

National Occupational Safety and Health Program in Agriculture

National Institute for Occupational Safety and Health

***Report of an external committee to review
the
extramural cooperative agreement
programs***

January 1995

To Linda Rosenstock, MD, MPH
Director, National Institute for Occupational Safety and Health, Centers for Disease
Control, Washington, DC

From: Susan M. Kennedy, Ph.D..
Chair, Review Committee
University of British Columbia, Vancouver, BC

Executive Summary

This report summarizes the opinions of eight external reviewers who were asked to review the National Occupational Safety and Health Program in Agriculture, an initiative consisting of five extramural programs, under the stewardship of the National Institute for Occupational Safety and Health (NIOSH). Funding for these programs commenced in FY 1989, and over 50 co-operative agreements have been undertaken. The review focused on the overall initiative, not the specific projects conducted by the individual co-operators. It was conducted in December 1994, and consisted of a review of written materials, supplemented by brief meetings with most of the co-operators and NIOSH personnel involved in the initiative. In general, the reviewers were impressed by the obvious commitment of the co-operators and NIOSH personnel both to the overall objective of preventing disease and injury in agriculture, and to open and productive collaboration with the review process.

The report contains six sections. The first five provide a summary of the objectives, strengths, and limitations for each of the five extramural programs, followed by the reviewers' recommendations for that program. The final section contains overall recommendations for the initiative as a whole and makes suggestions for future NIOSH activities directed at agricultural injury and disease prevention. This executive summary follows a similar structure (starting with the overall recommendations), with emphasis on the recommendations of the reviewers.

Overall Recommendations

The NIOSH Agricultural initiative is an important and necessary component of the agency's occupational safety and health mandate, and should continue. In summary, the reviewers recommend continued support for the Centers for Agricultural Injury and Disease Research, Education, and Prevention (Centers), for an expanded Occupational Health Nurses in Agricultural Communities (OHNAC) program (to include targeted intervention and health promotion activities), and for a further 2 years for the Farm Family Health and Hazard Surveillance (FFHHS) program.

In addition, it is recommended that a new, more flexible and open funding envelope be created to support innovative studies or demonstration projects for interventions, educational initiatives, safety and health promotion activities, or other community based prevention strategies. This component should be viewed as the venture capital component of the second five year funding cycle, and should be structured so as to allow participation from a broad spectrum of researchers, including community based groups.

The reviewers' recommendations for improvement of the overall program include improved co-ordination of the initiative by NIOSH (through a single co-ordination unit, reporting to the director), increased communication among all components of the

initiative (with the Centers acting as co-ordination agents, with the assistance of NIOSH personnel), inclusion of under-represented populations in all future components (e.g. the hired farm labour force, children and women, persons of color, and the entire agricultural sector in major southern regions of the country), requirement for consistent and realistic evaluation of projects and programs as an essential component of all programs from the outset, and facilitation of community based research and outreach activities.

The National Occupational Safety and Health Program in Agriculture was structured as a broad based effort to identify, evaluate, and manage health and safety issues in agriculture using the widest possible spectrum of approaches. This approach inevitably generates some programs which succeed more readily than others. The program's formulators are to be commended for this far reaching initial approach, as well as for seeking to review its successes and limitations in a timely fashion. The review committee was impressed with the considerable strengths of the program and by the commitment of its various participants to the objective of improving health and safety in agriculture. The first funding cycle has allowed the establishment of foundations for programs and centers which will require a long-term commitment in order to make a significant impact on preventing injury and illness in agricultural populations. The challenge of the next funding cycle will be to consolidate and build on the successes and work towards ensuring program stability in order to achieve a long-term reduction in disease and injury in agriculture.

Centers for Agricultural Injury and Disease Research, Education, and Prevention

The six research and education Centers established as part of this program comprise a strong and productive scientific effort towards prevention of injury and illness in agriculture. The Centers have achieved admirable progress toward this end, considering the very short amount of time since the initiative began.

The reviewers recommend continuation of support for the Centers, and, if possible, expansion of the Center program to include other regions (e.g. Texas, Florida, Mississippi delta region) with a high degree of agricultural activity.

Specific recommendations for improvement include the development of an evaluation scheme for Center activities, additional emphasis on development of control technology interventions, increased attention to populations not well represented in the current research (e.g. hired farm laborers, children, women), encouragement of multidisciplinary research, and improvement of linkages and communication with other governmental and non-governmental bodies involved in agricultural health (with special emphasis on improving communication with other NIOSH sponsored programs).

Farm Family Health and Hazard Surveillance

Six states have participated in this program to conduct a comprehensive cross-sectional survey of baseline health status and workplace hazards among a sample of farm families. Despite a two year delay beyond the control of the co-operators and NIOSH, community

support for the survey activities remains high and the project has good potential for successful completion.

The reviewers recommend two further years of funding for this program to allow for completion of the health and demographic survey, the medical outcomes screening, and the hazard surveys. The reviewers feel strongly that all aspects of the program will provide valuable data not available from other sources and which will be extremely useful for evaluating the success of other prevention activities. It is further suggested that NIOSH consider extension of the survey (using existing expertise and community based groups) to at least one additional population of hired farm laborers.

Recommendations for improvement include increased co-ordination of community based activities among all agricultural initiatives, collaboration between NIOSH and co-operators to plan the analysis of program-wide results, and utilization of the results of this survey in planning and evaluating future intervention programs.

The reviewers do not recommend that this program be used as a model for population-based surveillance, or that the survey activities automatically be expanded to other states.

Occupational Health Nurses in Agricultural Communities

This program has provided teams of occupational health nurses in 10 states, working in direct association with State Health Departments, to conduct case-based surveillance of agricultural injuries and diseases. In general the committee was impressed by the large number of significant accomplishments reported by these nurses, and by the effective linking of surveillance and intervention activities which has been accomplished to date.

The reviewers recommend that NIOSH continue to provide support for this type of program, and to consider mechanisms for expanding the intervention, health promotion, and education aspects of the program more formally.

Some important limitations were identified in the existing program, and the reviewers propose several strategies aimed at strengthening the program. It is recommended that NIOSH personnel take a more active role in communicating with and assisting the co-operators (to provide a stronger specific focus, to develop case-definitions and common data bases, to develop evaluation strategies). It is further recommended that linkages with NIOSH Centers be established in order to provide assistance with evaluation of the surveillance data collected. Finally, it was noted that efforts need to be made to involve the OHNAC program more closely with the other components of the NIOSH agricultural initiative, to improve its perceived 'second-class' status.

Agricultural Health Promotion Systems

This program has provided funding for a large number of projects spanning a wide variety of, mainly educational and promotional activities, most of which are no longer receiving funding. A recent change in the program objectives has been apparent.

Unfortunately, due to some miscommunication between NIOSH and the reviewers about the program objectives, the reviewers found it difficult to review this component. In general, the projects appeared to be creative in their attempts to disseminate health and safety information broadly, and to target underserved and vulnerable populations such as hired farm laborers and farm children. Laudable efforts to involve the affected communities in program delivery were also apparent.

Barriers to the success of the program overall included communication and coordination difficulties and little or no evaluation of the specific projects. These difficulties, although not unique to this program, appear to have impacted this component of the initiative more strongly.

The reviewers do not recommend that this component, as it is currently structured, be continued. Rather, the reviewers recommend that safety and health promotion, education, and intervention projects be included within other components of the NIOSH agriculture initiative. The reviewers also propose that all such projects include mechanisms to ensure that the affected communities are involved in the projects from their inception.

