NIOSH Agriculture, Forestry, and Fishing Program

Plan to Implement the National Academies Program Evaluation Recommendations

January 2011

Executive Summary

The National Institute for Occupational Safety and Health (NIOSH) Agriculture, Forestry, and Fishing Program (AgFFP) underwent a systematic review by the US National Academies (NA) in 2006 through 2007. The NA concluded that NIOSH was doing relevant work in the area of Agriculture, Forestry, and Fishing (AgFF) occupational safety and health, but with more limited impact on the safety and health of the workforce.

The NA review provided major recommendations on improving relevance, strengthening impact, and reducing barriers to effectiveness of the AgFFP in the following areas: 1) setting strategic goals and for improvement in administration and evaluation; 2) developing a cohesive program; 3) implementing a comprehensive surveillance system; 4) identifying and tracking AgFF populations at risk; 5) conducting research on knowledge diffusion process; 6) improving stakeholder engagement and partnerships; 7) implementing integrative and interdisciplinary approaches; and 8) enhancing awareness of national policy. Virtually all of these recommendations would require additional efforts to be undertaken with additional resources.

In addition to the NA systematic review, other major inputs to this plan have been findings and suggestions from the NIOSH AgFF Steering Committee, and a national strategic planning process for agricultural safety and health from the National Occupational Research Agenda (NORA) AgFF Sector Council.

A summary of the NIOSH organizational response is provided. Centered on the "NORA National Agriculture, Forestry, and Fishing Agenda," NIOSH's response is to adopt as much of this agenda as is currently feasible, while poised to adopt more in the future, as well as encouraging partners to do the same.

Major progress to date is presented in improving: stakeholder engagement; program leadership, cohesiveness, and evaluation; and enumeration and surveillance for AgFF populations at risk, including subsets of especially vulnerable workers. Multiple new tools for evaluating, managing, and following progress in the newly-integrated NIOSH AgFF Program are presented.

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Introduction

> Farming looks mighty easy when your plow is a pencil, and you're a thousand miles from the corn field. – Dwight D. Eisenhower

The Agriculture, Forestry and Fishing (AgFF) sector comprises establishments primarily engaged in growing crops, raising animals, harvesting timber, and harvesting fish and other animals on a farm, ranch, or from their natural habitats and includes establishments that provide services specific to these activities. Excluded from the AgFF sector are establishments primarily engaged in agricultural research and administering programs for regulating and conserving land, mineral, wildlife, and forest use. Also excluded are manufacturing activities that may be related to this sector (e.g. meat and seafood processing, grain mills, and sawmills).

Mission Statement

The mission of the National Institute for Occupational Safety and Health (NIOSH) AgFF Program (AgFFP) is to eliminate occupational diseases and injuries among workers in these industries through a focused program of research and prevention. The program strives to fulfill its mission through high quality research, practical solutions, partnerships, and carrying out Research to Practice (r2p) activities.

National Academies Review and the AgFFP Implementation Plan

In keeping with NIOSH's values of being relevant to the Nation's occupational safety and health issues, conducting quality science, performing at a level that produces results, and being accountable for such values, the AgFFP received a thorough external review in 2007 (available at http://www.nap.edu/catalog.php?record_id=12088).The review was conducted by the National Research Council and the Institute of Medicine – all part of the National Academies (NA) in Washington, DC. A committee of twelve experts, chaired by Paul D. Gunderson of the National Farm Medicine Center (emeritus) reviewed the AgFFP for its relevance to workplace issues and its contributions to improvements in occupational safety and health. The committee also identified emerging issues the Program is facing. In addition to numerical scores for program relevance and impact (4 of 5 for relevance and 3 of 5 for impact), the committee's report included a number of recommendations for program improvement. The committee briefed AgFFP managers on their findings in December, 2007.

Subsequently, the AgFFP has distributed the NA report to intra- and extramural staff and managers and the NORA AgFF Sector Council, composed primarily of stakeholder representatives from industry, NGOs, and other government agencies, co-chaired and staffed by NIOSH program representatives, working as part of the National Occupational Research Agenda (NORA) process (see http://www.cdc.gov/niosh/nora). It has engaged staff, managers, and stakeholders in dialogue and thinking about the best course forward for the Program in response to the report.

The purpose of this document is to outline that response for the NIOSH Board of Scientific Counselors and other interested parties. AgFFP leadership looks forward to input from all stakeholders about this response and all Program activities as the Program moves forward. This document is organized by the eight major recommendations of the NA report:

1. Establish Strategic Goals for Improvement in Administration and Evaluation
2. Develop a Cohesive Program
3. Implement a Comprehensive Surveillance System
4. Identify and Track AgFF Populations at Risk
5. Conduct Research on Knowledge Diffusion Process
6. Improve Stakeholder Engagement and Partnerships
7. Implement Integrative and Interdisciplinary Approaches
8. Enhance Awareness of National Policy

In each section, recommendation language from the NA report is followed by a description of the program's implementation efforts.

NIOSH Plan to Implement the National Academies Program Evaluation Recommendations

Recommendation 1: Establish Strategic Goals for Improvement in Administration and Evaluation

Recommendation 1: The AgFF Program should establish strategic goals for the overall program and for separate subpopulations to provide a basis for improving program leadership, administrative oversight, and program evaluation.

> ***1.a: The AgFF Program lacks a concerted effort and should focus its administrative efforts on improving program leadership, administrative oversight, and program documentation.***
>
> ***1.b: The AgFF Program should develop a comprehensive program evaluation mechanism to assess and set priorities among its research and transfer activities.***

Strategic Planning

In 2008, the Program adopted the nine strategic goals of the national research strategic plan developed by the NORA AgFF Sector Council:

1. Surveillance
2. Vulnerable Workers
3. Outreach, Communications, and Partnerships
4. Agriculture Safety
5. Agriculture Health
6. Forestry Safety
7. Forestry Health
8. Fishing Safety
9. Fishing Health

The AgFFP adopted these goals to guide NIOSH intramural projects, provide a suitable strategic landscape for the NIOSH Office of Extramural Programs in providing their guidance to extramural investigators interested in applying for NIOSH funding in AgFF areas, and maximize impact through partnerships that promote the widespread adoption of improved workplace practices based on research results. The Program is working to differentiate which partners might be best prepared to fulfill each of the action steps described in the Council's strategic plan. Each strategic goal has a set of intermediate goals and shorter term "activity" or "output" goals. These goals were developed with the input of the internal NIOSH AgFFP Steering Committee members (who also served on the NORA AgFF Sector Council). The AgFFP has also developed the goals into a matrix management tool to focus on NIOSH projects and their status in addressing each goal.

Furthermore, as part of a larger NIOSH effort to pinpoint priorities in each NORA Sector, the AgFFP is working to identify 3-5 top priorities for strategic investment from NIOSH over the next 2-4 years.

The final NORA Strategic plan, "NORA National Agriculture, Forestry, and Fishing Agenda for Occupational Safety and Health Research and Practice" was finalized in January 2009 and can be found in Appendix 1 or at: http://www.cdc.gov/niosh/nora/comment/agendas/AgForFish/pdfs/AgForFishDec2008.pdf.

Evaluation

The AgFFP will work with the NIOSH Office of Planning and Performance to apply program planning and evaluation tools, such as the NA evaluation framework, to implement comprehensive program reviews at regular intervals.

Recommendation 2: Develop a Cohesive Program

Recommendation 2: The AFF Program should provide national leadership and coordination of research and transfer activities in agricultural, forestry, and fishing safety and health.

To prepare for and following the NA review in 2006-2007, a number of major changes have been made to better coordinate and strengthen the NIOSH AgFFP. Our focus has been on developing a strategy to transform the program from a germane but marginal-impact one to a high-performing, tightly organized program with demonstrable impact.

Program Leadership

By mid-2006, three key personnel for AgFFP, a manager, coordinator, and assistant manager, had been named, marking the beginnings of more regular programmatic coordination. The internal NIOSH AgFFP Steering Committee, which had not met since 2003, was reorganized, and met frequently during this period, and generally monthly since. An Assistant Coordinator for the AgFFP was named in Mid-2008. A "content expert" (subject matter /program lead) has been named for Fishing Safety and Health. In July 2010, NIOSH hired a Forestry expert to help revitalize its efforts in forestry safety and health. Efforts are under way to identify and recruit other appropriate subject matter/program leads in areas such as communications, and behavioral health.

The key means by which the NIOSH AgFFP leadership seeks to affect our mission are:

1) Provide visible, national leadership for AgFF occupational safety and health in the US.
2) Provide coordination for the program across the NIOSH Divisions/Laboratories/Offices (DLOs) and intramural/extramural distinctions.
3) Provide accountability for program quality, relevance, and impact to stakeholders and Institute leadership, including the Board of Scientific Counselors.
4) Ensure quality, relevance, and impact of all NIOSH AgFFP activities conducted by intramural scientists and the NIOSH Agriculture, Safety, and Health (ASH) Center scientists and staff, and to encourage these traits to be used by NIOSH general extramural program grantees with AgFFP projects.
5) Conduct periodic strategic and ongoing tactical planning.
6) Provide periodical evaluation and archiving of program results.
7) Provide input and influence on projects following review and tracking of project outputs and outcomes.

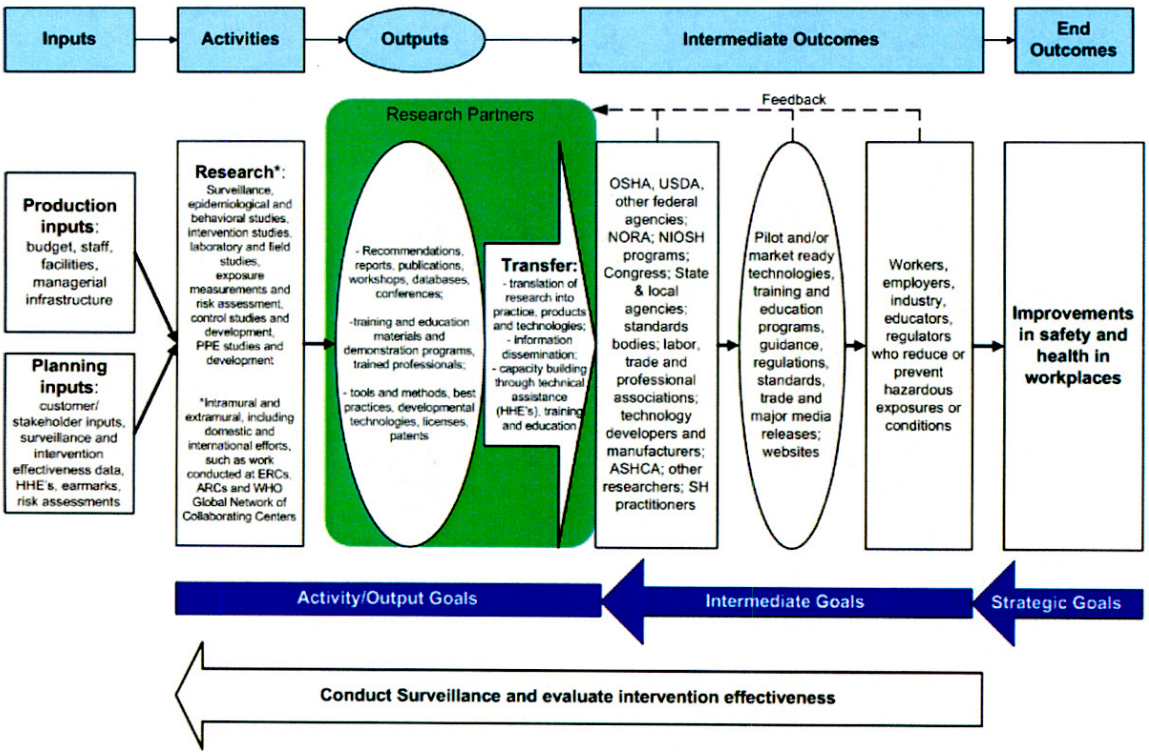
The NIOSH Office of Extramural Programs is responsible for all of NIOSH's extramural grants and cooperative agreements. For the agriculture, forestry and fishing areas, AgFFP provides general and strategic guidance to OEP toward developing announcements. OEP is responsible for announcing, vetting, and awarding all extramural grants and cooperative agreements.

AgFFP Logic Model and Planning Tools

The Program refined its logic model (see Figure 1). Closely modeled after the NIOSH logic model, it reflects the scope of Program operations in one graphic. It will serve to help communicate about those operations to staff and other stakeholders. Of particular note is the important, iterative role which accurate surveillance plays in focusing efforts and evaluating progress.

