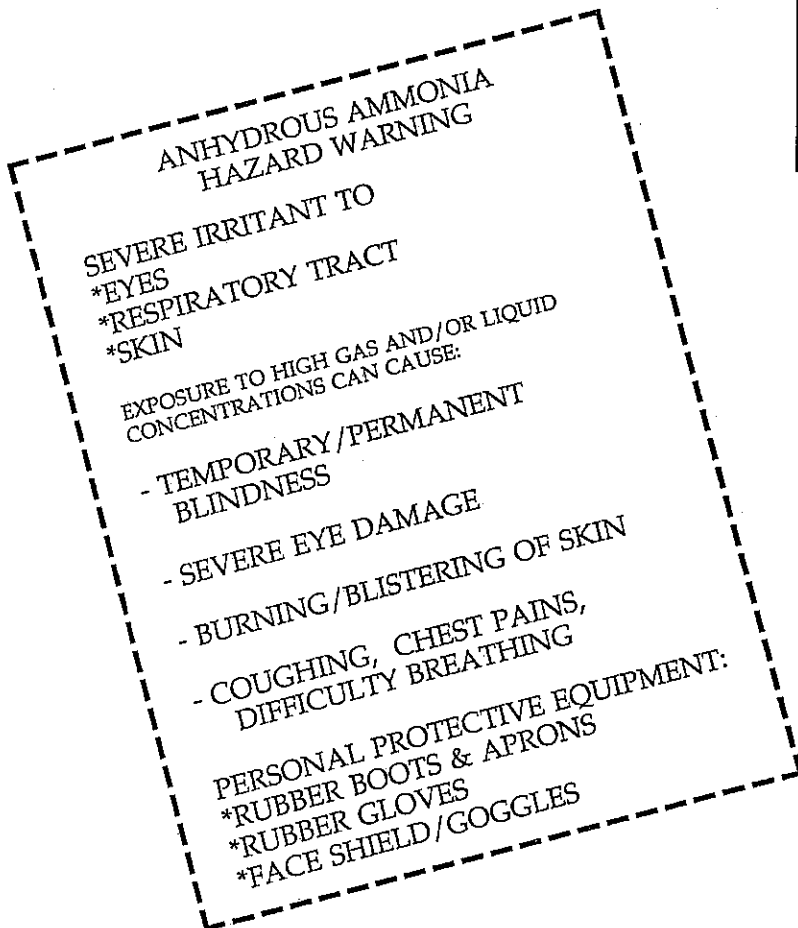


A significant outcome of hazard evaluation visits was the identification of a lack of hazard warning through appropriate labeling on anhydrous ammonia tanks. Center staff members designed an appropriate label and to date more than 300 have been strategically located on stationary and mobile tanks to alert workers of the associated hazards. The Center is currently serving as the facilitating group in an attempt to design a single hazard warning label that will satisfy all regulatory considerations and agencies. This is a direct response to the needs expressed by users of this product since the multiple labels now required are often confusing and redundant.



Musculoskeletal Injuries

The risk of back injuries when handling agricultural commodities, which typically weigh 100 pounds or more, was well documented through an ergonomic study conducted in dry bean handling facilities. Center health and safety specialists assisted operators with a re-design of lifting and palletizing techniques which should significantly reduce musculoskeletal injuries in this workforce.



Introduction

When accepting the role of a NIOSH supported center, HI-CAHS committed itself to test various methods for increasing health and safety conditions on farms and ranches. To accomplish this goal, the innovative HI-CAHS education and service programs are carefully evaluated to assess their effectiveness. Successful programs can then be offered throughout the region.

Hazard Consultation Evaluation Form

Directions: Please indicate your reaction to each aspect of the hazard consultation about your operation by circling the number which best represents your opinion

Thoroughness of Consultation	
Covered details adequately	5 4 3 2 1
Fluency of time was given to the consultation	5 4 3 2 1
Validity of Hazards Identified	
Hazards identified were accurate risk	5 4 3 2 1
Consultation resulted in an accurate description of the situation	5 4 3 2 1
Style of Consultant	
Very knowledgeable	5 4 3 2 1
Good communicator - easy to talk to	5 4 3 2 1
Within reports were good	5 4 3 2 1
Pleasant manner	5 4 3 2 1
Helpfulness of Consultant	
Very valuable to me	5 4 3 2 1
I learned a lot about agricultural hazards	5 4 3 2 1
Recommendations were practical	5 4 3 2 1

Evaluation Service



The Evaluation component offers the following ongoing services through HI-CAHS.

Instrument Development: forms to assess the effectiveness of center activities are developed by the Evaluation component. Two such forms, one for educational presentations and one for consultation visitations are shown.

Activities Tracking System: a system of recording, coding and analyzing the time expended and services offered by HI-CAHS personnel has been developed. This system profiles the overall contributions of the Center.

Consultation and Review: evaluation consultation is available to researchers within the Center and for other ag health and safety projects outside the Center.

Research Suggestions: prospective health and safety research topics are suggested to agricultural organizations and design assistance is made available for such projects.

Please evaluate this session by circling the number that best approximates your position concerning each of the statements below. (If you feel you haven't made a judgment on any item, please leave it blank.)