Cancer Control Demonstration Projects for Farmers

Eight well focused projects have been funded as a result of this initiative, with 5 completed. Although the initial objectives were extremely broad, NIOSH and the co-operators wisely focused on practical, achievable aims. The programs allowed traditional cancer researchers and cancer prevention programmers to venture into unserved agricultural communities, which they appear to have accomplished with success.

It was the shared view of the co-operators and the reviewers that cancer prevention activities for 'agricultural cancers' could be equally well impacted by the broad cancer prevention initiatives directed at the general public and currently supported by other agencies. Therefore, the reviewers recommend that this component of the agriculture initiative be allowed to terminate but that NIOSH ensure broad circulation of the results of the 'barriers to cancer services' survey undertaken through this initiative to those other agencies funding cancer prevention initiatives so that agricultural populations are better included in those efforts.

The reviewers also recommend that NIOSH contribute to cancer prevention through other avenues (e.g. providing exposure assessment expertise to NCI and EPA initiatives) and support pesticide research through existing research operating grant funding mechanisms.

1. INTRODUCTION

1.1 Background: establishment of the NIOSH Agricultural Initiative

In 1989, the United States Congress directed the Centers for Disease Control to sponsor a broad public health initiative directed at reducing injuries and illness in agricultural populations in the nation. Five specific extramural programs were identified as follows:

1. Centers for Agricultural Disease and Injury Research, Education, and Prevention
2. Farm Family Health and Hazard Surveillance
3. Occupational Health Nurses in Agricultural Communities
4. Agricultural Health Promotion Systems
5. Cancer Control Demonstration Projects

The National Institute for Occupational Safety and Health (NIOSH) was charged with implementation and oversight for this initiative. Specific objectives for each program area were identified and Requests for Applications published in the Federal Register. Cooperative agreements were formed in each of these areas (with over 50 cooperators in total) over the subsequent 5 years. The majority of the cooperative agreements entered into as a part of this initiative were for 3 to 5 years, and most are nearing the end of the 5 year funding period. Therefore, as would be appropriate for any major funding initiative, NIOSH has sought the views of a group of experts, external to the agency, to comment on the relative successes and limitations of these programs and to assist in formulating plans for the future. This report contains the views of the external reviewers.

1.2 Review committee

1.2.1 membership

Committee membership was determined by NIOSH personnel. Care was taken to ensure that committee members were not now (nor have been in the past) involved with the NIOSH Agricultural Initiative as cooperators or as recipients of funding in any fashion. In addition, as much as possible, a diversity of backgrounds among reviewers was attempted, including academic scientists, public health providers and educators, and other members from the public, voluntary, and private sectors. The reviewers were:

Susan M. Kennedy, Ph.D..
Committee Chair
Associate Professor and Director
Occupational Hygiene Programme
University of British Columbia, Canada

Joni Barnett, MS
Director of Health Center Services
National Migrant Resources Program, Inc.
Austin, Texas

David Christiani, MD
Associate Professor
Occupational Health Program
Harvard School of Public Health, Boston

James Dosman, MD
Professor and Director
Centre for Agricultural Medicine
University of Saskatchewan, Canada

Colleen Hennessy,
Public Health Analyst. Programs & Policy
Office of Rural Health Policy
Rockville, Maryland

Murray O. Madsen
Product Safety Engineer - Ag. Equipment
Deere and Company
Moline, IL

David Pratt, MD
Director, Corporate Medical Affairs.
Hershey Foods Corporation
Hershey, PA

Valerie Wilk
Health Specialist.
Farmworker Justice Fund
Washington, DC

1.2.2 mandate

The review group was formed at the request of Dr. Linda Rosenstock, Director, NIOSH, with Dr. Greg Wagner, Division Head, Division of Respiratory Disease Studies as the principal NIOSH contact. Dr. Steve Olenchock, and Ms. Pat Amendola, also of the Division of Respiratory Disease Studies provided all necessary technical assistance for the committee.

The mandate was to review the overall extramural NIOSH program for agricultural health and safety from FY90 forward and to make recommendations for future directions. The mandate did not include specific review of individual projects within this NIOSH funding umbrella. The review was limited in scope by the short time available to the committee. The individual committee members were asked to evaluate the program from their own unique perspectives.

In addition to the five extramural programs, several internal NIOSH initiatives in agricultural health research and prevention activities were undertaken. The committee's mandate did not extend to the review of these internal activities or projects.

1.2.3 review process

The committee was formed in November 1994 and asked to prepare a final report by mid-January 1995. The committee's deliberations involved the following:

review of written materials

For each of the 5 program components, a package of material was provided to committee members by NIOSH project officers (and other NIOSH personnel), which included

- the original congressional language specifying the objectives for the program
- a summary of the activities undertaken by the program since its inception (including names of co-operators, dates and amounts of funding awarded)
- recent progress reports from each of the individual co-operative agreement projects sponsored as a part of the program

A brief questionnaire, prepared by the committee chair, was sent to each co-operator (current and past), which asked for candid comments regarding initial objectives, changes in objectives, feasibility, special accomplishments, criticisms, and recommendations for future directions. A copy of the questionnaire is appended. Responses (received from over 80% of cooperators) were confidential to the committee members only and sent directly to the committee chair, not to NIOSH.

meetings: co-operators, NIOSH project officers, and committee members

A three day meeting was held in Pittsburgh on Dec. 12-14, 1994. The meeting consisted of an evening session (Dec. 12) for committee members only, a full day and evening of meetings with cooperators who wished to speak directly to the committee, and a final day in which the committee met to confer, to prepare written summaries of their findings, and to obtain feedback and clarification from NIOSH project officers and other NIOSH personnel.

As the meeting schedule was extremely tight, it was necessary to focus only on a small number of specific questions which would help the committee to understand the global strengths and limitations of the various program components, and to obtain a broad spectrum of views and suggestions for improvement.

In all meetings with co-operators and NIOSH personnel, the committee offered participants the opportunity to provide additional confidential comments (in writing) to committee members at the close of the sessions. Participants were also reminded that the

committee's mandate was to review the overall NIOSH initiative and not to evaluate in detail any one specific project therein.

The attendance of co-operators at the meeting with the review committee was voluntary and no additional financial support was provided for attendance. Several project directors discussed possible attendance with the committee chair prior to the meeting, and were informed that, if their written remarks in response to the chair's questionnaire were sufficient, they should not feel compelled to attend the meeting.

The commitment of the co-operators to this program is evidenced by their response to the request for input (either by responding to the questionnaire or attending the Pittsburgh meeting). In total, participation was 100% for the agricultural centers, farm family health and hazard surveillance projects, occupational health nurses in agriculture projects, and the currently funded agricultural health promotion and cancer projects. For the projects no longer receiving funding (i.e. 18 health promotion projects and 5 cancer demonstration projects) response rates were still at the 60% level.

1.2.4 report authorship

Report writing was preceded and accompanied by committee discussion of the main recommendations of this report with respect to the overall NIOSH Agriculture initiative. Initial drafts of sections of the report corresponding to each of the 5 components of the NIOSH initiative were written by individual committee members or small subgroups. These were compiled and edited by the committee chair, who also wrote the general sections of this report, the executive summary, and overall recommendations. The entire edited report was circulated to all committee members for additional comment and changes prior to final submission to NIOSH.