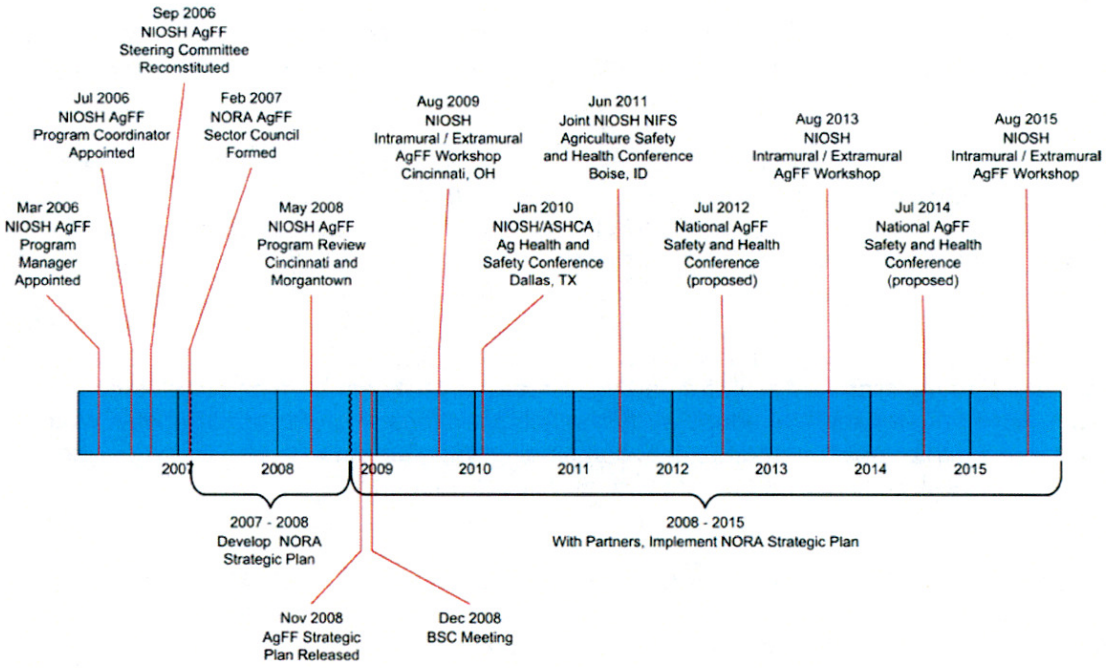
Figure 1

NIOSH Agriculture, Forestry, and Fishing Research Logic Model



The AgFFP has also developed several planning tools that are critical in program coordination, strategic planning, and implementation. First, NIOSH has developed a timeline of AgFFP activities for the years 2006 through 2015 keyed to NA report recommendations areas (Figure 2). Second, NIOSH is developing a program-specific, interactive program management tool that will augment the existing NIOSH Project Planning Module, organizes existing projects by strategic goal area, provides fiscal and personnel data in a cross-sectional fashion, and provides for scoring on a variety of criteria (e.g., strategic need, likelihood of success, and timeliness). This tool will be offered internally to NIOSH DLOs, along with AgFFP consultation and technical assistance.

Figure 2: Timeline of AgFFP activities 2006-2015



Intramural Steering Committee

The AgFFP Steering Committee consists of the Program's leadership plus one representative from most of the DLOs in NIOSH (see Appendix 2). The committee was reorganized in 2006 and has been meeting regularly since. Major roles of each committee member include:

- Representing the interests of each NIOSH DLO in the AgFFP activities and planning processes.
- Representing NIOSH as members of the NORA AgFF Sector Council and associated council working groups.
- Assisting with preparations for AgFFP reviews.
- Providing technical expertise on addressing the recommendations from the NA report.

Annual Intramural Program Review

The first intramural, annual AgFFP reviews were held in the spring of 2008 in Cincinnati and Morgantown, with Envision connections to the other locale: Anchorage, Spokane, Washington, DC, and Atlanta. These program reviews were designed to be informative and relaxed, focusing on accomplishments to date and future potential for translating research to practice (r2p) and high-impact results. Staff response to these reviews was overwhelmingly positive as staff learned about the breadth and depth of intramural AgFFP efforts.

Extramural/Intramural Coordination

NIOSH's general program announcement for investigator-initiated research directs applicants to focus on strategic goals in the NORA Sectors, including AgFF. In addition

to NIOSH-funded general program grantees, the NIOSH-funded Centers for Agricultural Disease and Injury Research, Education, and Prevention (there are currently 8 funded) are located in academic and/or biomedical institutions widely distributed across the US. All but one (the National Children's Agriculture Safety Center) of these centers asserts a regional focus, and each includes projects in its suite that have a regional emphasis and potential utility.

The first biennial invitational NIOSH AgFF intramural/extramural workshop was held in Cincinnati, Ohio on August 11-12, 2009. This workshop provided an excellent opportunity for these two groups of colleagues to get to know each other, share each others' work, as well as discuss the feasibility of functional collaborations. Attendees included representatives from NIOSH DLO leadership, NIOSH scientists currently involved in AgFFP projects, NIOSH Ag Center leaders and principal scientists, as well as appropriate general program principal investigators. Project officers from most intramural and extramural projects had the opportunity to present highpoints of their work, key findings, and their ideas for future collaborations. Multiple opportunities were available for informal interactions between small groups, or at the "1-on-1" level. The next intramural/extramural workshop is tentatively planned for June 2011 in Boise, Idaho.

The NIOSH AgFFP is planning for biennial major, recurrent, national AgFF safety and health Conferences beginning in 2010. These major events are intended to bring together parties interested in AgFF safety and health, from government, academia, industry, and non-governmental organizations. In January 2010 the first conference was held, co-sponsored by NIOSH and the Agricultural Safety and Health Council of America (ASHCA), an agricultural production industry-led consortium. The conference was held in Dallas, Texas and had over 140 attendees from industry, academia, and safety and health professionals from other organizations. An agriculture, forestry, and fishing safety and health conference is being planned in conjunction with the National Institute for Farm Safety annual meeting in Boise, Idaho in June 2011. This meeting will provide a venue for researchers, industry, and safety and health practitioners to share information and provide opportunities for developing partnerships. In addition, NIOSH has proposed holding another very large scale public AgFF conference (similar in scale and scope to those held in 1990 and 1992) in 2012.

Recommandation 3: Implement a Comprehensive Surveillance System

Recommendation 3 : The AgFF Program should develop a comprehensive surveillance system.

> ***3a. Conduct research on the potential use of both ongoing and non-routine surveillance systems to identify priority topics for future research or interventions. A focus on hazard surveillance, sentinel health and injury events, and occupational illness outbreak investigations similar to the FACE investigations may be more cost-effective that the current piecemeal approach.***
>
> ***3b. Convene a panel of surveillance experts from state health departments, FACE program experts, universities, the State and Territorial Injury Prevention Directors Association, workers' compensation insurance experts, labor organizations representing all AgFF sectors including***

temporary workers, and the Council of State and Territorial Epidemiologists to develop new approaches to AgFF surveillance.

3c. Implement pilot surveillance systems based on the new approaches proposed by the convened experts.

3d. Develop an evaluation plan to assess the quality of the pilot surveillance systems.

Additional comments and recommendations were provided throughout the NA report addressing two broad categories for surveillance improvement: numerators (i.e., health outcomes or hazards), and the denominators (i.e., types and sizes of the populations at risk). The AgFFP is also considering these specific detailed comments during implementation.

AgFF Surveillance

Public health surveillance is an essential part of any public health prevention program. Currently, surveillance data for the AgFF sector are sparse and are only adequate for occupational fatal injuries. According to the NA report, non-fatal injuries and illnesses are not adequately tracked for any of the AgFF sub-sectors. Progress has been made in some areas, such as pesticide poisoning surveillance, injury surveillance for youths on farms, and traumatic injury and fatality surveillance for fishing in Alaska, but these advances have not been extended to cover all important health conditions or populations at risk. In addition, information is limited on the number and types of workers at risk within these sub-sectors. Major improvements are needed in the area of surveillance if the occupational health of this sector is to be significantly enhanced.

Strategic Planning

The NIOSH AgFF Program is currently undertaking activities to address these recommendations and comments. NIOSH is working with NORA AgFF Sector Council partners to define surveillance priorities for the AgFF sector. The AgFF Program strategic goals for surveillance are on page 11 of Appendix 1.

Intramural Surveillance Activities

The internal NIOSH Surveillance Coordination Group (SCG) will be assessing current NIOSH AgFF surveillance activities to determine how they address the NA report and align with the NORA AgFF Sector surveillance priorities. The SCG is also creating a surveillance webpage that will ultimately provide sector-specific occupational illness, injury, and labor force charts. Finally, the SCG is identifying areas where new activities could be undertaken if additional resources for surveillance activities were available.

In the future, AgFF surveillance will involve continued coordination of existing surveillance efforts among the NIOSH DLOs. The SCG currently coordinates existing data collections on both content and cycle frequencies. Some examples of existing surveys include the National Agricultural Workers Survey and the U.S. Department of Agriculture (USDA) surveys. We also plan to assess the availability and utility of existing data sources such as workers' compensation data and non-traditional public health surveillance data sources (e.g., Census of Agriculture, USDA Agricultural Resource Management Survey, equipment manufacturer data, and insurance data).

Expanding existing internal surveillance efforts would require additional resources. Examples of surveillance activities that could be re-established or expanded include, but are not limited to, surveillance of U.S. crop workers, surveillance of the national farm operator population, a national surveillance program for fishing, and increased State-based programs (e.g. Sentinel Event Notification System for Occupational Risk program activities in pesticides and asthma) as well as possible new emphasis on logging and forestry hazards.

The third phase of an expanded surveillance effort would depend heavily on the recommendations for addressing surveillance gaps generated by the workshop described below. The specific resource needs for such an effort would best be assessed after the workshop. This assessment would include determining the feasibility of the proposed surveillance methods, pilot testing those that seem promising, evaluating their effectiveness, and then determining the long term cost of establishing and maintaining those surveillance methods found to be effective.

Intramural/Extramural Surveillance Collaboration

As stated previously, the AgFFP is planning to conduct workshop and conferences to share experiences and discuss issues in AgFF research. Attendees for these meetings include federal, state, and private agencies, and academic experts, many with experience in surveillance. Conference program will include presentations and discussions on assessing new approaches to conducting surveillance in all three industry sub-sectors. One example topic is surveillance in the forestry and logging sector. Current nonfatal injury or illness surveillance systems covering forestry or logging workers are inadequate for making public health decisions. In addition, there are some questions about the accuracy and comprehensiveness of labor forces estimates in this AgFF sub-sector. Through the NIOSH SCG and stakeholders in this area we propose an assessment of current status and potential sources of AgFF surveillance data beginning at this workshop.

Recommendation 4: Identify and Track AgFF Populations at Risk

Recommendation 4: The NIOSH AgFF Program should clearly identify and track its target populations.

> ***4.a: A clear definition of worker populations "at risk" is needed.***
> ***4.b: The AgFF Program should conduct comparative studies across agriculture, forestry, and fishing to set priorities better and to respond to dynamic workforce and workplace conditions.***

The NIOSH AgFFP believes that Recommendations 5-8 are also germane to vulnerable workers in AgFF.

Background

Some workers experience disproportionate rates of occupational injuries and illnesses within the AgFF Sector because of social or physiological factors which may lead to increased workplace exposures and/or individual susceptibilities. Low English proficiency and literacy level may decrease the efficacy of training and risk communication programs. Socioeconomic factors may lead some workers to accept and remain in higher risk jobs. These social factors can also compromise workers' options for

seeking protection and accessing resources that might be more easily obtained by others employed in this sector. The temporary or seasonal nature of their employment may require workers to frequently change jobs and relocate for work, adding other social and economic burdens.

Workers may start employment at a young age due to family connections or economic necessity, before they are physically or mentally prepared to respond to hazardous working conditions. At the other end of their career, they may continue to work after physical or mental limitations that accumulated over time have potentially accelerated the onset of disabilities. Unpaid family workers are common in agriculture, and employment on small fishing vessels also does not require the contract protections seen on larger vessels. The forestry industry lacks information on this type of vulnerable workers.

The circumstances and characteristics leading to vulnerability are defined here to include extremes in age (under 18 and over 65 years), gender, limited English language and literacy, mobility and migration, socio-economic status, documentation status, ethnicity, culture, physical or cognitive disability, and unpaid status. For many workers vulnerability is multi-factorial and the degree of vulnerability can vary throughout the worker's work life. Appropriate interventions and remedies require an understanding of the factors that increase and reduce vulnerability of workers in the AgFF Sector. The NORA AgFF strategic goal for vulnerable workers can be found in Appendix 1 on page 15.

Current Intramural Activities

The AgFFP currently has 24 intramural projects or activities that directly or indirectly provide vulnerable worker information for the AgFF sector. These activities address seven specific populations:

1. Hired workers
2. Forestry and logging industry workers
3. Children
4. Elderly
5. Physically and cognitively-disabled workers
6. Recent immigrants
7. Non-English speaking populations

Four NIOSH divisions and one office are involved in these activities: the Division of Applied Research and Technology (DART); the Division of Surveillance, Hazard Evaluations and Field Studies (DSHEFS); the Division of Safety Research (DSR); the Education and Information Division (EID), and the Alaska Pacific Regional Office (APRO).

Defining "Occupational Health Disparities"

The first step towards achieving measurable reductions in occupational health disparities among AgFF workers, as outlined by both the NA Review and the NORA Sector Council, is to devise a clear and specific definition of occupational health disparities in this sector and the essential concepts surrounding it, including vulnerable workers and the characteristics that contribute to vulnerability, minority populations, and child labor. Recently a working group on these issues formed with participants from NIOSH's DSR, DSHEFS, and the Office of Health Communication. Representatives from the NIOSH Occupational Health Disparities Cross-Sector Program and AgFFP are also

participating. The group is engaged in an internal NIOSH process to devise and evaluate a working definition and consider the surveillance data sources or other data collection that will be necessary to be able to track occupational health disparities in AgFF based on this definition. The first meeting of the working group occurred in September 2008. A working draft definition was prepared for the NORA AgFF Sector Council meeting in January 2009.

This definition may be used by researchers to better focus on describing the health and safety outcomes for which some workers experience disparities, and the physical, biological, environmental, and societal conditions which result in higher risks or worse outcomes for some workers. In addition, community-based participatory research and other methods that engage populations at risk for occupational health disparities to help ensure the implementation of findings could be employed to fill in knowledge gaps and assist in the research-to-practice process. The AgFFP could also expand its inquiry of research translation methods to boost the ability of NIOSH and its partners to influence behaviors and policy change that will reduce occupational health disparities among populations at risk. While the AgFFP has been successful at such investigations for particular populations and topics (e.g., tractor rollover prevention among high risk farmers), there is much room for increased attention to communicating with other at-risk populations.

Recommendation 5: Conduct Research on Knowledge Diffusion Processes

Recommendation 5: NIOSH should conduct research on the science of knowledge diffusion to identify effective methods for AgFF research-to-practice programs.

- ***5.a: The AgFF Program should incorporate broader social science expertise into the research diffusion process.***
- ***5.b: The AgFF Program should explore communication tools capable of reaching the AgFF workforce.***

There is a substantial repository of research findings and expertise in the university agriculture community regarding the diffusion of knowledge and innovations through social systems, possibly more than in any other industrial sector.[1] From the diffusion of new varieties of seeds to new technologies, sociologists, extension agents, educators, and farm organizations have studied innovation adoption patterns in farming populations for decades. The well-known categories of "early adopters, opinion leaders, and laggards" were identified by such researchers. Methods of social network analysis and innovation "adoptability" assessment were developed. The AgFFP will work to put such existing knowledge to use through efforts to identify and learn from diffusion expertise among its extramural partners. In addition, the Program will enhance its focus on health communication, for example by looking at ways to develop, implement, and evaluate culturally appropriate educational and outreach programs for such areas as promoting the psychological wellbeing of AgFF workers and their families.