Objective/Purpose	5	4	3	2	1	Objective/Purpose	5	4	3	2	1
Purpose of session clearly identified						Purpose of session not made clear					
Objectives of session fully addressed						Objectives of session not achieved					
Content											
Content was exactly what was advertised						Subject matter not what was expected					
Information was very useful for me						Information did not add to my knowledge					
Presentation of Subject Matter											
Very interesting						Very dull					
Well organized						Poorly organized					
Presentation/subject well						Presentation/subject not well presented					
Used time effectively						Time not used well					
Communicated information clearly						Poor communication of information					
Helpful ideas, printed, or other training aids						Training aids not helpful					
Presenter Style											
Presenter(s) unprepared about the topic						Topic treated as routine and boring					
Presenter(s) respected audience knowledge						Presenter(s) had "lectured" all the while					
Presenter(s) invited audience participation						Presenter(s) discouraged questions					
Overall Evaluation											
Overall, I rate this session very favorably						I rate this session very unfavorably					
Overall, I rate the presenter(s) very favorably						I rate the presenter(s) very unfavorably					
Overall, session exceeded my expectations						Session did not exceed my expectations					
What was the most useful information you received?						What was the poorest part of the information?					

Demographic Characteristics:
 Age under 18 ___ 18 to 24 ___ 25 to 34 ___ 35 to 44 ___ 45 to 54 ___ 55 to 64 ___ 65 and over ___
 Gender: Male ___ Female ___
 Primary Association with Agriculture: Family farm ___ Corporate farm ___ Agriculture ___
 Primary Role in Agriculture: Owner ___ Manager ___ Employee ___
 Type of Agricultural Activity: Production of products ___ Sale of products ___ Processing of products ___
 Provision of services (e.g., health care, contract spraying) ___ Other (please specify) ___
 Location of Session: _____ Date of Session: _____

Presentation Evaluation Form

HI-CAHS is interested in determining the most efficient and effective ways to provide agriculture health and safety consultation and education programs. This requires that persons who provide these programs understand the importance of the various issues to farmers and ranchers, determine the adequacy of existing programs, and discover the characteristics of the most effective efforts to provide health and safety education.

To gain this information, the Agriculture Health and Safety Survey has been sent to more than 1,100 persons in Colorado. By contacting health personnel, coop operators, farm and ranch organizations, elevator operators and implement dealers, for example, it is expected that the perceptions of a much larger number of farmers and ranchers will be reflected. Returned questionnaires are now being tabulated.

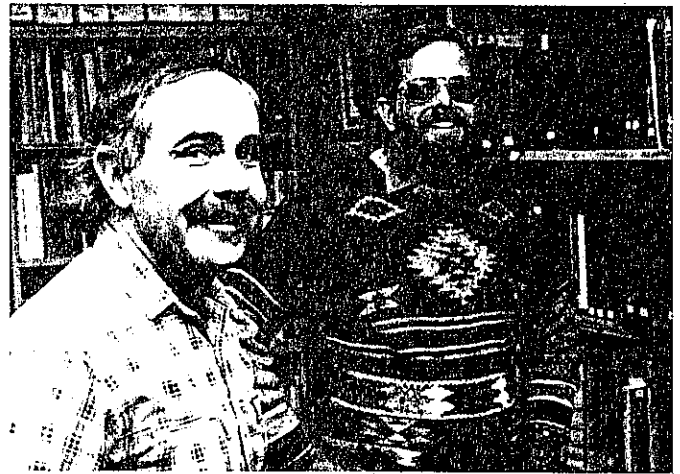
HI CAHS Staff

Education & Training

Office

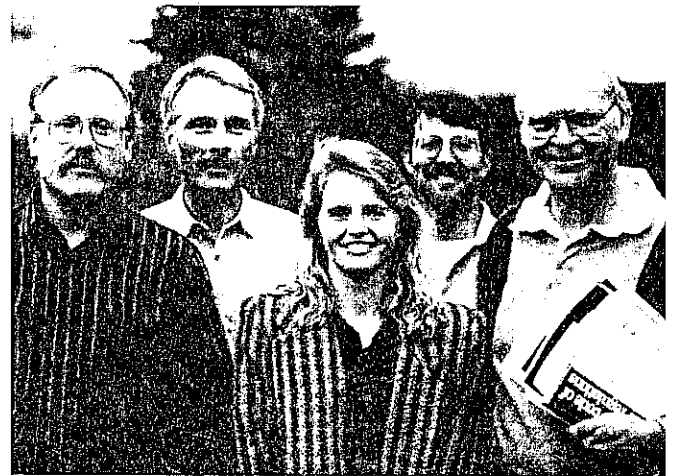


Mary Selby, Nina Whitehead (seated) and Jackie Turnberg



Bart Beaudin and Rex Fockler

Service



Bob Grundemann, Del Sandfort, Sarah Robins, Mitch Little and Ken Gordon

Evaluation



Vicky Buchan, Chuck Neidt, Brad Sheafor, Sue Hewitt and Mary Selby (not pictured: GRA Lisa Schmiesing)

Research



Don Beard and Paul Ayers (not pictured: Howard Ramsdell)

Colorado State University is an equal opportunity/affirmative action institution and complies with all federal and Colorado State laws, regulations, and executive orders regarding affirmative action requirements in all programs.