1.2.5 acknowledgments

The reviewers extend sincere thanks to all the co-operators who participated in this review. The comments (both written and oral) were extremely useful and the willingness to provide feedback, advice, and evaluation, with very little advance warning and without really knowing how it would be used is a testament to the support the program and its NIOSH overseers enjoy among this community of researchers, health providers, and educators. We also extend our thanks to the NIOSH project officers and other NIOSH staff who kindly provided comprehensive written summary materials, oral feedback for their respective programs, and other technical assistance; and to Ms. Pat Amendola, Dr. Steve Olenchock, and Dr. Greg Wagner, who provided all the guidance and assistance necessary to enable the reviewers to complete this review.

2. CENTERS FOR AGRICULTURAL INJURY AND DISEASE RESEARCH, EDUCATION, AND PREVENTION

2.1 Summary

The Centers for Agricultural Disease and Injury Research, Education, and Prevention (Centers) were originally designed to conduct multidisciplinary, investigator-initiated research projects that address regional agricultural health and safety problems. Geographically, the Centers are spread widely.

The initial objectives identified for the Centers were to:

1. develop model programs for the prevention of illness among agricultural workers and their families;
2. develop model educational programs on agricultural safety and health for workers in agriculture;
3. evaluate agricultural injury and disease prevention programs implemented by agricultural extension programs, State health departments, Federal agencies, and others;
4. conduct applied research and evaluations of engineering and ergonomic control technology and procedures developed by Federal and private agencies; and
5. provide consultation to researchers, safety and health professionals, agricultural extension programs and others.

Two Centers were established in FY90 (U. Iowa; UC. Davis), two in FY91 (Marshfield, Wisconsin; Colorado State), and two in FY92 (U. Kentucky; NY Center of Agricultural Medicine and Health).

The Centers have been allowed (and encouraged) to develop distinct personalities and to co-operate with each other and with NIOSH investigators on research and intervention.

2.2 Examples of successful activities, strengths

It was very evident to the review committee that the general approach of the Centers was characterized by enthusiasm and integrity. It was also apparent that work between NIOSH and the Centers is facilitated by a relationship of confidence between Center co-operators, Dr. Steve Olenchock (NIOSH program officer), and NIOSH staff. The following list of activities, initiatives, and general aspects of the Centers which struck the review committee as positive is not intended to be all-inclusive, but rather to illustrate the breadth of the impact of these Centers.

1. One of the strengths of the Center program is the balance between overall program objectives and the characteristics of the individual Centers to allow for enhanced creativity. The Centers collectively address the 6 original objectives, rather than each center attempting to address all the objectives.

2. NIOSH has been a very active partner in providing technical/expert assistance and research collaboration to the Centers making the Centers and NIOSH a great fit. For example, Dr. Olenchock's lab carries out endotoxin analysis for several of the Center respiratory disease research projects. Dr. Olenchock has also facilitated collaboration between NIOSH immunology and pathology labs and Centers, as well as facilitated collaboration with the safety division of NIOSH and the Centers.
3. With the infrastructure achieved by NIOSH funding, new scientific personnel have been recruited into research in agricultural safety and health, and Centers have been able to attract funds from other sources (e.g. research project grants) thereby enhancing the capability of the NIOSH funded initiative.
4. There has been an increase in multidisciplinary research at the Centers. Established faculty have refocused work into the area of agriculture, for example, collaboration of mining engineers and industrial hygienists with agricultural safety and health investigators.
5. Pilot projects for faculty, and graduate and post graduate support has broadened the impact of the programs. One example is the funding of masters and doctoral student thesis projects.
6. There are now three new journals in the field of agricultural safety and health and Center investigators are submitting research papers to them. In addition, they are submitting work for publication to specialty journals in their disciplines, including physiology, toxicology, epidemiology, industrial hygiene and safety, and social and behavioral sciences.
7. The Centers have developed effective communication among themselves in the form of annual meetings, an inter-program newsletter, and a communication network. Representatives of the Centers appear to get along well.
8. All of the Centers engage in some aspects of health promotion and development of model prevention programs, with some implementation of model programs.
9. Some Centers have been successful in encouraging new partnerships between agricultural industry and the safety equipment industry. For example, one Center was instrumental in assisting the commercial success of personal protective safety device sales.

Prior to the NIOSH Agricultural initiative, there were only two research centers (Wisconsin and Iowa) working on agricultural health and safety in the nation. As a result of the NIOSH initiative, these centers have been strengthened, and the partnership between them and the additional centers has created what appears to be a very credible scientific effort towards prevention of injury and illness in agriculture.

2.3 Limitations

1. In general the Centers have undertaken priority items and they have been successful in focusing their activities on their individual strengths; however, the Center Directors noted (and the review committee concurred to the extent possible in this review) that the multiple mandates as laid out in the objectives have at times stressed the resources of the Centers in a negative fashion.

2. There is an opportunity for enhanced communication among investigators and other personnel involved in agricultural safety and health promotion, such as between Centers and Land Grant Institutions. It was apparent to the committee that some attention needs to be paid (with funding and specific directives given) to ensure that the research and program development work done by the Centers reaches where it is most needed, i.e. the farm community, the industry, the farmworker. This theme, i.e. enhanced collaboration between those engaged in research and those engaged in community outreach, education, and implementation of programs emerges as a central recommendation throughout all aspects of this review.

2.4 Activities as they relate to the initial goals

The committee feels that the six objectives in the original Request For Applications were somewhat too ambitious for the Centers alone to achieve, resulting in human and financial resources being spread too thin within the context of these specific objectives. What was needed was high quality science in the field of agricultural injury and disease prevention, and the Centers have achieved admirable progress toward this end, considering the very short amount of time since the initiative began. In some instances this is a function of enhancement of the work the Universities were doing before the Centers were funded by NIOSH. In others, the NIOSH funding has provided the principal stimulus for developing a research program in agriculture. Overall the Centers' activities have directly related to the global goal of reducing morbidity and mortality of those engaged in agricultural activities.

2.5 Recommendations

The review committee recommends that the program to support Centers for Agricultural Disease and Injury Research, Education, and Prevention be continued by NIOSH. Overall, this program appears to have made excellent progress towards research and education with a goal of disease and injury prevention in agriculture in the short time since its inception. The following recommendations focus on aspects of the program which could be improved and on additional components which NIOSH may wish to consider in order to enhance the impact of this program.

1. NIOSH and the Centers need to work together to develop an evaluation scheme for the various component programs and projects initiated by the Centers and for evaluating the Centers overall. This evaluation scheme must include clear and realistic program evaluation tools. Flexibility of programs should be maintained rather than negatively

impacted by the evaluation initiative. Evaluation tools for the Centers themselves should take into account the commonalities and the differences among the Centers.

2. The Center Directors voiced some concern about the renewal cycle. The review committee concurred that NIOSH must provide Center Directors an early indication of the future of these worthwhile programs.
3. The Centers have identified the need to place additional emphasis on the development of control technology interventions. The review committee concurs and recommends that NIOSH consider mechanisms to facilitate identification of problem(s) with national implications for which control technology research would be useful, which all the Centers could work on jointly.
4. Similarly, NIOSH should consider mechanisms to enhance or encourage multidisciplinary research such as the collaboration with engineers on control technology already undertaken at the Centers.
5. NIOSH and the Centers are encouraged to strengthen (where appropriate) linkages with other governmental and non-governmental bodies involved in agricultural health, such as Area Health Education Centers, Rural Health Initiatives, Emergency Medical Services, etc.
6. More attention needs to be focused on the particular health and safety issues of special sectors of the agricultural population, including women, children, and the hired migrant and seasonal farm labor force. For example, it appears that currently only the Kentucky Center is studying farm owner/operator women, and only the California Center includes hired migrant and seasonal farmworkers in its research focus. NIOSH and the Centers are encouraged to work together to develop strategies to increase the focus in these critical areas.
7. Clearly there are major agricultural areas of the country (e.g. Florida. Texas. the Mississippi Delta region) which are not currently served by agricultural research and education Centers. These areas include a large farm work force of low-income people of color. Given the important contribution made by the existing Centers to their respective regions, and the ongoing commitment by the federal government to advance environmental justice, the committee recommends expanding the Center program to include all regions with a high degree of agricultural activity.
8. The committee suggests that the Centers consider the possibility of developing research capacity in rural health delivery: however we recognize that this may not be possible given current constraints.
9. There is, and should continue, an absolute focus on prevention. Centers' work should continue to develop knowledge and methods to prevent injuries and illness in agricultural communities.