Recommendation 6: Improve Stakeholder Engagement and Partnerships

Recommendation 6: The AgFF Program should establish a new model to involve stakeholders throughout the research process, and should also establish an

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[1] Rogers, E [1995]. Diffusion of Innovations. 4th edition. [Free Press: New York].

effective multipartite stakeholder mechanism that includes at-risk workers and other organizations to focus on occupational safety and health.

- ***6.a: The AgFF Program should develop a new model for targeting all key stakeholders as full participants in its research program design and execution.***
- ***6.b: The AgFF Program should establish a coordinating council that would serve as a public advisory committee and would assume lead responsibility for informing public discourse on occupational safety and health issues.***
- ***6.c: The AgFF Program should continue to partner with appropriate federal and state agencies and establish additional interagency partnerships to increase the capacity for carrying out research and transfer activities.***
- ***6.d: The AgFF Program should establish public-private partnerships to work more closely with equipment, facility, and pesticide manufacturers in design and development processes.***

Enhancing surveillance, producing guidelines on health and safety for the agriculture, fishing and forestry industries, and addressing the specific circumstances of vulnerable populations are the crucial substantive tasks for achieving the goals of this strategic plan. The Outreach, Communications and Partnerships strategic goal sets a course of action to disseminate what is learned to all entities that have a stake in improving the health and safety of workers and producers in these industries. Disseminating relevant interventions and promoting the adoption of best practices in the workplace may be achieved through partnerships and collaborations. Proven approaches to improved worker health and safety for each of the sector industries can be identified and a wide variety of outreach methods applied to assure that the best health and safety practices are fully implemented in agriculture, fishing and forestry. These best practices include, but are not limited to, new technologies and engineering controls; behavior change interventions; training; incentive programs; and guidelines and policy changes.

Current efforts responsive to this recommendation include:

1. NORA AgFF Sector Council organized (January 2007)
2. Biennial NIOSH Intramural/Extramural Research Workshop (first held in August 2009)
3. NIOSH / ASHCA Joint Conference on Agriculture Safety and Health (January 2010)
4. Planning to organize and co-sponsor major, recurrent, national agricultural safety and health conferences
    a. Joint NIOSH National Institute for Farm Safety Agriculture, Forestry, and Fishing Safety and Health Conference, June 2011 in Boise, Idaho
    b. Proposed large national conference open to public, June 2012
5. Beginning to partner with the Agricultural Safety and Health Council of America (ASCHA) in research and knowledge diffusion efforts. (July 2008)
6. Relevant NIOSH intramural projects:
    a. "Improving the Adoption of CROPS" social marketing project (DSR).
    b. "Educational Products on Agricultural Hazards" project (EID).
7. "National Agricultural Tractor Safety Initiative" project (OEP and ASH Centers).
8. "Partnerships for Hearing Loss Prevention in Agriculture" project (2009)
9. "Pandemic Influenza Guidance and Education Products" project (2012)
10. *National Children's Center for Rural and Agricultural Health and Safety* collaborations with DSR.

11. Partnership with the NCI, EPA and NIEHS on the Agricultural Health Study since 2000.

The NORA AgFF Sector Council is charged with and is well-placed to achieve the national agenda through partnerships and, as facilitators of and participants in the Council, the NIOSH AgFFP will contribute to and benefit from those partnerships.

We have also noted recommendation 6d and will attempt to establish such partnerships.

Recommendation 7: Implement Integrative and Interdisciplinary Approaches

Recommendation 7: The AgFF Program should implement integrative and interdisciplinary approaches in its research practices.

7.a: Researchers that receive funding from the AgFF Program should visit worksites regularly so that they can acquire understanding of the workplace environment and thus develop and integrate culturally appropriate and sensitive approaches.

7.b: The AgFF Program should increase the use of interdisciplinary teams to address the environmental, social, cultural, and psychological complexities of issues that face AgFF workers.

Currently, extramural grantees visit worksites in accordance with the research design/scope of work for their specific projects. For the NIOSH intramural program, we have noted and intend to heed recommendations to visit worksites regularly and to use interdisciplinary teams as feasible. Within the Steering Committee, we have also agreed on the importance of interdisciplinary collaborations to develop methods of exposure evaluation in agriculture health.

The current sector and cross sector organization of the NIOSH intramural programs will be helpful in incorporating an interdisciplinary team in research projects. AgFFP leadership will encourage collaboration, with other sectors and cross sectors, in designing and implementing projects.

Recommendation 8: Enhance Awareness of National Policy Activities

Recommendation 8: The AgFF Program staff should develop greater awareness of national policy activities because they can have a substantial impact on AgFF worker populations and risk factors.

The AgFFP acknowledges the critical importance of policy areas such as the Farm Bill, immigration polices, and trade policies as context for occupational diseases, injuries, and deaths in the AgFF Sector and the link to improved program effectiveness. Accordingly, the Program is working to enhance its awareness of national policy issues and is pursuing a number of key related efforts including:

- Fostering a strategic alliance with ASHCA that provides a rich platform for exploring policy issues such as farm and agricultural trade policy and economics and the potential ramifications for worker safety and health;
- Conducting an analysis of consequences of the Small Farm Exemption to the OSH Act ;
- Examining policy issues related to heat stress and food safety, such as adequate access to water and shade, sanitation, and work scheduling;

- Publishing an editorial on the need for policy changes to retrofit roll bars and seatbelts in old U.S. farm tractors in the January 2010 *Journal of Agricultural Safety*;
- Continuing to encourage and develop engineering capacity to address high-risk subsector operations (e.g. commercial fishing, logging, etc.);
- Exploring possible new links with Ag-oriented organized labor and NGOs.

Appendix 1: NORA National Agriculture, Forestry, and Fishing Agenda

NATIONAL OCCUPATIONAL RESEARCH AGENDA (NORA)

NATIONAL AGRICULTURE, FORESTRY, AND FISHING AGENDA

FOR OCCUPATIONAL SAFETY AND HEALTH RESEARCH AND PRACTICE IN THE U.S. AGRICULTURE, FORESTRY, AND FISHING SECTOR

Developed by the NORA Agricultural, Forestry, and Fishing Sector Council
December 2008

Recommended Citation: NORA AgFF Sector Council [2008]. National Agriculture, Forestry, and Fishing Agenda. Washington, DC: NIOSH.

PREFACE

For the first time in the U.S. there is a formal research and public health practice agenda for occupational safety and health for the industries of agriculture, forestry and fishing. Over a 20 month period, a dedicated group of individuals prepared the core content of this National Occupational Research Agenda (NORA) plan based on scientific evidence, public testimonies, peer reviews, and personal expertise associated with clinical practice, organization responsibilities and industry directives. **Crucial, substantive tasks for achieving the goals of this strategic plan are enhancing surveillance, producing guidelines and promoting evidence-based health and safety interventions for the agriculture, fishing, and forestry industries, and addressing the specific circumstances of vulnerable populations.**

We wish to express deep gratitude to the many people who provided input into the action plan. These included more than 40 individuals providing public and written comments, 31 corresponding members providing feedback on preliminary drafts, National Institute for Occupational Safety and Health (NIOSH) and National Farm Medicine Center staff who facilitated meeting arrangements, and NIOSH leaders who provided guidance to all the industry sector councils. The NORA Agriculture, Forestry, and Fishing (AgFF) Sector Council was especially productive and efficient because of the appointment and active participation of 35 dedicated people representing the three sub-sector groups and NIOSH. The Council met in-person four times and via teleconference many times during the development of this document. These meetings, combined with numerous electronic reviews, yielded valuable insights into key issues and guided the enumeration of priorities. The result is an action plan for the future with the goal of improving working conditions in some of our nation's most hazardous industries.

Members of the NORA AgFF Sector Council from January 2007 through 2008 are noted below. They generously gave their time to ensure this endeavor was successful. Captain Brad Husberg, NIOSH, was the engine behind the scenes that kept the work on track, while Hillary Strayer, MPH, NIOSH, provided editorial services. We are especially grateful to Dennis Murphy, PhD, of Penn State University for leading the development of the "Dictionary of Terms for Agriculture, Forestry, and Fishing Safety and Health Professionals" which is appended to this document. We encourage you to adopt these definitions to facilitate consistent understanding and application of this planning document which augments the body of knowledge associated with occupational safety and health.

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Executive Summary

For the first time in the U.S. there is a formal research agenda for occupational safety and health for the agriculture, forestry and fishing (AgFF) industries. The National Occupational Research Agenda (NORA) plan is based on scientific evidence, public testimonies, peer reviews, and personal expertise.

The AgFF Sector includes activities such as growing crops, raising animals, harvesting timber, and harvesting fish and other animals from farms, ranches, or natural habitats. **This plan includes a set of strategic and intermediate goals to focus research, intervention efforts and prioritization of safety and health issues to an audience which includes industry, labor, federal, state, and local governments, and subject matter experts.** Considerations critical to the priority-setting process were: the numbers and proportions of workers at risk for a specific injury or illness; the seriousness or severity of the hazard or issue; and the probability that new information/approaches will improve worker safety or health.

This executive summary lists the nine strategic goals put forth by the Council. For each Strategic Goal, there are up to five intermediate goals, each of which has specific action steps.

STRATEGIC GOAL 1 - Surveillance
Improve surveillance within the Sector to describe: the nature, extent, and economic burden of occupational illnesses, injuries, and fatalities; occupational hazards; and worker populations at risk for adverse health outcomes.

Because of the paucity of surveillance data in the AgFF subsectors, especially non-fatal injury data and the number and types of workers, enhanced surveillance is critical to addressing the other strategic goals. These data will define the specific populations at risk, the injuries and illnesses of greatest concern, and the impact/effectiveness of prevention efforts and intervention programs. A top priority is improved systems for collecting, analyzing and reporting data.

STRATEGIC GOAL 2 – Vulnerable Workers:
Reduce deleterious health and safety outcomes in workers more susceptible to injury or illness due to circumstances limiting options for safeguarding their own safety and health.

Some workers experience disproportionate rates of occupational injuries and illnesses because of social or physiological factors which can lead to increased workplace exposures and/or individual susceptibilities. Low English literacy and proficiency may reduce the efficacy of training and risk communication programs; socioeconomic factors may lead some workers to accept and remain in higher risk jobs. These factors compromise workers' ability to seek protections and/or access resources. The circumstances and characteristics leading to vulnerability include extremes in age (under 18 and over 65 years), gender, limited English language and literacy, mobility and migration, socioeconomic status, ethnicity, culture, documentation status, and physical or cognitive disability. A priority is to secure and share valid, timely data regarding characteristics of this workforce, then develop evidence-based interventions targeted for vulnerable workers.

STRATEGIC GOAL 3 – Outreach, Partnerships, and Communications
Move proven health and safety strategies into workplaces through the development of partnerships and collaborative efforts.

Outreach is necessary to effectively implement the strategic plan. Disseminating relevant interventions and promoting the adoption of best practices in the workplace to all those who have a stake in improving the health and safety of workers can be achieved most effectively through partnerships and collaborations. Best practices include, but are not limited to: new technologies and engineering controls; behavior change interventions; training; incentive programs; and guidelines and policy approaches.

Strategies will highlight collaborations that yield effective adoption of best management practices across the agriculture, forestry and fishing industries.

STRATEGIC GOAL 4 – Agriculture Safety
Reduce the number, rate, and severity of traumatic injuries and deaths involving hazards of production agriculture and support activities.

Agricultural production is one of the most hazardous industry sectors in the U.S. Between 1992 and 2005 in the U.S., 7,571 farmers and farm workers died from injuries sustained while performing farm work in the U.S. Farm tractors accounted for the greatest portion of the fatalities (37%), predominantly caused by overturns (rollovers) and runovers. In addition to fatalities, an average of 93,000 non-fatal OSHA recordable injuries occur on U.S. farms each year. A top priority is adoption of interventions known to be effective in preventing tractor rollovers and runovers.

STRATEGIC GOAL 5 – Agriculture Health
Improve the health and well-being of agricultural workers by reducing occupational causes or contributing factors to acute and chronic illness and disease.

Agricultural workers face a wide range of acute and chronic health exposures at work. Their work can be strenuous, involving long hours, difficult conditions and repetitive exposure to musculoskeletal strains and sprains, respiratory hazards, toxic chemicals, psychological stresses and a variety of zoonotic diseases. These longstanding problems persist and there are emerging situations associated with new production methods, environmental issues, technologies and changing demographics of the workforce. Among the many concerns, a priority is to reduce the incidence and prevalence of musculoskeletal disorders.

STRATEGIC GOAL 6 – Forestry Safety
Reduce the number, rate and severity of traumatic injuries and deaths involving hazards of forestry.

In order to develop performance measures and track improvements in safety and health working conditions, comprehensive baseline data are needed. Different federal agencies monitor aspects of forestry workers, products, and occupational fatalities. Determining the specific cause of an injury event is often not possible because of lack of detailed data. This sector warrants considerable attention in building capacity to implement evidence-based safety interventions, starting with improved surveillance of workers and their exposures.

STRATEGIC GOAL 7 – Forestry Health
Improve the health and well-being of forestry workers by reducing occupational causes or contributing factors to acute and chronic illness and disease.

Forestry workers face health risks related to the strenuous jobs they perform over long work shifts. Musculoskeletal disorders and occupational illnesses can shorten working lives. Exposures to hazards and toxic materials, availability of protective clothing and equipment, and drug and alcohol use are major concerns for the forestry workforce. In addition, the health status of these workers has likely changed with mechanization. A key area for action will be interventions to minimize work-related musculoskeletal disorders.

STRATEGIC GOAL 8 – Fishing Safety
Reduce the number, rate and severity of traumatic injuries (including deaths) involving hazards of commercial fishing.

Commercial fishing remains one of our nation's most hazardous occupations. Despite increased regulations in 1988, commercial fishermen are about 30 times more likely to die pursuing their occupation than the average worker. The impact of the high rate of death and injury is devastating to fishing communities and fishermen's families. To exacerbate the situation, some of the industry is overcapitalized and competition for a tightly controlled resource adds competitive pressure to support risk

taking. A priority is to adopt interventions that reduce deaths associated with vessel sinking and falls overboard.

STRATEGIC GOAL 9 – Fishing Health
Improve the health of commercial fishermen by reducing occupational causes or contributing factors to illness and disease.

Commercial fishing workers face many acute and chronic health exposures at work but little research has been done on these health issues or their prevention. There is also no surveillance or required reporting of health hazards for commercial fishing. As with agriculture and forestry, reduction of work-related musculoskeletal disorders is a top priority.

Note: The AgFF Strategic Plan includes a dictionary intended to standardize terminology used by safety and health professionals to describe and report occupational hazards, risks, injury, disease and illness used in occupational safety and health research.

NORA AgFF Strategic Plan Authors: A list of the AgFF Sector Council members is available on the NORA website (http://www.cdc.gov/niosh/nora/councils/agff/planpart.html).

Introduction

What is the National Occupational Research Agenda?

The National Occupational Research Agenda (NORA) is a partnership program developed to stimulate new knowledge, innovative research, and improved workplace safety and health practices. Unveiled in 1996, NORA has provided a research framework for the National Institute for Occupational Safety and Health (NIOSH) and the nation. Diverse parties collaborate to identify the most critical issues in workplace safety and health. Partners from government, academia, industry, and labor work together to identify critical issues in workplace safety and health and develop goals and objectives for addressing them, creating a national agenda. The Agenda will provide guidance to the entire occupational safety and health community for research prioritization, moving research into workplace practice, evaluation, and developing long-term surveillance. The following types of information inform the priority-setting process:

- The numbers and proportions of workers at risk for a particular injury or illness
- The seriousness or severity of the hazard or issue
- The probability that new information and approaches will improve worker safety or health.

NORA celebrated its first decade of demonstrated impact advancing bodies of knowledge and implementing effective workplace interventions at the NORA Symposium 2006. The program entered its second decade with a new sector-based structure to better move research to practice within workplaces. NORA sectors are based on the U.S. Census Bureau's North American Industry Classification System (NAICS). This system groups establishments into sectors and industries based on the activities in which they are primarily engaged. There are 20 sectors in the United States NAICS, which include 1,179 industries. Details about NAICS can be found at http://www.census.gov/epcd/www/naics.html.

What is the role of the NORA Sector Councils?

For manageability, NIOSH has aggregated industries into eight major sector groups (listed below) and with its partners, has formed eight corresponding NORA Sector Councils to develop and promote implementation of the National Occupational Research Agenda. In addition, a Cross-Sector Research Council will promote coordination across NORA Sector Councils, for example, identify opportunities for common research across sectors.

NORA Sector Group	NAICS Code
Agriculture, Forestry & Fishing	11
Construction	23
Healthcare & Social Assistance	62
Manufacturing	31-33
Mining	21
Services	51-56, 61, 71-72, 81 & 92
Transportation, Warehousing & Utilities	48-49 & 22
Wholesale and Retail Trade	42 & 44-45

Participation in the NORA sector councils is broad, and includes stakeholders from universities, large and small businesses, professional societies, government agencies, and worker organizations. The diversity of NORA Council members is one key to its success.

Each Sector Council is tasked with identifying the most prominent safety and health needs of its sector and developing a strategic plan—the sector's contribution to the national Agenda—to address those needs. The strategic plans seek to highlight the most important research questions, recognize priority safety and health concerns, understand the most effective intervention strategies, and disseminate information on ways to implement those strategies to achieve sustained improvements in workplace

safety and health practice. Implementation plans for the nation will then be developed based on the sector strategic plans.

What is role of the NORA Agriculture, Forestry, and Fishing Sector Council?

Agriculture, Forestry, and Fishing (AgFF) is one of the 20 NAICS sectors. Activities of this sector include growing crops, raising animals, harvesting timber, and harvesting fish and other animals from farms, ranches, or natural habitats (North American Industry Classification System, United States 2002; Executive Office of the President OMB, 2002).

The AgFF Sector Council has crafted a set of goals, action steps, and performance measures that comprise this sector's contribution to the National Occupational Research Agenda. These goals will be used as a written strategic plan to focus research and intervention efforts. To begin addressing the priorities outlined in the agenda, the AgFF Sector Council will identify available funding, stakeholders, and other potential partners interested in providing research resources (e.g., data, staffing) and expertise or who are participating in research to practice activities. A current list of the AgFF Sector Council members, partners and their affiliations is available on the NORA website (http://www.cdc.gov/niosh/nora/councils/agff/planpart.html).

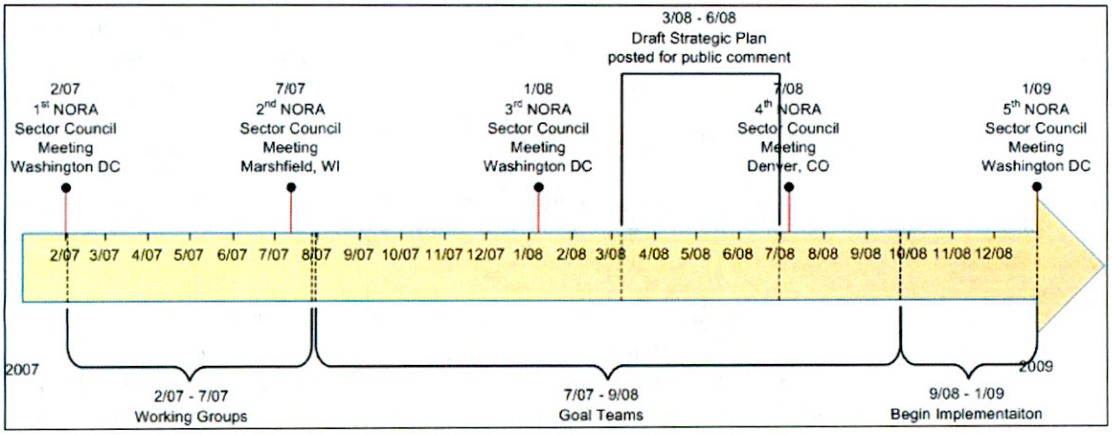
Who is the target audience?

The NORA AgFF Strategic Plan provides guidance on prioritization of safety and health issues to industry, labor, federal, state, and local governments, as well as to experts in professional associations, academia, and public interest/advocacy groups. It can be used to improve health and safety of workers, in each of the three sub-sectors, by providing areas of focus for partnering efforts. The Plan will provide direction to investigators on where information is lacking and what gaps should be addressed in future research, and supply topics of interest to potential funding sources.

What process was used to develop the goals for the NORA AgFF Strategic Plan?

From December 2005 through December 2006, NIOSH and other NORA partners gathered with stakeholders to discuss regional and sector-specific safety and health issues at 13 town hall meetings held throughout the United States. These meetings were intended to gain initial public input on occupational health and safety concerns to guide the development of the national agenda. The meetings were held in twelve states and one territory, and half of the 1000 participants offered their thoughts on which diseases, injuries, exposures, and populations should have the greatest research focus. During this same period, comments were also received through the NORA website and by mail. Transcripts from the meetings, and a searchable database of the comments generated can be found at http://www.cdc.gov/niosh/nora/townhall/default.html.

In October 2006 eight Sector Councils were formed. The diagram below illustrates the timeline showing progress of the AgFF Sector Council.



The first AgFF Sector Council meeting was held in February 2007. Priorities were determined based on available surveillance information, council member expertise, and comments from the town hall meetings. Members were divided into "working groups" (Surveillance; Vulnerable Populations; Outreach; Agriculture; Forestry; and Fishing) to determine specific areas of interest for each priority. At the July 2007 meeting, the Council decided that Agriculture, Forestry, and Fishing should each be divided into separate Health and Safety emphasis areas. Council members were reassigned to nine "Goal Teams" and each team was asked to determine one overarching Strategic Goal for one of the following topics:

- Surveillance
- Vulnerable workers
- Outreach, Partnerships, and Communications
- Agriculture safety
- Agriculture health
- Forestry safety
- Forestry health
- Commercial fishing safety
- Commercial fishing health

The Goal Teams were also tasked with developing Intermediate Goals, and corresponding Action Steps to support the Strategic Goals and determine implementation strategies. The Goals and Action Steps were reviewed by the Sector Council at the January 2008 meeting, with the additional instruction to prioritize them.

Throughout this process, the availability of multiple means of communication (in-person meetings, teleconferences, and e-mail) have enabled Council members and Goal Teams to discuss and develop sections of the plan and reach agreement on several issues that required further refinement. Among these was a concern about the inclusion of bystanders: people who are not workers, but are family members or others in the physical vicinity of work operations who could be injured due to conditions or exposures in the work setting. Additionally, the definition of 'vulnerable workers' went through several revisions. For production agriculture, some items were debated because, while they do not have an immediate effect on worker safety in the workplace, they are associated with the industry and can have a significant effect on the workers, e.g., global trade, housing, and pesticide-contaminated clothing.

A draft strategic plan was posted for public comment in March 2008. During the July 2008 meeting the strategic plan was finalized and discussion began on potential partners for implementation of the strategic plan.

The AgFF Sector Council Strategic Plan is a dynamic living document. The contents of this document will continue to be considered and revised as additional research is completed, comments are received, and new issues arise.

How can you become involved with the NORA AgFF Program?

The membership of the current NORA AgFF Council (authors of this document) is included in the Preface, and can be found at http://www.cdc.gov/niosh/nora/councils/agff/planpart.html.
There are several ways to be involved with the AgFF Sector Program.

- Corresponding Member
  - As a Corresponding Member you would be kept informed of Council activities, provide input on issues to be discussed, and review draft documents. Some Corresponding Members may be asked to join workgroups and Goal Teams on specific topics or to join later as full Council members when openings arise. Contact the Sector Coordinator Brad Husberg (BHusberg@cdc.gov) with questions or to volunteer as a Corresponding Member.
- Partnership
  - Partners can participate in a wide range of activities such as offering comments on the Sector strategic plan, participating in research, translating research findings into Sector-appropriate information products, implementing research results and recommendations, and disseminating information and practices. If you or your organization is interested in partnering on a particular strategic or intermediate goal, please contact the NORA AgFF Sector Coordinator Brad Husberg at BHusberg@cdc.gov.

STRATEGIC GOAL 1 – Surveillance

1. **STRATEGIC GOAL - Improve surveillance within the Agriculture, Forestry, and Fishing Sector to describe: the nature, extent, and economic burden of occupational illnesses, injuries, and fatalities; occupational hazards; and worker populations at risk for adverse health outcomes.**

Public health surveillance is an essential part of any public health prevention program [Halperin, 1992]. These data define which populations are at risk for injury or illnesses and assess the impact of intervention programs by tracking changes over time, while providing the means of identifying new and emerging health issues. Surveillance for the AgFF sector is sparse, and currently is only adequate for occupational fatal injuries. Non-fatal injuries and illnesses, and illness-related deaths are not adequately tracked at this time [National Academy of Sciences 2007]. Progress has been made in some areas, such as pesticide poisoning surveillance and injury surveillance for youths on farms, but these advances have not been extended to cover other illnesses or farm populations [NIOSH, 2006; NIOSH, 2008]. In addition, information is limited on the number and types of workers at risk within this sector. Finally, the surveillance data that are available are not always readily accessible to those who need the data to take preventive actions [National Academy of Sciences, 2007]. All these areas need major improvements if the occupational health of this sector is to be significantly increased. In response to these needs, three intermediate goals have been set: improve data on the work force within the AgFF sector; improve occupational health surveillance in all its forms (e.g., illnesses, injuries, exposures, hazards) within the AgFF sector; and increase data access to those who need these data to take preventive actions within the AgFF sector.

Intermediate Goal 1.1 - Improve national and state-level illness, injury, hazard, and exposure surveillance by utilizing existing data systems or creating new databases to identify injuries, illnesses, hazards, and exposures within the AgFF sector.

Better surveillance data are needed to define the occupational injury and illness burden of workers in the AgFF sector. This will require the use of population-based and case-based surveillance methods. These data are needed at the national, state, and local level to help define intervention priorities, as well as track changes in these conditions over time. Hazard and exposure surveillance data are also needed to better understand the exposures workers in this sector face at work. This will require enhancing existing, or creating new data systems to provide more timely information on occupational illnesses, injuries, and economic costs among detailed sub-sectors within the AgFF sector. It will also necessitate developing hazard and exposure surveillance systems to describe hazards within detailed sub-sectors of the AgFF sector, and to assess the use of Personal Protective Technology/Personal Protective Equipment (PPT/PPE) to reduce the risks these hazards pose. These programs should be flexible enough to be used down to the state level, and where possible, down to the community or employer level.

Action Step 1.1.1 - The Coast Guard, working with NIOSH, will develop an improved and realistic data collection regime for improving what is learned from casualty investigations within the commercial fishing industry. Target: 2008.

Action Step 1.1.2 - Hold a national meeting of surveillance experts and stakeholders to assess the current status of AgFF health surveillance systems, to identify new approaches to conducting health surveillance for all AgFF sub-sectors, and to identify existing or new partners for conducting AgFF health surveillance (recommendation from the National Academy of Sciences' [2007], NIOSH Agriculture Program Review Committee). Target: 2009.

Action Step 1.1.3 - Increase the use of subject matter experts in the review of case-based surveillance reports (e.g., NIOSH Fatality Assessment and Control Evaluation [FACE] reports, State occupational illness investigation reports) to improve the accuracy of information, and to improve intervention recommendations provided in such reports. Target: 2009.

Action Step 1.1.4 - Assess the available surveillance for all sub-sectors of the AgFF sector and identify gaps in the existing systems. Target: 2010.