10. The Centers should ensure the participation of the affected communities (farm owners/operators and hired farmworkers and their families) in program and research development, intervention, and evaluation.

3. FARM FAMILY HEALTH AND HAZARD SURVEILLANCE

3.1 Summary

The initial objectives of this program were to document the health status and work-related risk factors and conditions of exposure among a sample of farm families. Despite the misnomer in the title of this program, the objectives describe a health and hazard baseline status survey, not health and hazard surveillance. Methods included a questionnaire survey (using a representative sample within defined areas / crops / processes), followed by medical testing and hazard assessments in a subset of the sample population. In FY90, six states were funded for a maximum of five years, to plan and conduct this survey. The final methods adopted for sampling and surveying were not standard across states (nor were they intended to be so), although some of the questions on the initial questionnaire were reported to be similar.

In summary, the methods used in each of the six states were:

CALIFORNIA: County-based (2 counties); sample of farms and selected farmworkers from each farm; hazard walk-throughs; closely integrated with the Occupational Health Nurses in Agricultural Communities (OHNAC) project (see below).

COLORADO: Statewide telephone survey of approximately 500 farms, followed by on-site health and hazard surveys on farms from 8 counties; focus of county surveys was health status, recent injuries, and depressive symptoms; hazard evaluations, and hearing and respiratory testing in same population of farmers: plan to assess pesticide exposure in small sub-set.

IOWA: Mail questionnaire survey of farm operators and family members and others who live and/or work full-time on the farm and who are involved in livestock operations and/or cash crop farming (18 counties and 500 farms); medical testing includes audiometry, spirometry, vitals, and total cholesterol; hazard assessment included day-long observation of exposures including estimates of duration and intensity, and limited quantitative evaluations for noise, inorganic gases, and organic vapors on a subset of 125 farms; plans for assessment of a small subset of low frequency high-hazard problems.

KENTUCKY: Telephone survey of 500 farm households, and then more detailed health information survey of four selected high-risk populations: farmers aged 55 and over, multi-job holding farmers, women in farm households, and children under 18; closely connected with Kentucky OHNAC project; hazard observation and physical examination screening for subset of farmers 55 and over.

NEW YORK: Selected geographic regions primarily dairy, livestock, fruit and vegetable, and some grain farms; hazard surveillance site visits; medical examination component.

OHIO: Mail survey with telephone follow-up of 5,000 cash-grain farms; detailed health assessment (audiometry and spirometry) and hazard walk-through on a population subset; personal and area monitoring for noise, dust, gas, and pesticide exposure in Phase 3.

3.2 Strengths

1. There has not been any recent systematic collection of data in the United States from which to quantify the overall health status of the agricultural population, nor has there been any systematic collection of agricultural hazard data. Without such baseline data, the evaluation of change and the planning of preventive interventions is seriously hampered. Although the farm family health and hazard survey is not being conducted nation-wide, nor is it designed to collect a statistically random sample of the agricultural community, the committee was impressed that the survey will, when completed, fill an important information gap, by providing valid data for the subsets of the agricultural community currently targeted by the program. In addition, it may validate previously held suppositions about the health of the agricultural population, as well as uncover hazards and farm-related health issues previously not recognized or emphasized.

2. The review committee was favorably impressed by the obvious dedication of the FFHHS project directors and staff to this program (which was aptly characterized by several as an omnibus effort). Early in the 5 year funding period, a significant barrier (and major delay with respect to time) was encountered by a decision to require clearance for the questionnaire(s) from the Office of Management and Budget. This had the effect of delaying the various projects for approximately two years. Despite this delay, the project staff have maintained their community contacts and their enthusiasm, and all projects are now back on track. There is, however, a major change to the anticipated completion dates.

3. Participation rates in the surveys varied, but were generally in the 50% range. The project directors expressed concern about these rates, which they felt were low, and attributed them to a number of factors associated with the initial design of the study itself. However, the committee felt that the participation rates were at the levels one could expect from mailed and telephone surveys such as this, and noted that co-operators are carrying out analyses of the impact of nonparticipation. It was not felt that the overall survey results would be biased as a result of lack of participation. In fact, the committee viewed the strategies adopted by co-operators to obtain (and maintain, given the delay) the support and participation of the farming populations as one of the strengths of this project. The barriers and limitations to participation (and the strategies adopted to overcome them) identified by the project directors included:

- Farm members are not a captive audience, and there are seasonal work demands of farmers/farmworkers which required considerable planning by the researchers. Extensive community outreach was undertaken by all cooperators to gain trust

and participation, and to reassure farmers that the project team was not connected with governmental agency enforcement efforts.

- Project participation was also hampered by the fact that the Agriculture Census was being conducted by the Dept. of Agriculture at the same time as the initial surveys (1993). In addition, there was confusion among farmers in states with multiple NIOSH agricultural initiative projects about the apparent duplication of efforts and lack of co-ordination on the part of the various research teams. Without exception, the project teams recognized the effort required to overcome these barriers and mounted successful strategies to maintain community support.
- The questionnaire was massive and covered a large number of health outcomes, without focusing on specific illnesses or effects. This was by design, but it limited the willingness of farmers to participate. Response rates also decreased for subsequent medical testing/hazard walk-throughs because of the additional time commitments by farmers. Furthermore, the credibility of the researchers was questioned by farmers who felt that the answers being sought were obvious. Although the specific strategies differed, all the project teams managed to overcome these problems successfully, in part by using the availability of medical screening and hazard evaluation as selling points for participation.

4. The process of planning and conducting these surveys has allowed the investigators to identify a number of potential research directions, interventions, and other spin-off projects which could be pursued at a later date. Although it was felt by the co-operators that this potential information will not be captured in the published results, it will undoubtedly form the basis for additional work by these projects teams. One example where this has already occurred is a study of behavioral risk factors for stress related problems in farm families conducted in one state.

5. The hazard survey component of this program will provide essential new information, currently not available from other sources in the country. By itself, this data will provide useful baseline information in the same way as will the baseline health data. In addition, health status and hazard data have been/are being collected for the same persons or households, and although the study is not designed as a cross-sectional exposure-response investigation, there may be limited potential to investigate differing health outcomes in groups with different exposure levels.

3.3 Limitations

In addition to the barriers to obtaining participation outlined above, the following limitations in this project were noted:

1. One of the objectives of this program was to document the health status of agricultural workers and their families. With the exception of California, the program only captures the health status of farm owner/operator households, and not the hired farm labor force. This will result in a significant gap in the data collected.

2. The committee noted some confusion about the intended nature of this overall activity. The name of the program includes the word surveillance: however, as discussed above, the objectives are to conduct a health and hazard status survey of a small number of populations at a given point in time. Some of the uncertainty about this may have been associated with the fact that this program was under the stewardship of the surveillance division of NIOSH, which has been prominently responsible for SENSOR, which is clearly a surveillance activity. As surveillance and survey activities are not the same, it is essential that the actual purpose be clear to all persons involved in (or associated with) this program. This includes the NIOSH personnel who may be responsible for evaluating the program and for proposing potential follow-up.