Action Step 1.1.5 - Work with U.S. Department of Agriculture National Agricultural Statistics Service (USDA-NASS) and the U.S. Bureau of the Census on assessing the feasibility of conducting occupational injury and illness surveillance within the forestry industry. Target: initiate in 2010 (ongoing).

Action Step 1.1.6 - Maintain and expand existing surveillance systems, including childhood agricultural injury surveillance, to fill identified gaps and increase the utility of the data for prevention activities. Target: initiate in 2010 (ongoing).

Action Step 1.1.7 - Develop coding software to assign occupation and industry codes to public health data sources that contain occupation and industry narratives. Target: initiate in 2010 (ongoing).

Action Step 1.1.8 - In collaboration with the U.S. Coast Guard, expand the NIOSH Commercial Fishing Injury Database (CFID) to other regions of the U.S. Target: 2011.

Action Step 1.1.9 - Provide analyses of existing surveillance data to the level of detail possible (e.g., type of outcome, cause, demographic characteristics, incidence and/or prevalence) for each sub-sector of the AgFF sector. Target: 2012.

Action Step 1.1.10 - Incorporate variables into existing or new surveillance systems to facilitate the identification of vulnerable worker populations. Target: initiate in 2012 (ongoing).

Action Step 1.1.11 - Improve comparability of research data over time by encouraging researchers to utilize terms and definitions from the "Dictionary of Terms for Agricultural Safety & Health Professionals" (Appendix 2) in their surveillance systems. Target: initiate in 2012 (ongoing).

Action Step 1.1.12 - Encourage utilization of the preferred categorical variables from the Dictionary of Terms for Agricultural Safety & Health Professionals in new surveillance systems. Target: initiate in 2012 (ongoing).

Action Step 1.1.13 - Examine new occupational injury, illness, hazard, and exposure data collection approaches (include pilot testing and evaluation) and implement those that are shown to be effective in filling data gaps. Approaches may include medical surveillance methods, case-based surveillance methods, physician reporting methods, worksite assessment methods, or other methodologies. Priority should be given to occupational illnesses (e.g., musculoskeletal conditions, hearing loss, respiratory diseases, and zoonoses), hazard assessments, and exposure assessments. Target: initiate in 2012 (ongoing).

Intermediate Goal 1.2 - Improve worker demographic information at the national and state level by enhancing existing employment demographic data or creating new systems to better characterize the workforce within each AgFF sub-sector.

To define who is at risk and accurately calculate injury and illness rates within the AgFF sector, better employment data are needed. To accomplish this goal, existing demographic data need to be expanded to provide workforce estimates of the total number of workers, annual average number of workers, and hours worked by detailed sub-sectors within the AgFF sector. Where data systems do not exist, new employment data systems need to be developed. Demographic data systems will need to be improved to provide accurate workforce estimates for specific racial and ethnic groups, and employment status of workers (e.g., self –employed, hired, contractor, day laborer, temporary workers).

Action Step 1.2.1 - Work with U.S. Coast Guard and National Marine Fisheries Service to apply the NIOSH methodology to estimate the size and makeup of the commercial fishing workforce population by fishery. Target: West Coast, 2008; East Coast, 2009; Gulf of Mexico, 2010.

Action Step 1.2.2 - Work with the Bureau of Labor Statistics (BLS) and the U.S. Bureau of the Census to make employment estimates (both hours worked and numbers employed) available to the public for detailed sub-sectors within the AgFF sector at the state-level. Target: initiate in 2010 (ongoing).

Action Step 1.2.3 - Work with the United States Department of Agriculture – National Agricultural Statistics Service (USDA – NASS) to increase the level of detail provided in their quarterly hired farm worker reports. This would include providing state-level estimates of farm labor usage by detailed type of farming operation. Target: initiate in 2010 (ongoing).

Action Step 1.2.4 - Work with U.S. Department of Labor's Education and Training Administration (USDOL-ETA) to use data collected from the National Agricultural Workers Survey (NAWS) to develop better estimates of the number of workers employed on crop operations in the U.S., and the percentage that are undocumented. Target: initiate in 2010 (ongoing).

Action Step 1.2.5 - Work with USDOL-ETA to determine the ability of the NAWS to provide regional and state-level worker demographic information. Target: initiate in 2010 (ongoing).

Action Step 1.2.6 - Work with USDOL-ETA to include livestock operations in the NAWS. Target: initiate in 2010 (ongoing).

Action Step 1.2.7 - Work with USDA-NASS to assess if the USDA Census of Agriculture could be expanded to include the forestry sector, including the collection of workforce data. Target: initiate in 2010 (ongoing).

Action Step 1.2.8 - Incorporate variables into existing or new demographic data collection systems to facilitate the identification of vulnerable worker populations. Target: initiate in 2012 (ongoing).

Action Step 1.2.9 - Work with USDA-NASS, USDOL-ETA, BLS, and the Bureau of the Census to assess the feasibility of collecting information on undocumented workers in non-farming sectors of the AgFF sector (i.e., logging and fishing establishments). Target: initiate in 2012 (ongoing).

Action Step 1.2.10 - Examine new demographic data collection approaches (include pilot testing and evaluation) and implement those that are shown to be effective in filling data gaps. Target: initiate in 2012 (ongoing).

Intermediate Goal 1.3 - Ensure that occupational illness, injury, and fatality surveillance data for the AgFF sector are readily available to workers, employers, intramural and extramural research scientists and the public in a timely manner.

The third major aspect of surveillance is getting the information to those who need the data in a timely fashion. This could be accomplished through a variety of approaches, including: providing surveillance findings and public use surveillance data sets on the internet; working with federal agencies and others to improve public access to surveillance data; and promoting and expanding existing services to fill special data requests from the public in a timely manner.

Action Step 1.3.1 - NIOSH will partner with the Coast Guard and health and regional safety organizations to develop occupational safety and health recommendations for the commercial fishing industry in different parts of the U.S. Target: West Coast, 2007; East Coast, 2008; Gulf of Mexico, 2009.

Action Step 1.3.2 - Work with USDA-NASS to release preliminary results of all NIOSH-sponsored surveys within nine months of completing data collection. Target: 2009.

Action Step 1.3.3 - Provide summary results from NIOSH-sponsored surveys conduct by USDA-NASS within 12 months of USDA-NASS completing data collection. Target: 2009.

Action Step 1.3.4 - Work with USDA-NASS to make public use data sets available for all NIOSH-sponsored surveys within nine months of completing data collection. Target: 2009.

Action Step 1.3.5 - Work with BLS to release detailed results from the Census of Fatal Occupational Injuries (CFOI) for the AgFF sectors within six months of the initial release of CFOI data by BLS. Target: initiate in 2010 (ongoing).

Action Step 1.3.6 - Work with USDOL, ETA to release initial NAWS results within one year of collection of the data. Target: initiate in 2010 (ongoing).

Action Step 1.3.7 - Work with BLS to better market their services for filling special data requests from their CFOI, Survey of Occupational Injury and Illness (SOII), and employment data sets. Target: initiate in 2010 (ongoing).

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NIOSH [2008]. NIOSH Safety and Health Topic: Pesticide Illness and Injury Surveillance. Available at: http://www.cdc.gov/niosh/topics/pesticides/. Date accessed March 4, 2008.

STRATEGIC GOAL 2 – Vulnerable Workers

2. Strategic Goal: Reduce deleterious health and safety outcomes in workers more susceptible to injury or illness due to circumstances limiting options for safeguarding their own safety and health.

Background
Some workers experience disproportionate rates of occupational injuries and illnesses within the AgFF Sector because of social or physiological factors which can lead to increased workplace exposures and/or individual susceptibilities.

Social factors
Low English proficiency and literacy may decrease the efficacy of training and risk communication programs; socioeconomic factors may lead some workers to accept and remain in higher risk jobs. These social factors also compromise workers' ability to seek protections and/or access resources that others employed in this sector access. Temporary or seasonal nature of employment requires some workers to change jobs and even relocate for work.

Physiologic factors
Workers may start work at a younger age due to family connections or economic necessity, before they are physically or mentally prepared for hazardous work. On the other hand, they may continue to work in spite of physical or mental limitations accumulated over time which may accelerate the onset of disabilities.

Examples of AgFF Sector worker populations that may be considered vulnerable because of these social and physiologic factors include: recent immigrants and Latino workers, young workers, older workers, physically- or cognitively disabled workers, and unpaid family workers.

For many workers, vulnerability is multi-factorial and may change during the worker's career. Appropriate interventions and remedies require an understanding of the factors that increase and reduce vulnerability of workers in the AgFF Sector.

Recent Immigrant and Latino Workers
Recent immigrants may have multiple factors contributing to their vulnerability, such as limited English, low literacy, low socioeconomic status (SES), lack of social support networks, and dire economic need. Foreign-born workers make up a large proportion of the AgFF workforce. Workers with undocumented immigration status, primarily from Latin American countries, make up one-third of the foreign-born labor force [Kochhar, 2008].

Demographic data are difficult to obtain for the forestry workforce (see Appendix 1), but it is estimated to be heavily dependant on Latinos, Southeast Asians and Eastern Europeans. Among agricultural workers, approximately 80% are foreign born, more than half are undocumented, and 87% are Latino, predominantly Mexican [Steege and Baron, 2007]. Latino AgFF workers have experienced elevated and increasing occupational fatality rates every year since 1992. The Medical Expenditure Panel Survey found that Latinos experience higher rates of non-fatal lost-work-time injuries than other AgFF workforce segments.

Their economic situation, the seasonal nature of much of the work, and the contingent work status of most Latino AgFF workers force many of them to change occupations within the sector (mobility) and to physically relocate themselves and their families (migration). These circumstances also make them less likely to challenge or to walk away from unsafe working conditions, the risks of which are compounded by their lower rates of health insurance coverage.

These conditions are not unique to Latino AgFF sector workers; other immigrant workers face similar challenges that may go unrecognized. Each of these circumstances leads to increased vulnerability

because they may result in social and economic marginalization isolating the worker from services (e.g., healthcare), resources (e.g., training), and protections available to AgFF workers overall.

Young Workers
Work tradition, economic need, and other circumstances lead to children working in family or community businesses. More than one million youth lived on farms in 2006 and more than half of them performed work or chores on the farm [NIOSH, 2007; NIOSH, 2004]. Hired workers younger than 18 years made up approximately 3% of the crop production workforce in 2003-2004 [Steege, 2008]. For workers under 18 years of age, the AgFF industries have increased rates of fatal traumatic injuries compared to that of all industries [Hard and Myers, 2006]. The physical and cognitive development and lack of experience of young workers make them more vulnerable to work-related injuries than their adult counterparts.

Older Workers
Thirty percent of the farming workforce is older than 55 years, and the proportion continues to rise [Meyer, 2005]. Farmers may work beyond their safety limits because there is no mandatory retirement. As visual acuity declines with age, older farmers are prone to injury because they may routinely work in situations with inadequate light [Farm Safety Association, 2002]. Additionally, senior farmers experiencing loss of sense of balance and bouts of dizziness are at increased risk of injury [Peters, 2007].Though demographic data are scarce for the fishing and forestry sub-sectors, it is probable that they, too, are "graying".

> "Fatal occupational injury rates are higher in the agriculture, forestry, and fishing sector than the private sector for every age group. The rates ranged from 13.7/100,000 for workers aged 16-24 to 62.0 for workers older than 64." [BLS, 2003].

Physically- and Cognitively-disabled Workers
Physically- and cognitively-disabled workers are at higher risk of occupational injury as a result of decreased ability to perform their job tasks and respond to non-routine or emergency situations. "Approximately one in five of the farm and ranch population have a disability that restricts daily living or hinders completion of essential work-related tasks" [Field, 2007]. The disabilities most frequently reported among these workers are musculoskeletal disorders, hearing impairment, cardiovascular diseases, and respiratory impairment [Field, 2007].

Unpaid Family Workers
Work traditions and economic need can lead to family members of all ages working without pay for family or community businesses. The Trades Union Congress Commission on Vulnerable Employment describes the risk inherent in being an unpaid family worker:

> "... Unpaid family workers are people ... undertaking unpaid work for a business they own or for a business that a relative owns. ... Not receiving a wage puts people at greater risk of exploitation – primarily because they have no agreed terms and conditions and are not entitled to even the most basic of legal employment protections" [Trades Union Congress Commission on Vulnerable Employment, 2007].

While it is suggested that unpaid family workers are more prevalent in agriculture, employment on small fishing vessels does not require the contract protections seen on larger vessels. The forestry industry has little documentation on this category of vulnerable workers.

The circumstances and characteristics leading to vulnerability are defined here to include extremes in age (under 18 and over 65 years), gender, limited English language and literacy, mobility and migration, SES, documentation status, ethnicity, culture, and physical or cognitive disability.

Intermediate Goal 2.1 – Define and identify "vulnerable workers" in each sector- agriculture, forestry and fishing

This Intermediate Goal and associated Action Steps reference the Surveillance segment of this plan to provide for population-based data collection on vulnerable workers.

Because of the range of characteristics that can lead to vulnerability, it is a challenge to define each condition in a way that allows measurement in the target population. Such definitions are necessary to allow comparison of survey data between sectors, industries, or population groups.

Action Step 2.1.1 - Draft surveillance definition for vulnerable persons and/or those suffering health inequalities. Target: 2009.

Action Step 2.1.2 - Enumerate vulnerable workers by location and characteristics to establish a baseline for identifying negative health outcomes in vulnerable workers. Target: 2011.

Intermediate Goal 2.2 Identify the deleterious health and safety outcomes of vulnerable workers in each sector- agriculture, forestry and fishing.

With the vulnerable worker population defined, the next step is to acquire data on their health outcomes. This will establish the level of health and safety risks for this population and allow comparisons to other AgFF worker populations to ascertain any increase in risk for vulnerable workers.

Action Step 2.2.1 - Identify health outcomes for each of the vulnerable worker groups that are not traditionally categorized as occupational but that substantially impact the work-life of that group. Target: 2011.

Examples include accumulation of pesticides on clothing because of limited laundry facilities and health hazards from unsafe housing.

Action Step 2.2.2 - Identify patterns and trends of excess morbidity and mortality for vulnerable workers. Target: 2013

Intermediate Goal 2.3 - Improve data collection and existing databases to provide information on safety and health disparities among vulnerable workers.

Although preliminary data are often informative, they are rarely comprehensive. Continuing effort should be made to acquire other data sources and refine the characteristics of the parameters used, to better identify the vulnerable worker population. Characteristics of the target population's activities and lifestyle, such as mobility and migration, must be taken into consideration when locating additional data sources and determining outcome rates. Continual improvement should be made in data collection methods to expedite the process and ensure the most complete data sets achievable.

Action Step 2.3.1 - Seek new data collection mechanisms where gaps exist. Target: 2010.

Action Step 2.3.2 - Incorporate variables into existing or new surveillance systems to facilitate the identification of vulnerable worker populations. Target: 2012.

Action Step 2.3.3 - Establish data-sharing mechanisms among universities, government agencies, and community-based and non-governmental organizations. Target: 2018.

Action Step 2.3.4 - Develop methods to track workers who are mobile geographically or across industries to be able to assess long-term health effects. Target: 2018.

Intermediate Goal 2.4 - Use innovative and proven communication, education, training, and marketing techniques to tailor workplace safety and health programs to be responsive to the unique needs of vulnerable workers.
This Intermediate Goal and associated Action Steps reference Intermediate Goal 3.3 of the Outreach segment of this plan to provide a focus on vulnerable workers.

Once the risks are determined, the data must be used to advise the stakeholders: clinicians, healthcare facilities, employers, worker support agencies, and the vulnerable workers themselves. The information should be communicated in a timely manner, before the affected population is no longer accessible or conditions change. Any information describing the risks, how to avoid or prevent them, and what action to take when exposed to a hazard, should be provided in a language, literacy level, and medium (e.g., radio) that is accessible to the target audience. Developing partnerships and continued collaboration with industry and government agencies and other stakeholders could ensure improved development and dissemination of materials and program interventions.

Action Step 2.4.1 – Ensure that the needs of vulnerable workers are included in yearly listings of proven interventions, per Action Step 3.3.2, including reading levels, translation, language, and responsiveness to needs. Target: Initiate in 2011 (ongoing annually).

Action Step 2.4.2 – Determine effectiveness of existing interventions and educational materials that are tailored to address unique factors associated with vulnerability. Target: 2011.

Action Step 2.4.3 – Facilitate the development and evaluation of high quality and appropriate materials where gaps exist. Target: Initiate in 2011 (ongoing annually).

Action Step 2.4.4 – Where gaps exist, conduct demonstration programs in conjunction with employers hiring vulnerable workers, to identify new, cost-effective approaches for safety training and work production. Target: 2013.

Action Step 2.4.5 – Facilitate implementation of effective health and safety interventions tailored to address risk factors associated with vulnerability, through partnerships with industry leaders in agriculture, forestry and fishing. Target: 2013.

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STRATEGIC GOAL 3 – Outreach, Communications and Partnerships

3. Strategic Goal: Move proven health and safety strategies into agricultural, forestry and fishing workplaces through the development of partnerships and collaborative efforts.

This goal sets out a course of action to disseminate evidence-based strategies to all those who have a stake in improving the health and safety of workers in the agriculture, forestry and fishing industries. Outreach is a necessary step to effectively implement the full NORA AgFF plan. Disseminating relevant interventions and promoting the adoption of best practices in the workplace can be best achieved through partnerships and collaborations. Proven approaches to worker health and safety for each of the sector industries should be identified and a wide variety of outreach methods applied to assure that optimal health and safety is achieved. These best practices include, but are not limited to: new technologies and engineering controls; behavior change interventions; training; incentive programs; and guidelines and policy approaches.

Intermediate Goal 3.1 - Form collaborative efforts with key stakeholders to: 1) biennially assess current and emerging major occupational health and safety concerns and solutions; and 2) prioritize interventions for implementation.

Assuring the implementation of best practices, techniques and equipment that promote health and safety in these industries will require the "buy-in" of as much of the sector as possible. One of the best ways to ensure broad-based support for the adoption of best practices is to have a strong group of stakeholders involved. These stakeholders must be encouraged to communicate their needs as well as be committed to promoting the adoption of the latest and best safety and health methods available to the agriculture, forestry and fishing industries.

Action Step 3.1.1 – Identify stakeholders and ensure they are aware of the NORA AgFF purpose and plan. Stakeholders should include: policy makers, federal and state agencies, safety and health researchers and practitioners, agribusiness, agricultural producers, union representatives, farm labor contractors, farm worker representatives, commercial fishermen, extension forestry services, youth-serving groups, community-based organizations, and national level coalitions (e.g., Agricultural Safety and Health Council of America).
Target: 2009

Action Step 3.1.2 – With partners, prioritize interventions for implementation in the agriculture, forestry and fishing industries. Target: Initiate in 2008 (ongoing, every two years).

Action Step 3.1.3 – Convene a biennial national state-of-the-science conference on agriculture, forestry, and fishing safety and health resources, interventions, program needs, and training issues. Use this conference to facilitate networking, program implementation, and improved training among a wide range of collaborators. Target: Initiate in 2010 (ongoing, every two years).

Intermediate Goal 3.2 - Identify practical and proven occupational safety and health interventions, then encourage new studies to meet needs where proven strategies do not exist.

It is critical that the best practices in agriculture, forestry, and fishing be identified and reassessed on a regular basis. Such best practices may include methods developed in the U.S. as well as by comparable industries in other countries.

Action Step 3.2.1 – Determine best methods to influence the behaviors of agricultural workers, loggers and commercial fishermen. Methods should account for social, economic, cultural, and other factors affecting the adoption of best practices among workers and employers. Assessments of barriers,

motivators and ideal strategies should be undertaken by NIOSH Agricultural Research Centers, USDA, Cooperative Extension services, universities and other partners with expertise to conduct relevant, valid studies. Target: Initiate in 2010 (ongoing).

Action Step 3.2.2 – Document and report proven interventions. Determine how and where a list and description of proven strategies should be maintained for easy access by stakeholders in the AgFF industries. The NIOSH Agricultural Research Centers should participate in this process to identify strategies of national as well as regional relevance. Target: Initiate in 2011 (ongoing, every two years).

Action Step 3.2.3 - Identify gaps in health and safety best practices and methods. Encourage and facilitate studies and programs to meet industry needs for improved safety, including engineering, information technology, and policy approaches. Target: 2011.

Intermediate Goal 3.3 - Use innovative and proven communication, education, and social marketing techniques to influence knowledge, attitudes and practices of agricultural workers, loggers and commercial fishermen.

As best practices are identified, it will be crucial that they be implemented as rapidly and thoroughly as possible in order to improve the health and safety of the target groups in each industry. The methods of dissemination of best practices in each industry must be varied and innovative. Farmers, fishermen, loggers and their employees are unlikely to change their behaviors as a result of a single input of information. Research has shown that education alone is not sufficient for preventing injuries or changing behaviors. The panoply of techniques known to influence positive behaviors and reduce hazards in the work setting must be used.

Action Step 3.3.1 – Facilitate implementation of evidence-based programs that are culturally, linguistically, and educationally appropriate for workers and employers. Target: Initiate in 2009 (ongoing).

Action Step 3.3.2 – Increase awareness and promote expanded application of best practices, materials, technologies, and policies via partners such as producer organizations, health and safety practitioners, regulatory personnel, vocational teachers, extension agents, insurers, clinicians, and others in positions to influence adoption of best practices. Target: Initiate in 2009 (ongoing).

Action Step 3.3.3 - Facilitate the development of public awareness and social marketing campaigns regarding high priority agriculture, forestry and fishing safety and health issues. Target: Initiate in 2010 (ongoing).

Action Step 3.3.4 – Encourage and promote proven outreach initiatives targeted for high risk populations, including children and bystanders in the work setting. Target: Initiate in 2010 (ongoing).

Intermediate Goal 3.4 - Use innovative educational techniques and certification programs to improve the safety practices of agricultural workers, loggers and commercial fishermen.

Developing and promoting best practices in the workplace may be enhanced through training and certification programs. Proven approaches to worker health and safety for each of the sector industries are more likely to be developed, tested and implemented if accessible, affordable, and high quality training (including certification programs) is available for the industries of agriculture, forestry and fishing.

Certification programs that currently exist provide examples, such as: a) tractor and equipment operation, including power take-offs (PTO's), guards, and shields for 14-15 year olds under the Hazardous Occupation Safety Training in Agriculture (HOSTA) program at USDA; and b) pesticide handling training for farm workers and handlers under EPA's Worker Protection Standard. Examples of modules in forestry and logging that could be developed for certification may include: a) felling and bucking (cross cutting)

timber; b) machine operator training, e.g., log loader operation; and c) mechanized operator training - harvester and forwarder. Training modules in commercial fishing for potential development and certification could include: a) surviving vessel sinking; and b) falls overboard and slipping prevention.

Action Step 3.4.1 – Assess current, and develop additional, training programs (including train-the-trainer programs), materials, incentives, and methods; regularly update training materials and programs to be culturally, linguistically, and educationally appropriate. Training should provide options for AgFF employers and employees, health and safety practitioners, regulatory personnel, vocational teachers, extension agents and others. Target: 2011.

Action Step 3.4.2 - Promote and facilitate worker safety and health training at agriculture, forestry and fishing industry/association regional events and national conferences. Target: Ongoing annually.

Action Step 3.4.3 – Provide occupational safety and health content and recommendations for graduate level curricula (e.g., for USDA graduate school courses) related to production and management training programs in agriculture, forestry and fishing held across the U.S. Target: 2011.

Action Step 3.4.4 – Develop nationally recognized certification programs for occupational safety training and health protection for agriculture, forestry and fishing workers. Provide certified training suitable for workers who may or may not have enrolled in vocational agriculture classes at the high school level. Target: 2013.

Action Step 3.4.5 – Annually assess the training programs, materials, and methods; update and modify them based on injury surveillance data and participant impact measures. Target: Initiate in 2015 (ongoing annually).

STRATEGIC GOAL 4 – Agriculture Safety

4. Strategic Goal: Reduce the number, rate, and severity of traumatic injuries and deaths involving hazards of production agriculture and support activities.

Agricultural production (i.e., farming) is one of the most hazardous industry sectors in the US. Between 1992 and 2005, 7,571 farmers and farm workers died from injuries sustained while performing farm work in the US, for an average annual fatality rate of 26 deaths per 100,000 workers [NIOSH, 2006]. Farm tractors accounted for 2,795 (37%) of these deaths, although motor vehicles, agricultural machines, animals, and working surfaces associated with falls were also common causes of death on farms in the U.S. [NIOSH, 2006; Hard et al., 2002]. Between 1992 and 2004, workers over the age of 54 years accounted for over half of all farm work deaths and 65 percent of all tractor deaths [Myers et al., 2007a]. Tractors and farm machinery were identified as the leading cause of death for youths less than 16 years of age on farms [Goldcamp et al., 2004]. For non-fatal injuries, an average of 93,000 non-fatal OSHA recordable injuries occurred on farms during for the years 2001 and 2004, for a work-related injury rate of 4.9 restricted activity injuries per 100 workers [NIOSH, 2006]. The most common sources of these injuries were working surfaces associated with falls (22%), animals (19%), machinery (12%), and hand tools (8%) [NIOSH, 2008]. Agricultural injuries do not only affect the workers. Bystanders are at risk as well, whether they are adults or children.

The National Occupational Research Agenda process was charged with addressing issues pertinent to workers. Yet, in agriculture, many farm-related injuries and diseases affect non-workers, especially children who live on or visit farms. With a federal mandate, NIOSH accepted a lead federal agency role for addressing childhood agricultural injuries in 1996. A national action plan, endorsed by 80 national-level organizations, set forth detailed goals and recommended actions [NCCAIP, 1996]. Five years later, an in-depth assessment was conducted and reviewed during a 2001 Summit on Childhood Agricultural Injury Prevention [Lee, Gallagher, Marlenga, and Hard, 2002]. These action plans and related activities address both working and non-working youth and were acknowledged by the NORA AgFF Sector Council as related to the plan that follows. Therefore, specific attention is not accorded in this goal section to concerns of non-working children.

To address the high fatal and non-fatal injury risk, five intermediate goals are proposed to reduce the overall burden of injury among workers in the agricultural production sector.

Intermediate Goal 4.1 - Reduce the number of fatalities due to overturns of tractors in agriculture by 50%, through the use of Roll-Over Protective Structures or similar technologies, by 2018.

Overturns (also called rollovers) usually result in massive traumatic injuries to operators and, with about 130 deaths annually, account for more than half of all tractor-related fatalities. Roll-Over Protective Structure (ROPS) and seat belts prevent fatalities and injuries when tractors overturn, yet about half of tractors in the United States don't have them, although retrofitting is available for many of them. Many older tractors can be retrofitted and newer, ROPS-equipped tractors can replace tractors too old for retrofitting.

Tractors accounted for 2,795 occupational fatalities to farmers and farm workers between 1992 and 2005 [NIOSH, 2006]. Tractor overturns accounted for 1,411 (50%) of these tractor-related worker deaths [NIOSH, 2006]. Farmers and farm workers over the age of 54 years account for 56% of these overturn deaths [Myers, 2007a]. Rates of overturn deaths have also been found to be geographically clustered, with the highest rates found in PA, WV, OH, KY, TN, and IL. ROPS and seatbelts are a proven intervention that can prevent most deaths associated with tractor overturns [Reynolds, 2000; Springfeldt et al., 1998; Thelin, 1998]; however, only 59% of all tractors used on farms in the U.S. are equipped with ROPS [USDA, 2008]. Data from Europe suggest that ROPS usage needs to exceed 75% before adequate protection is achieved within the farming workforce [Springfeldt, 1996; Springfeldt et al., 1998]. While operator age has been found to be a risk factor for overturn deaths, older farmers have also been

identified as a group that own and operate a large number of tractors without ROPS [Sanderson et al., 2006; Loringer, 2008]. Other factors related to a low proportion of ROPS on farms are: farms with low annual value of sales; farms that are operated on a part-time basis; and farms with small acreages [Sanderson et al., 2006; Loringer, 2008]. Based on what is known about overturn deaths and ROPS use in the US, the following activities are proposed to meet this intermediate goal:

Action Step 4.1.1 - Work to increase the number of older non-ROPS tractors retrofitted with ROPS and seat belts or replaced by ROPS and seatbelts equipped tractors.