3. It must be recognized that the results of the surveys will be limited to the types of populations targeted and will not necessarily be applicable to all agricultural groups.

3.4 Recommendations

It is the opinion of the review committee that the Farm Family Health and Hazard Surveillance Program was, and still is, a worthwhile endeavor, and the committee recommends that sufficient additional funding be allocated to the cooperators, to allow completion of the work to meet the initial objectives. It is anticipated that this will require two additional years of funding. The committee views all three components, the health and demographic survey, the medical outcomes screening, and the hazard evaluations, as equally important and feels strongly that it would not be appropriate to consider completing the health component without the hazard component.

In addition, the committee makes the following recommendations for improving the current program and for future consideration with respect to the information collected and the teams assembled for this program.

1. NIOSH project officers are encouraged to assist all agriculture initiative cooperators in pooling information about which farm/farmworker households are participating in research studies, surveys, and outreach efforts in order to collect data in more cost-effective fashion and to protect farm er/farmworker populations from undue interference in their lives. This should be considered as an early priority item, as it would greatly assist the FFHHS projects in their final data collection stages.

2. It is recognized that the sampling strategies and data collection instruments differed across states. Therefore, straightforward pooling of data into a national data set is not possible and is not recommended. However, the studies are sufficiently similar in design that useful comparisons will be able to be made for many components and the committee strongly recommends that this be done. The committee further recommends that, because the cooperators have the in-depth knowledge of their projects, NIOSH include them in any attempts to extract program-wide results.

3. Once this health and hazard survey is completed, it will provide suitable pretest data for future intervention studies with the same or other farm/farmworker populations. This should be considered by NIOSH in the design of any programs which may build on this work.

4. Because of the limited information that will be collected by the FFHHS on hired farm laborers, it would be useful for NIOSH to consider strategies for enabling collection of data of similar quality and quantity in one additional farm labor population. If this were done in direct collaboration with existing community farmworker group(s) and with the assistance of some of the investigators already experienced in the FFHHS program, it may well be possible to do this at limited additional cost and effort. The committee recommends that NIOSH consider mechanisms to fund one such addition to this survey.

5. NIOSH should develop a mechanism for these (and other) investigators to propose intervention projects, based on the experiences learned during the survey activities. Some examples already identified by the co-operators include looking at farm management practices such as pesticide use, standards development (e.g. lighting and marking of farm equipment), the development of a model agricultural motor vehicle code, strategies for protection of drinking water supplies, control of manure gas generation. It would be appropriate to develop a funding mechanism for such projects (and obtain appropriate peer review) outside the existing operating grant processes, within which agriculture appears to get a low priority score due to the small size of the population.

The FFHHS approach to collecting health and hazard data (i.e., an in-depth and comprehensive approach on a selected sample population) can be a useful strategy for obtaining a baseline 'snapshot' of the population. However, the experience of the cooperators in this project has amply demonstrated that trying to use this approach as a model for population-based surveillance would be inappropriate due to the overwhelming time commitment required. Therefore, this committee does not recommend that this type of program be repeated again in the near future, nor do we recommend that it be automatically expanded to additional states as a population surveillance strategy (with the exception of the proposal noted in recommendation 4, above). This program should be viewed as providing useful baseline information for future initiatives with respect to intervention and research and not as a model for surveillance.

4. OCCUPATIONAL HEALTH NURSES IN AGRICULTURAL COMMUNITIES

4.1 Summary

The goal of the Occupational Health Nurses in Agricultural Communities (OHNAC) Program was to "provide surveillance of agriculture-related disease and injury by placing occupational health nurses in agricultural communities". This program is a cooperative activity carried out in conjunction with State Health Departments. The original objectives were driven by a sentinel event (case-based) model and were as follows:

1. identify and report agriculture-related disease and injury cases;
2. assist in collecting other agriculture job-related fatality, safety, and health data;
3. conduct community evaluations of occupational agricultural risk factors; and
4. provide targeted interventions.

Eight states were awarded funding to conduct the OHNAC programs in FY90. Those states were: California, Georgia, Iowa, Maine, Minnesota, New York, North Carolina, North Dakota. In FY91 two additional states were added to the original eight. Those new programs were in Kentucky and Ohio. The Georgia program operated for three years and was last funded by NIOSH in FY92.

The ten OHNAC Programs have carried out their missions remarkably close to the original goals and objectives. All the sites have had a strong case-based surveillance component. Each program has done case investigations, education, outreach, and interventions.

Only North Dakota's program attempts to address the injuries and illnesses occurring in the entire state. All other sites have limited the surveillance locations and populations. California has had a special challenge estimating the population at risk in light of the huge seasonal and migrant farm labor group.

Two sites have done screenings for hearing loss (Maine and New York). All sites have worked with the pre-existing public health structure. Each site has collaborated with public schools to build farm safety into the curriculum.

Several sites have worked closely with NIOSH based teams in special circumstances. Notable instances were investigations of Green Tobacco Sickness in Kentucky, Anthrax in North Dakota, carbon monoxide poisoning in Iowa, and cumulative trauma disorders in blueberry harvesters in Maine.

All program sites have conducted safety day camps for farm children to alert them to hazards.

4.2 Important successes, strengths

The committee was impressed by the large number of significant accomplishments reported by these Programs. The following is a partial list of some remarkable achievements.

1. The Maine Program identified a very high rate of acute hand and arm tendinitis among young blueberry harvesters, which led to a research initiative to evaluate the causes of the problem, and information being made available to the community to limit the development of disability among these young people.

2. The Iowa Program found dangerously high levels of carbon monoxide in swine confinement building when internal combustion power washers were in use. These observations prompted alerts to the agricultural community. After the Great Plains flood of 1993 similar hazards were found when gas powered concrete saws were used in confined spaces and similar information alerts were conducted.

3. The Kentucky Program uncovered a sizable, previously under-recognized, problem with nicotine poisoning (Green Tobacco Sickness), and facilitated educational interventions aimed at broadening the awareness of the toxicity of nicotine in the harvesting effort.

4. The New York Program identified a problem with tractor and forage wagon work site logistics that virtually forced farmers to cross turning power takeoffs to unload wagons. This led to equipment design modifications to reduce the potential for injury.

5. The North Carolina Program identified important barriers to prevention in the perception of lack of control over hazards and the absence of a sense of a right to a safe workplace' on the part of the farm community. They developed a Farm Wives Night Out activity which provided an opportunity for farm wives to get together to discuss farm health and safety issues and to overcome this perception barrier.

6. The North Dakota Program uncovered cases of Q fever in sheep farmers which lead to a survey of farming practices and a sero-prevalence study to support the survey.

7. The California Program conducted detailed investigation reports following case investigations and have developed a very wide dissemination network for these NURSE reports. Follow-up investigations have identified that these reports have been used by agricultural employers for training purposes and have also been further distributed by a number of worker compensation companies.

8. The Minnesota Program built ties with a large creamery and offered targeted health promotion activities for the 1300 dairy producer members, including training for service representatives and distribution of respirators by the company's drivers.

9. The Ohio Program learned that 50% of the farm related injuries in their surveillance areas were caused by horses. Based on that surveillance data a specific horse hazard communication program for the farming community was developed and implemented.

10. The Georgia Program came up with the highly innovative and well received farm safety overnight camp for farm children. The Georgia program has now succeeded in obtaining state funding for its continuation.