Action Step 4.1.2 - Bring awareness to the issue by conducting extensive outreach to production agriculture and get more tractor operators to use a tractor with ROPS and wear seat belts on ROPS-equipped tractors. Outreach materials could include pamphlets, posters, radio and TV ads. Establish rebate programs to encompass the entire nation similar to recent efforts in New York and Virginia.

Action Step 4.1.3 - Improve surveillance: include economics, intervention cost-effectiveness, epidemiology, behavior, and other human factors, as well as engineering and technology. Because ROPS are proven technology, more research should be done on determining barriers preventing farmers from retrofitting their tractors with ROPS, assessing which tractors are overturning, and identifying where fatalities are occurring.

Action Step 4.1.4 - Partnership groups and coalitions, essential to preventing tractor-related injuries and deaths, should be formed in each region or state to influence adoption of proven interventions (e.g., engineering, incentives, and policies). Partners should include, among others, government agencies, employer associations, labor representatives, tractor manufacturers, family farm representatives, farm cooperatives, insurance companies, universities, and NIOSH Agricultural Research Centers.

Intermediate Goal 4.2 - Reduce the number and rate of fatalities in production agriculture and support activities due to runovers by agricultural field and farmstead machinery by 50% by 2018.

Runovers are the second most common type of death associated with farm tractors in the US, accounting for 759 deaths between 1992 and 2005 [NIOSH, 2006]. An additional 240 runover deaths occurred during this time period involving other types of machines [BLS, 2008]. Nearly half of these runovers (485 deaths) involved the operator falling from and being run over by the moving equipment, followed by 270 deaths from being struck by rolling equipment not in normal use (e.g., rolling from brake failure with no one on the equipment, individual by-pass starting a machine while it is in gear), and 244 pedestrians being struck by the equipment during normal equipment use [BLS, 2008]. As with overturns, farmers and farm workers over the age of 54 years account for a significant number of these runover deaths (68%) [Myers et al., 2007b; BLS, 2008]. Youths less than 16 years old, and especially those less than 5 years old, are at high risk for being run over by tractors and other mobile farm equipment [Goldcamp et al., 2004].

Operators and others, including persons providing support services, can be run over by agricultural field or farmstead equipment. Equipment operators, for example, can be run over when they attempt to start or move such equipment from a position other than the recommended operator's station or in a manner contrary to equipment manufacturer recommendations. Operators may also be run over when they are near equipment that continues to move or moves unexpectedly, whether or not the engine is running, or when they attempt to mount equipment that is in motion. In addition, terrain, obstacles, and other factors can contribute to an operator being runover after falling from the equipment operator's station.

Extra riders, including persons authorized to provide training or being trained, can also fall from, exit, or attempt to remount field or farmstead equipment and be runover by it. For example, an extra rider may fall from the fender of an open station tractor, through an operator enclosure doorway, from a platform, or from a host of other places not designed or intended to be occupied while the machine is moving. In addition, extra riders may approach unnoticed or attempt to mount or dismount machines before the

equipment has been fully stopped and secured. In some instances a person exiting and assumed to have cleared the area can be run over when the operator resumes equipment operation. In other instances, riders can fall from work platforms not intended for riders but nonetheless used for monitoring or other diagnostic purposes.

A bystander or helper can become a runover victim in a variety of ways even though they are neither riding on, nor attempting to mount or dismount, the equipment when the runover occurs. For example, a person assisting a tractor operator to position a tractor making a connection to an implement could be run over by the tractor or the implement. An unsuspecting bystander of any age could be run over in the swept area of a wide machine traveling or turning. An unseen person near or approaching a machine that is moving or put into motion could also become a runover fatality.

The following activities are proposed to meet this intermediate goal:

Action Step 4.2.1 - Partner with producer groups, trade and technical associations, and safety professionals to identify ways to protect operators, helpers, and bystanders (adults or children) exposed to risks of being run over by field or farmstead equipment. Efforts should be made to identify persons, tasks, and risk factors associated with runover events, identify commonalities and differences among the types, and evaluate strategies to reduce exposure to being runover by field or farmstead equipment.

Action Step 4.2.2 - Identify runover-related problems addressable by technical solutions; evaluate studies associated with current runover prevention intervention technologies and develop improved solutions. Consider also that field and farmstead equipment, production methods and processes, will continue to change as new technologies and capabilities expand. In some instances new forms of hazard may be introduced, such as the potential to be runover by an autonomous or remotely controlled machine during restart or use.

Performance Measure: Identify the three priority runover-related problems requiring engineering solution(s) by 2010.

Action Step 4.2.3 - Identify, evaluate, and investigate ways to improve the performance of sensors and systems for enhanced vision and human presence protection, interlock and lockout systems, Global Positioning Systems (GPS) for worker location and activity monitoring, and sensor technologies that could be applied in the production agriculture and service activity workplace as means to address runovers by field or farmstead equipment.

Action Step 4.2.4 - Evaluate the effectiveness of existing runover prevention intervention measures (including barriers, obstacles, and incentives) in use by production agriculture and support activity workers (e.g., equipment dealers); then expand awareness and use of existing, effective runover prevention intervention measures by farmers, ranchers, farmworkers, their families and persons providing support services for production agriculture through relevant partnerships.

Performance Measure (1): Increase translation into practice of three existing engineering approaches and five educational training, or other runover prevention intervention measures by 2011.

Performance Measure (2): Increase awareness of runover hazards and effective prevention intervention measures among 10% of farmers, ranchers, and farmworkers by 33% over a baseline year by 2013.

Action Step 4.2.5 - Document and report the effectiveness of engineering, educational training, and other runover prevention intervention measures translated into practice. Target: 2016.

Action Step 4.2.6 – Based on evaluation results and injury/fatality surveillance data, raise awareness and influence use of runover prevention intervention by farmers, ranchers, farmworkers, their families and persons providing support services for production agriculture. Target: 2014.

Action Step 4.2.7- Respond to the unique needs of an increasingly diverse workforce, not limited to accommodating persons with disabilities (hearing impairment, physical limitations, or otherwise), in terms of runover prevention strategies.

Intermediate Goal 4.3 - Reduce the number and rate of fatalities in production agriculture and support activities involving agricultural field and farmstead equipment, not covered in 4.1 and 4.2 by 25% by 2018.

Machinery and industrial vehicle deaths not associated with overturns or runovers accounted for 1,505 deaths between 1992 and 2005 [BLS, 2008]. These deaths are more varied in nature, but involve such events as the victim being caught in running machinery (624 deaths), non-highway transportation events excluding overturns and runovers (269 deaths), highway collisions between the farm equipment and other vehicles (154 deaths), being struck by falling parts of the machinery (144 deaths), or equipment contacting electrical lines (72 deaths). As with the overturns and runovers, farmers and farm workers over 54 years old account for more than half of these deaths (774 deaths), especially those involving other non-highway transportation events where older workers were the victim 71% of the time. To address these other machinery and industrial vehicle risks, the following activities are proposed:

Action Step 4.3.1 – Using available data, identify and report fatality trends and keystone issues, e.g., entanglements, operations (dropping, raising, swinging), electrocutions, slips, trips, falls, and collisions, associated with equipment-related deaths. Target: Initiate in 2010 (ongoing).

Action Step 4.3.2 - Enhance/expand safety interventions with farmers and farm families, including resources such as safety videos, hazard identification kits, and best practices guidelines, to be distributed by partner organizations. Incorporate information regarding economic issues/benefits of maintaining a safe working environment (lost family income, medical costs, lawsuits and legal issues, and tax benefits). Target: 2010.

Action Step 4.3.3 – Conduct studies to determine the most cost-effective and practical strategies for eliminating fatalities, including engineering design (e.g., sensors), information technology (e.g., GPS), incentive programs, and guidelines or policies. Target: 2012.

Action Step 4.3.4 – With partners in agricultural production and support activities, promote and implement those interventions deemed most effective in eliminating fatalities. Target: 2014.

Intermediate Goal 4.4 - Reduce the number, rate and severity of non-fatal injuries (OSHA recordable type) in production agriculture and support activities involving agricultural field and farmstead equipment by 25% by 2018.

Data from NIOSH estimates that there was an average of 93,000 non-fatal OSHA recordable injuries on farms during the years 2001 and 2004 [NIOSH, 2006]. Machinery (e.g., balers, mowers, augers, and combines) and industrial vehicles (e.g., farm tractors and forklifts) accounted for 12% of these injuries [NIOSH, 2008]. Machinery accounted for 7,400 injuries while industrial vehicles caused 4,000 injuries. For machinery-related injuries, the highest portion (38%) involved the victim getting caught in running equipment, followed by being struck by the machine or parts of the machine (26%). For industrial vehicles, half the injuries involved off-road vehicle incidents, which includes overturns and falls from running equipment. Unlike fatal injuries associated with machines and industrial vehicles, most non-fatal injuries occur to farmers and farm workers less than 55 years old (65%). However, workers over the age of 54 years accounted for 45% of industrial vehicle injuries. To reduce these non-fatal machinery and industrial vehicle injuries by 25% over the next 10 years, the following activities are proposed:

Action Step 4.4.1 – Improve surveillance options for tracking non-fatal injuries; then regularly identify trends and keystone issues based on surveillance data. Maintain strong working relationships with Occupational Safety and Health Administration and state plans to expand monitoring programs and investigate workplaces with high injury rates.

Action Step 4.4.2 – Assess existing educational materials for accuracy, relevance and usability for target audiences. Ensure educational materials incorporate economic issues/benefits of maintaining a safe working environment (lost family income, medical costs, lawsuits and legal issues, and tax benefits) and proven strategies for the most common equipment-related injuries. Facilitate dissemination of these materials through partner organizations and various distribution mechanisms (refer to Strategic Goal 3).

Action Step 4.4.3 – Conduct research to identify innovative strategies, other than traditional educational approaches, for reducing the rate of non-fatal equipment-related injuries. Interventions to be tested should address engineering design, information technology, incentive programs, and policies. Target: 2012.

Intermediate Goal 4.5 - Reduce the number, rate, and severity of non-fatal injuries (OSHA recordable type) and the number and rate of fatalities in production agriculture and support activities not covered in 4.1, 4.2, 4.3 and 4.4 by 25% by 2018.

Examples: livestock, tools, buildings, bins, and structures.

Non-machinery causes of deaths accounted for 3,479 fatalities in production agriculture between 1992 and 2005. These fatal agricultural injuries involved trucks associated with highway transportation events (743 deaths), working surfaces associated with falls (345 deaths), animals (317 deaths), and ammunition associated with assaults and self-inflicted injuries (249 deaths) [BLS, 2008]. Farmers and farm workers over the age of 54 years account for approximately 63% of the animal-related deaths reported in agriculture [Hard et al., 2002; BLS, 2008]. For the annual 93,000 non-fatal OSHA recordable injuries that occur on farms, an average estimated by NIOSH, the most common sources of injury were identified as working surfaces associated with falls (22%), animals (19%), and hand tools (8%) [NIOSH, 2008]. Nearly three-quarters of these non-fatal injuries occur to workers less than 55 years old, with this age group accounting for just over three quarters of the animal-related injuries and 65% of the working surface-related injuries associated with falls. To address this broad range of fatal and non-fatal risks, the following activities are proposed:

Action Step 4.5.1 - Work with USDA-NASS and NIOSH to support NIOSH intramural efforts to conduct injury surveillance to provide state-level data that identifies and describes the nature and extent of non-fatal work-related injury according to the preferred categorical variables in the *Dictionary of Terms for AgFF Professionals*.

Action Step 4.5.2 - Analyze data from USDA-NASS, NIOSH and refereed journals to determine major causes of non-fatal agricultural work-related injuries and to identify effective strategies that could prevent these injuries.

Action Step 4.5.3 - Work with USDA, NIOSH, the Agricultural Safety and Health Council of America (ASHCA) (www.ashca.org), and other similar partners to gain increased political and financial resources to reduce non-fatal work-related injury.

Action Step 4.5.4 - Work with the NIOSH Agricultural Research Centers, Cooperative Extension safety specialists, Farm Bureau safety leaders, and others to identify effective, research-based intervention programs for non-fatal work-related injury for application at national, state, county and community levels.

Action Step 4.5.5 - Work with ASHCA, the National Institute for Farm Safety (NIFS), NIOSH Agricultural Research Centers, Cooperative Extension safety specialists, Farm Bureau safety leaders, producer organizations, and others to promote and implement safety education, intervention programs, and recommended guidelines/policies for non-fatal work-related injury (refer to Strategic Goal 3).

Action Step 4.5.6 - Work with ASHCA, major farm organizations, agribusiness and the farm media to influence farmers' and the public perspectives on the value of working to better manage hazards and risks among workers and bystanders in agricultural occupational settings (refer to Strategic Goal 3).

Action Step 4.5.7 – Identify best options for protecting non-workers from hazards in and around production agriculture and support activities.

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STRATEGIC GOAL 5 – Agriculture Health

5. Strategic Goal: Improve the health and well-being of agricultural workers by reducing occupational causes or contributing factors to acute and chronic illness and disease.

Agricultural workers face an exceptionally wide range of acute and chronic health exposures at work. Agricultural work is hard work and involves long hours under difficult conditions and repetitive exposure to musculoskeletal strains and sprains, respiratory hazards, toxic chemicals, psychological stresses and a variety of zoonotic diseases. These problems have been recognized by the agricultural health and safety community for some time. Many of the salient issues, clearly identified in the groundbreaking report, "Agriculture at Risk: A Report to the Nation (1989)" remain a concern [Merchant et al., 1989]. Additionally, emerging concerns associated with new production methods, environmental issues, technologies and changing demographics of the workforce warrant attention.