All sites have increased the awareness of farm safety in their states, and several of the participating states have now mandated reporting of agricultural injuries and fatalities. All programs have succeeded in building important bridges with the Cooperative

Extension. A notable example is evident in several local coalition groups built by one program which include active participation by Extension staff.

The state health department and local hospital base has allowed much of the OHNAC information to be integrated into traditional public health efforts, which are perceived by the communities served as being lasting and non-threatening. The use of nurses based in the community is also an important strength of this program. It is apparent that the nurses have become accepted as providers of health and hazard information and as recorders of health events in their communities.

4.3 Program limitations

1. As OHNAC has progressed, the lack of common case definitions and common data bases has limited the national impact of the effort.
2. The future of OHNAC is unclear to the program managers. There is no shared vision of what a future might look like if funding is secure for a predictable period.
3. Careful, consistent evaluations of the activities undertaken by the OHNAC Program have not been done. Any evaluation effort should be developed in collaboration with the program co-operators.
4. In some instances there has been a reluctance to focus the OHNAC activities, due in part to the large number of unaddressed questions in agricultural health.
5. Information is shared among OHNAC sites but there seems to be a need for more communication, both personal and electronic. The OHNAC Programs report a feeling of second class status in the NIOSH Agriculture initiative as a result of not having been invited to meetings or offered the same opportunity for full participation.
6. In some cases, OHNAC programs lack the analytic resources to evaluate their surveillance data to gain the maximum from their efforts. The Centers have the resources that could support this need. In addition, given the important role of surveillance in the OHNAC Program, obvious linkages can be seen with FFHHS as well as with the Centers. There are examples in which linkages among these groups have been extremely successful (in several states the FFHHS and OHNAC teams work closely together, and in one state, an engineering component was added to case investigations as a result of direct collaboration between the OHNAC program and the Center) but this is not as widespread among the programs as would be ideal. Finally, natural linkages can be seen between Area Health Education Centers, Educational Resource Centers, and OHNAC programs which are not being fully exploited.

4.4 Conclusions and recommendations

It is the view of the review committee that the OHNAC Program has played an important role in heightening the awareness of the dangers of farming in all states. Further, the

case-based data has prompted valuable interventions and co-operative investigation with NIOSH scientists. The committee recommends that NIOSH continue support for this or a similar program, building on the important linkages already established by the nurses engaged in these programs. The following recommendations are directed at improving this important effort:

1. NIOSH personnel need to co-operate more closely with the OHNAC projects and provide greater assistance with focusing OHNAC activities. Although a large and often overwhelming number of problems may demand attention, the case-based surveillance approach is more successful when focused on a smaller number of issues or problems, using well defined approaches for which quality control procedures can be implemented. This is not to suggest that all OHNAC projects should be identical, but rather that OHNAC and NIOSH personnel work together to determine a common focus and priorities, upon which the individual programs may build.
2. Efforts should be made to develop case definitions and a common data set for OHNAC. NIOSH needs to participate fully in this effort, in collaboration with the project nurses and managers.
3. There is an important need to have the OHNAC efforts evaluated in a fair and objective manner. These evaluations should occur on a regular basis. The results of the evaluations should be used to modify and change programming, if necessary.
4. NIOSH should continue to encourage face to face meetings for the OHNAC leaders and field nurses on a regular basis. The use of the CDC Wonder computer network should continue and be refined.
5. NIOSH should inform the OHNAC managers as soon as possible about the future direction of the program. If NIOSH needs guidance in a future vision for OHNAC, the program managers are an excellent resource, and should be involved.
6. Efforts should be made to fully integrate the OHNAC people into the agricultural initiative of NIOSH. They should be given full information about meetings of Centers, FFHHS and other NIOSH agricultural meetings. OHNAC Programs might well be more formally tied in with the geographically closest Center. Communication efforts among all NIOSH agriculture programs should be fostered and funded.
7. NIOSH should consider ways to include safety and health education, health promotion, and intervention programs, and their evaluation, more formally with the existing OHNAC programs. Care should be taken to ensure that this does not detract from the need for greater focus for the surveillance activities.

5. AGRICULTURAL HEALTH PROMOTIONS SYSTEMS

5.1 Summary

Initially (FY90) the Agricultural Health Promotions Systems (AHPS) program consisted of 3 year cooperative agreements with 18 Land Grant Universities to:

- do health promotion with farmworkers;
- promote safety and health issues with the management of agricultural operations; and,
- introduce and improve hazard control components into continuing education and college curricula.

In the second year of the arrangement, an additional 6 Universities were brought into the initiative. After the third year was completed, only four of the projects received additional funding and two new projects were funded for a total of 6 projects. Information obtained from current grantees indicate that emphasis has shifted away from the initial objectives. The Request for Applications issued in 1994 listed the following purpose which appears to be significantly different from the initial objectives.

The purpose of this new cooperative agreement is to stimulate agricultural safety and health intervention programs to reduce agricultural injury or to reduce exposure to hazards resulting in injury. A primary emphasis is the assessment of the efficacy of the proposed intervention programs.

This new focus appears to indicate a shift away from direct health and safety promotion in the form of outreach and education activities towards intervention research that can be evaluated in a way that is quantitatively and qualitatively measurable. Discussions with the Project Officer indicate a new focus on the establishment of injury prevention programs.

The committee found it very difficult to review this component of the agricultural initiative. As committee members were not aware of the change in objectives and did not have access to copies of the 1994 RFA prior to the December meeting with co-operators, the majority of the committee's time with cooperators was spent in bringing the committee up to date on the changed status of the program. The remarks which follow are the results of the abridged review and are intended as preliminary impressions only.

5.2 Strengths

All of the original projects funded through this initiative appear to be creative in their attempts to implement multiple models for dissemination of information related to agricultural safety and health. Many of the programs were community based and took a message of safety and health to individuals who may not otherwise hear it, such as hired farm laborers. One example was public information campaigns using television and radio, which are accessible even to persons with zero literacy. Another example was a focus on farm wives as change agents. Many of the programs touched a younger, more

impressionable population through work with 4-H clubs, Farm Bureau Youth and FFA. Some of the co-operators delved into more sophisticated technology such as the use of a tractor simulator for hands on training and use of satellite teleconferencing and interactive CD ROM education to do in-service training. Another project involved hazard assessments of farms. Finally an innovative idea included use of a bounty program to encourage coroners to better document occupation and cause of death information on farm accident death certificates.

Although the committee was not able to evaluate the impact of the many programs created as a part the AHPS initiative, the co-operators reported that the original objectives were met with some measure of success before the initial project period ended.

There were some obvious successful implementations of specific projects, such as the inclusion of accredited college courses in agricultural safety and an extensive media campaign aimed at individuals who may not otherwise receive health information. The grantees report feeling that this initiative has helped to raise the profile of extension safety programs and created a potential opportunity to foster a much needed relationship between the medical academic community and the education/agricultural engineering community.

As with the Agricultural Centers, the individual grantees wisely focused on objectives most likely to employ their institutional strengths.

5.3 Limitations

1. There seems to have been little or no evaluation of the individual projects funded during the first cycle. It would be useful to evaluate which of the plethora of projects from the first funding cycle met some or any of the following objectives (or other identifiable objectives which would ultimately be expected to improve the health status of agricultural communities):

- engendered new relationships within the academic community for agricultural safety and health research;
- were successful in impacting the industrial and managerial sector in agriculture to change behavior, products, equipment, or training;
- were successful in leveraging dollars from other sources for outreach and research;
- were successful in bringing new students to the field of agricultural health and safety;
- were most widely and best received in the community; or
- were most linguistically and culturally appropriate.

2. Other barriers which appear to have impacted the success of this program include communication and coordination difficulties between the academic and professional disciplines involved in the various projects. There appears to be a natural opportunity for linkage between the Agricultural Centers and the Health Promotion programs. In most instances this opportunity has been under-utilized, though there is at least one state that did it very well and apparently benefited from it greatly.

3. Both previous and current grantees indicate a lack of understanding of the evolution of the program, from the limited growth in the second year, to the decision making process that resulted in a change in requirements and objectives, to the criteria used to choose the newly funded projects. This may have some bearing on the future success of the projects.

5.4 Review and recommendations

It is too early to evaluate the impact of the changed strategy for this program (i.e. via the six new co-operative agreements), and perhaps too late to fully evaluate the impact on prevention of injury and disease in agriculture as a result of the projects which have been terminated.

The committee was concerned that although the shift of emphasis from the provision of outreach initiatives (i.e. traditional health promotion, such as via media and education campaigns) to research studies with more readily measurable outcomes may result in more focused research, it may seriously reduce the impact of this program on the migrant and hired farm labor population (and possibly on all farm populations) in the short term. Further, without community-based outreach and intervention activities, even the long range impact of research projects will be limited.

While the committee recognizes the need for measurable outcomes (and, as noted above, have identified the lack of evaluation as a significant shortcoming of this program), it is concerned about the feasibility of combining innovative health promotion and outreach activities on a significant scale with traditional research outcome methodologies.

Although this may not have been the intention of NIOSH in shifting the emphasis of this program, it appears to have been interpreted in this fashion by many of the participants in the various projects.

The committee is supportive of attempts to foster creative prevention and intervention programs in every state in collaboration with cooperative extension programs. However, a question which does not appear to have been clarified in this program is what messages should be promoted or which interventions proposed. The expertise to propose such interventions may lie in the community, with the traditional agricultural agents, as well as with the various programs and projects that have been created or enhanced as a result of the first five years of the NIOSH agricultural initiative.

Therefore, we suggest the following:

1. Safety and health promotion, education, and intervention projects should be linked with (and perhaps become integral components of) the Agricultural Centers and programs such as the OHNAC program, who could work in conjunction with the coop extension programs to develop and evaluate outreach and intervention strategies.

2. Safety and health promotion, education, and intervention projects must involve the affected communities in all phases of project development, implementation, and evaluation.

3. NIOSH should investigate strategies to combine traditional etiologic research with research into interventions, control strategies, and regulatory and education approaches to prevention. Further, NIOSH should facilitate (via funding or personnel contribution) and require linkages to be created between researchers and outreach programs to translate research results into useful community programs. An essential component of all research and surveillance projects should be the outreach necessary to take intervention strategies directly to the community.

6. CANCER CONTROL DEMONSTRATION PROJECTS FOR FARMERS

6.1 Summary

In the initial Congressional language mandating the Cancer Control Demonstration Project for Farmers, CDC was directed to construct an early detection strategy to reduce the number of cancer deaths among farmers. Citing the need for close cooperation with existing rural hospitals having modern diagnostic equipment and certified oncologists, funding was provided for demonstration projects linking these hospitals with projects in regions where high cancer rates among the target farmer population had been identified.

In recognition of the fact that most cancers for which agricultural populations have been shown to be at high risk do not lend themselves to early detection, NIOSH participated in redirecting the program objectives to address not only early cancer detection among farmers, but also to include primary and tertiary levels of cancer control. The main goals were:

1. to identify barriers which prevent farmers and their families from accessing the full range of cancer control services;
2. to implement interventions to eliminate or reduce those barriers; and
3. to devise an appropriate evaluation component to the project.

Critical to the development of these projects was the requirement to incorporate interventions and demonstrate an adequate intervention evaluation strategy.

Eight cooperative agreements were established for 3 year periods. Five have been completed; three are still underway. A research project directed at the etiology of brain cancer has also been funded in which four of the original five co-operators are participating

6.2 Important contributions, strengths

Each of the project teams evidenced a clear understanding that funding by NIOSH for this program represented a finite, one-time agreement. Both cooperators and NIOSH personnel agreed that the original mandate was beyond what could reasonably be addressed successfully. Practical limits imposed on the project had the positive yield of focusing on what could be accomplished productively within constraints. This focus was clearly one of the strengths of this program and resulted in projects that were able to reach and impact populations in varied, meaningful ways.

This program provided the opportunity for traditional cancer researchers to work in a new, underserved area and co-operators felt a significant contribution was made in enhancing their ability to reach and influence the isolated, hard-to-reach farmer and farm laborer populations. Co-operators believe they were well received in the community because their work "connected" with cancer concerns already resident and saw this connection as important and helpful. It appeared to the committee members that the co-operators have succeeded in making productive connections with farming communities and in translating the messages of cancer prevention and early identification appropriately for this community.

In addition to increasing the understanding of cancer within the populations themselves, co-operators felt they markedly impacted the understanding of rural health care professionals, encouraging them to watch for opportunities to influence behaviors to reduce the risk of cancer in the agricultural workplace. This better enabled cooperators to gain local provider support in community screening efforts.

An important strength of this program, identified by the cooperators, was the focus on youth. When they interacted with farmers, the response was often, "I've been doing it for years and you can't change that, but you can change my kids". Farm youth became a most-receptive target population. Clearly the opportunity to evaluate the prevention of cancers in the population of farm children will require a much longer term than this funding cycle.

6.3 Program limitations

The frequent peer review processes required for these projects were seen as cumbersome by some members of the project teams given the program constraints. Contributors did not feel the peer reviewers were fully versed in community-based research and did not feel they had sufficient opportunity to interact with the reviewers. The perception was not validated by the project officers, who reported selecting leaders in the field of community-based research to be peer reviewers. The committee was unable to resolve

this issue, but notes that this apparent misunderstanding with respect to the peer review process may signal a more generic problem with communication in this program.

There was a general feeling among the co-operators involved in this program (and the committee members agreed with this sentiment) that general health prevention and promotion materials are often inapplicable and have low impact on changing behaviors with respect to cancers for this population.

6.4 Recommendations

1. It was the shared view of the cooperators and the committee members that the prevention message for most preventable cancers prevalent in agricultural populations could be equally well impacted by broader initiatives for the general public, as by initiatives aimed directly at the agricultural population. Such efforts are ongoing outside NIOSH. In addition, research regarding etiology of cancers in agricultural populations is being pursued in other venues. Therefore, we recommend the Cancer Control Demonstration Projects segment of the NIOSH Agricultural Initiative be allowed to terminate as planned with the completion of the currently funded projects.
2. We recommend that NIOSH consider other avenues for contributing to research into the health effects of exposure to pesticides (one of the suspected etiologic agents for cancer in the agricultural population). This research should go beyond cancer and consider other outcomes such as degenerative, neurological and reproductive disorders.
3. NIOSH should foster collaborative links between itself (and all its cooperators) and other federal bodies (e.g. NCI, EPA) in order that NIOSH may contribute to the agricultural cancer research underway at these other federal agencies. For example, the experience of NIOSH and its cooperators may be particularly useful with respect to exposure assessment as well as in ensuring that all agricultural populations are properly represented in cancer research. NIOSH should also attempt collaboration on exposure identification for the recently established cancer incidence registries in many states.
4. The cancer prevention message, strategies, and educational materials should be integrated into all NIOSH agricultural programs. The Agriculture Centers with expertise in oncology might take on the additional role of creating educational materials which convert commonly understood prevention techniques and cancer research findings into usable, occupationally specific guidance for the farming and farmworker populations, which could be utilized by other (non-governmental and governmental) farmworker organizations.
5. NIOSH should ensure that the knowledge gained from the study of barriers to accessing cancer detection and treatment be distributed widely in the scientific and general health literature.

7. GENERAL SUMMARY AND RECOMMENDATIONS:

7.1 Basic premise for this review

7.1.1 Impact of the initial broad-based approach

The programs as outlined originally by congress and as specified in the various Federal Register Requests for Application created an extremely broad based, nation-wide effort to identify, evaluate, and manage health and safety issues in agriculture including the widest possible spectrum of approaches. These included laboratory research, broad-based epidemiology, public health education and intervention, education and training at all levels from the elementary school, to the farm manager and farmworker, to the post-doctoral researcher, and the provision of basic health and hazard control services in agricultural communities.

This broad-based approach inevitably generates some programs which succeed better than others. This is the inherent value of such an approach and a review of such a program will detect the 'less successful' components. These should not become the major focus of the review, but rather should serve only to assist in defining future directions for the program.

7.1.2 Impact of the diversity of the target population

A unique challenge is presented by this program in attempting to generate research and education programs for an agricultural "community" that is a community in name only, but in reality, is extremely diverse with respect to geography, culture, language, socioeconomic status, productive activity, and political status and power. This diversity, has meant that five years of funding for most of the projects undertaken has allowed primarily for the establishment of a research (or education) base, for the building of connections with the community, and for generating or recruiting trained personnel, i.e., effectively laying the groundwork for successful outcomes which will require additional support for several years to come.

The broad initial base and the diversity of the target population lead to an important conclusion with respect to the review process: that it would not be appropriate to ask the question, "should this overall initiative be continued or terminated?" This would be analogous to stopping construction of a building after only the foundation has been laid. Rather, the appropriate question should be "Now that the foundation has been established, how can the initiative be tailored to generate the best possible programs, and further, how can supporting structures be created so that continuation funding can be built into the programs themselves?"

The agricultural safety and health initiative will require a long-term commitment (i.e., more than five years) in order to realize meaningful results and to make any significant impact on health and safety on this population. There needs to be a recognition that continuity of funding is important for the whole agricultural initiative. Five years is only

enough time to establish the framework and infrastructure for research, interventions, and surveillance.

The recommendations of the review committee are predicated on this basic premise.

7.2 Overall Recommendations

In conjunction with the specific recommendations for the five components of the program listed in each of the sections above, the committee makes the following recommendations with respect to the overall NIOSH initiative.

7.2.1 continue to fund some existing, and some new, program components:

1. As stated above, we recommend that NIOSH continue support for the Agricultural Centers, for the FFHHS (for 2 years only, in order to allow for the survey completion), and for a program based on the activities of the current OHNAC program (with the possibility of expansion to include some well-focused community based health promotion, education, and intervention activities). Specific recommendations for these programs are included in previous sections of this report.
2. We do not recommend continuation (except for current commitments) of the existing Cancer Demonstration Projects and Agricultural Health Promotion Systems programs. As discussed in greater detail in previous sections, we suggest that NIOSH collaborate with agricultural cancer research at other agencies, and that NIOSH include community based agricultural health and safety intervention and education programming, research, and evaluation within the OHNAC and Centers programs, and as a part of a new, less restricted, funding envelope (described below).
3. An additional funding envelope should be made available which would enable current or previous collaborators (and other groups) to propose innovative studies or demonstration projects for interventions, educational initiatives, health promotion activities, or other community based prevention strategies. It is anticipated that the majority of projects proposed under this funding envelope would arise from the experiences of the previous cooperators, although this should not be a necessary prerequisite. Some examples already identified by the co-operators include looking at farm management practices for pesticide use, standards development (e.g. lighting and marking of farm equipment), the development of a model agricultural motor vehicle code, strategies for protection of drinking water supplies, and control of manure gas generation. This component need not be extremely large, but we recommend that it be left relatively open with respect to specific objectives, in order to encompass a wide variety of creative projects, from a broad spectrum of potential applicants, including community groups. This should be viewed as the 'venture capital' component of the second five year funding cycle.

7.2.2 increase and improve communication, linkages, and collaborations

3. Although it is clear to the committee that there has been a productive relationship between NIOSH staff and most of the individual program components, there is an obvious need for better internal NIOSH coordination for the whole Agriculture initiative, and for improved collaboration across the existing extramural components. Examples of this need have been discussed in previous sections of this report. To effect improved internal coordination the committee strongly recommends that oversight and direction of the NIOSH Agricultural Safety and Health Initiative be united in a single unit within NIOSH, under the authority of the NIOSH director. Further, we recommend that personnel dedicated to this initiative should be assigned to provide the technical assistance and coordination for all components of the initiative.

4. We also recommended that the Agricultural Centers act as coordinating agents between regional NIOSH projects as well as facilitating communication among NIOSH projects and other related organizations and persons in the field of agricultural safety and health. Communication tools such as newsletters (already used to good purpose by the Centers), mailing lists, and electronic communication should be used to their maximum advantage, as well as support for face-to-face contacts.

5. NIOSH should take advantage of opportunities for collaboration and cooperation with other federal agencies for improved communication and to obtain support for expanding the scope of its initiatives (see below) with respect to environmental justice and women in the workforce, as well as for issues such as pesticide exposure and agricultural safety. In addition, NIOSH should actively assist its co-operators in forming collaborative links with state and local bodies, and in seeking and securing new sources of continuation funding for the future.

7.2.3 expand the scope to include under-represented populations

6. NIOSH and its co-operators are encouraged to work together to develop strategies to increase their focus in critical areas, currently underrepresented in the agricultural initiative. We recommend that all components of the agricultural initiative be structured, in the future, so as to place equal attention on the hired agricultural labor force including migrant, seasonal and permanent employees. Other populations and regions also require additional focus in the agricultural initiatives in the future. These include children (who work, legally, in agriculture at a very young age), women (as the home and the workplace are often synonymous for this group), and the large agricultural populations of the South and Southeast regions, which are currently not served by any of the Agriculture Centers.

7. Further, because people of color suffer a disproportionate burden of workplace and living condition hazards, we recommend that NIOSH develop strategies which will allow focused research and intervention with these populations. This includes diverse groups from African American farmers to Latino, Haitian, and Asian migrant and seasonal farmworkers.

7.2.4 include specific evaluation in all new components and projects

8. NIOSH and all co-operators (current and future) need to work together to ensure that an evaluation component is built in to all projects. As discussed above for the Centers, the evaluation scheme must include carefully developed, realistic, and appropriate (to community programs) evaluation tools. The results of the evaluations should be used to modify and change programming.

7.2.5 facilitate community based intervention research and outreach activities:

9. In order to facilitate the development of community based projects aimed at providing and evaluating regulatory, education, control, or other preventive interventions, the committee recommends that NIOSH provide additional training (or trained personnel) to both community-based researchers who wish to propose this work and to the traditional peer reviewers who would be evaluating these funding applications. Community based applicants may need assistance to propose scientifically sound projects with clear evaluation plans; reviewers and university based researchers may need assistance in how to evaluate and sponsor projects in disciplines which do not lend themselves well to the traditional clinical trials/outcomes research evaluation models. NIOSH and the Agriculture Centers (together with all participants in the various agricultural initiatives) should develop training programs toward this end.

10. Further, NIOSH should facilitate (via funding or personnel contribution) and require linkages to be created between researchers and outreach programs to translate research results into useful community programs. An essential component of all research and surveillance projects should be the outreach necessary to take intervention strategies directly to the community