With respect to limitations in agricultural occupational surveillance data, the 1989 report noted that, "These statistics... ignore the wide range of agriculturally related diseases that have been documented in several epidemiologic studies, but for which adequate state or national statistics are not available" [Merchant et al., 1989]. The data collection challenge remains a problem and is addressed throughout this document.

Note: For Goal 5, target dates were excluded because baseline data from which to measure change are not yet available.

Action Step 5.0 – Develop, test and continually improve surveillance systems to document incidence and prevalence of disease outcomes associated with agricultural work.

The five intermediate goals which follow are not meant to be all inclusive but represent recommendations of the Council regarding priority issues.

Intermediate Goal 5.1 - Reduce the incidence and prevalence of musculoskeletal disorders (MSD) associated with work practices and production agriculture.

Among available general industry data sources (BLS, National Safety Council, Liberty Mutual Annual Workplace Safety Index) strains and sprains consistently comprise the largest share of the most frequent cause of workplace injuries and illnesses. General agreement exists that, "while there is not good national data on the extent of these injuries and illnesses either within agriculture or relative to other industries, there is growing evidence that this problem likely exceeds all other types of injury and disease in the agricultural industry" [Chapman and Myers, 2001]. Agricultural work encompasses the full range of identified musculoskeletal injury risk criteria including force, repetition, duration, posture, and metabolic factors. Helpful research and successful intervention projects have been initiated on a modest scale in some industry segments, for example the nursery and wine industries, but significantly more is needed [Janowitz et al., 1998; Meyers et al., 2006].

Action Step 5.1.1 - Conduct continued research on MSD risk factors as they relate to workers in the agricultural sector.

Action Step 5.1.2 - Conduct research on alternative methods to accomplish tasks with high incident rates of MSD.

Action Step 5.1.3 – Develop, test, and widely promote best practice models and guidelines for MSD prevention in specific agricultural operations.

Action Step 5.1.4 - Conduct research on MSD injury recovery and return to work in an agricultural setting that provides guidelines to health care providers, injured workers and employers.

Action Step 5.1.5 - Continue research into and development and validation of MSD exposure assessment tools as well as the etiology of MSD's.

Action Step 5.1.6 - Improve utilization of the NIOSH Agricultural Research Centers, Education and Research Centers (ERCs) and other partners to address regional work and environmental hazards that causes unique illness and disease conditions that can be rectified in the future by research and program interventions.

Intermediate Goal 5.2 - Reduce acute and chronic respiratory disease caused, or exacerbated by, agricultural exposures including asthma, chronic obstructive pulmonary disease, and interstitial and infectious diseases of the respiratory system.

A wide range of respiratory diseases have been associated with exposures in agriculture [Schenker, 1998]. These diseases include effects on the upper respiratory tract, the airways, and the pulmonary interstitum. In addition, exposures to biologic agents (bacteria, mycobacterium, viruses, and fungi) in agricultural processes may result in respiratory infections. Upper respiratory tract effects include inflammation of the mucous membranes in the naso-pharynx and sinuses. Airway disorders cover a wide range of diseases including upper airway irritation, asthma and asthma-like syndrome, toxic tracheo-bronchitis and chronic airflow obstruction. Interstitial diseases include fibrosis, organic dust toxic syndrome and hypersensitivity pneumonitis. A contributing risk factor is that agricultural work is associated with very high exposures to respiratory toxicants, often orders of magnitude higher than in other occupational settings [Doekes et al., 1998]. Epidemiologic studies have documented increased respiratory morbidity and mortality in a wide range of agricultural settings. This is of particular concern because cigarette smoking prevalence is lower among farmers and farm workers than in the general population. A challenge to reducing respiratory disease in agriculture is that farmers do not believe their risk to be increased and use of respiratory protection is limited [Schenker et al., 2002]. As with many hazards in agriculture, specific risks vary greatly with the climate, geographic region and agricultural practices. For example, hypersensitivity pneumonitis is a greater risk in regions with increased moisture, which is conducive to mold growth. Conversely, dry climate farming in the western states has a greater risk for dust-induced airflow obstruction and restrictive lung disease. Some respiratory diseases such as tuberculosis may be increased among immigrant farm workers, but dissemination may be associated with agricultural practices and/or housing conditions [Ciesielski et al., 1991].

Action Step 5.2.1 - Provide outreach and education to employers and the employees on the hazards to which they could be exposed and proven strategies and interventions for exposure control.

Action Step 5.2.2 - Conduct research on facility and equipment design and other engineering modifications that can reduce employee exposure to respiratory disease-causing agents.

Action Step 5.2.3 - Conduct continued research on chronic respiratory disease and its effects on agricultural workers, giving attention to the synergistic affect of occupational and non-occupational risk factors.

Action Step 5.2.4 - Develop and improve methods for assessment of exposures and better characterization of pathophysiological disorders.

Action Step 5.2.5 - Conduct research on how to best develop respiratory protection programs for rural communities and on best practices for providers of these programs and services.

Action Step 5.2.6 - Improve utilization of the NIOSH Agricultural Centers and ERCs to address regional work and environmental hazards that cause unique illness and disease conditions that can be rectified in the future by research, outreach and education.

Intermediate Goal 5.3 - Reduce acute and chronic illnesses associated with exposure to pesticides and other agrochemicals.

Pesticides are a diverse group of chemicals in terms of their toxicity, modes of action, and uses. Broadly, pesticides include insecticides, herbicides, fungicides, fumigants, and specialty applications such as miticides, algaecides, and rodenticides. The pesticide landscape is steadily changing as chemicals move off the market while others move in. For many decades, pesticides have been an integral part of crop and animal production. They have also been used in forestry to control insects and diseases, and have emerged in commercial fish farming. Workers in the agriculture, forestry, and fishing sector are also exposed to other agrochemicals, such as biopesticides, fertilizers, organic crop protection chemicals, crop oils, adjuvants, as well as inert ingredients in pesticide formulations.

Historically, the effects of acute pesticide exposure were initially described, especially the effects from acute exposure to organophosphorus (OP) and carbamate acetylcholinesterase-inhibiting pesticides. More recently, the effects of chronic pesticide exposure, as well as the delayed effects of acute pesticide exposure, are becoming better understood. Chronic exposure to certain pesticides has been associated in some epidemiological studies with certain cancers (e.g., non-Hodgkin's lymphoma, prostate, colon, bladder, multiple myeloma, and leukemia), with respiratory disease (allergic asthma) and respiratory symptoms (e.g., wheeze), with certain neurological-related conditions and disorders (e.g., Parkinson's, depression, cognitive dysfunction, and organophosphate-induced delayed neurotoxicity), with retinal degeneration, and with hearing loss [Alavanja et al., 2004; Kirkhorn and Schenker, 2002; Richter and Chlamtac, 2002; Dich et al., 1997; Zahm et al., 1997; Maroni and Fait, 1993]. On-going or additional research is needed to confirm these associations and to understand the biological mechanisms of action utilizing appropriate in vitro human systems, human cell lines, human primary cells, and humanized transgenic animal models. Human metabolism studies, using genotyped samples with polymporphisms, can also reveal the extent of variation within the population, thereby improving human health risk assessment. Certain pesticides have also shown reproductive or developmental effects in animals; however, human data are limited [Iyer, 2001]. Less understood is the effect of co-exposure to multiple pesticides which may dramatically alter the metabolism and elimination of pesticides and enhance toxicity. Interactions between pesticides and endogenous metabolites such as steroid hormones may have important human health implications. Finally, as the working population ages attention will need to be focused to better understand how agro-chemical exposures might interact with the prescription drug intake of older workers. These workers may also experience different recovery responses to acute or chronic exposures.

Exposure monitoring, pesticide poisoning surveillance, and epidemiological studies have been used to varying degrees to describe the extent of pesticide exposure, morbidity, and mortality, primarily in agriculture [Curwin et al, 2005b; Alavanja et al., 2004; Hines et al., 2003; Kirkhorn and Schenker, 2002]. Workers exposed to pesticides include farmers, ranchers, commercial pesticide applicators, horticultural workers, tree nursery workers, forestry workers, hired agricultural workers, crop advisors, and commercial fish farmers. The families (spouses and children) of AgFF workers may also be exposed to pesticides either as a result of the close proximity of the home and work environment or through pesticides carried home on the clothes and equipment of the workers [Curwin et al., 2005, 2007; Bradman et al., 1997; Fenske et al., 2000; Loewenherz et al., 1997; Simcox et al., 1995]. Methods to assess pesticide exposure include environmental measurement of pesticides in air and dermal samples, qualitative and quantitative fluorescent tracer techniques, and biological monitoring. These techniques have generally required significant laboratory facilities. More rapid, but still reliable, in-field assays would be desirable. The wide-ranging chemistry of pesticides and their metabolites together with the continual introduction of new pesticides poses a challenge for developing exposure monitoring tools.

As exposure and health studies identify determinants of pesticide exposure and exposure pathways among AgFF populations, research to evaluate interventions for reducing exposure will be needed. These interventions might focus on equipment modifications, work practice changes, PPE use, hygiene practices, culturally- and language-appropriate training and education materials, and risk perceptions.

Action Step 5.3.1 – Improve the organization of existing information. Based on an evaluation of findings, develop and implement biological monitoring guidelines, e.g., cholinesterase testing.

Action Step 5.3.2 - Develop and distribute pesticide education materials that can be easily understood by all workers, including foreign-born workers, reflecting language and cultural differences.

Action Step 5.3.3 - Test and evaluate interventions that lead to implementation of best practices and behavioral change related to protection from chemical exposures.

Action Step 5.3.4 - Develop and improve methods for assessment of exposures to agrochemicals, including interactions of multiple chemicals found in the workplace.

Action Step 5.3.5 - Improve utilization of the NIOSH Agricultural Research Centers, ERCs, and other partners to address regional work and environmental hazards that causes unique illness and disease conditions that can be rectified in the future by research and program interventions.

Action Step 5.3.6 - Conduct research to assess the effects of occupational exposures to pesticides and other agrochemicals on the reproductive, neurological, or neurobehavioral health of men, women, and children.

Intermediate Goal 5.4 - Reduce illness and disease due to environmental and infectious exposures in agriculture such as ultraviolet radiation, heat and cold, noise and zoonoses.

The agricultural worker encounters many, varied environmental health risks, including physical agents such as hot or cold work environments. The hours of outdoor work common in many agricultural settings often result in intense exposures to ultraviolet (UV) radiation and dermatologic health outcomes such as skin cancer. Exposures to noise and vibration are a common occurrence in agriculture through exposure to a range of farm machinery and animal confinement operations. Studies document that noise-induced hearing loss can accompany these exposures in farmers. Agricultural tasks often involve close work with many different types of domestic animals providing opportunity for the expression of zoonotic diseases through contact with diseased animals, their body fluids, aerosols from contaminated agricultural settings, or from needle stick injuries. Brucellosis, leptospirosis, tuberculosis and avian or swine influenza are some examples of zoonotic diseases and exposure hazards among agricultural workers.

The health status, illness and disease, of workers on American farms from environmental exposures are difficult to quantify. Farm workers are exposed to a wide variety of environmental hazards, chemical exposures, biological agents, and physical agents (noise, heat, cold, vibration, UV light, etc.). Farm workers undertake many work situations: traditional crop and livestock production, machinery repair, welding, and chemical application. The Bureau of Labor Statistics gathers statistics on agricultural injury and fatalities, but this only provides a partial picture of the hazards faced by farmers. Occupational illness is common in agriculture. However, documenting an exposure and its health effect is often difficult because of the long latency period (years) between exposure and health outcome. Better surveillance is needed to determine the extent of and evaluate reduction of these diseases by interventions.

Action Step 5.4.1 – Establish systems to more efficiently access currently available data and acquire new data on exposure and health outcomes associated with environmental and infectious agricultural conditions.

Action Step 5.4.2 – Augment current research associated with animal-related diseases or zoonosis, such as but not limited, to avian influenza, bovine tuberculosis and other emerging issues such as agroterrorism. Exposure assessment, prevention, vaccination and treatment all need to be included in the research.

Action Step 5.4.3 - Test and evaluate interventions that lead to the implementation of best practices and behavioral change related to environmental and infectious exposures.

Action Step 5.4.4 - Develop methods of exposure evaluation as well as ongoing research into the characterization of the pathophysiology of these illnesses.

Action Step 5.4.5 - Increase involvement of the NIOSH Agricultural Research Centers and ERCs to address regional work and environmental hazards associated with unique illness and disease conditions that can be rectified in the future by research and program interventions.

Intermediate Goal 5.5 - Develop and promote adoption of effective interventions to enhance psychological well-being of workers and to minimize the adverse effects of stressful agricultural working conditions (e.g., economic forces, weather, and isolation).

Psychological stress is typically a product of overwork or conflicting or competing demands on the job. Inadequate time to complete a task can create anxiety and stress that then challenge the ability of workers to cope with the job demands. As this high level of demand continues over many hours or days, fatigue accumulates along with the stress, then farmers and farm workers are no longer able to attend to the hazardous conditions in their work environments. The cumulative impact of psychological stressors can lead to conditions of acute stress in the short-term and chronic strain over the long term. Changing weather conditions provide an excellent example of circumstances where the agricultural worker has no control over the forces of nature but is nevertheless responsible for maintaining the agricultural operations.

The experience of the U.S. farm crisis of the 1980's has been replicated around the world. An economic recession in the U.S. which followed a period of high inflation resulted in some farmers owing more money than their entire operations were then worth. In the language of agricultural economics, the debt-to-asset ratio on some U.S. farms rose above 1.0. One consequence of this crisis is that the suicide rate (from confirmed suicides) of principal owner/operators of farms climbed to approximately four times that of other rural residents, including other farm family members [Gunderson et al, 1993]. (The actual rate of suicides among principal owner/operators in the U.S. is almost certainly much higher because of the stigma associated with suicide, as well as possible loss of any insurance benefits.) The continuing stress and worry associated with these economic problems resulted in the loss of many family farms, marital breakups, and as noted, too many suicides.

The combination of stress and fatigue has both short and long term consequences [Kidd, Scharf, and Veazie, 1996]. In the short term, stress and fatigue can result in lack of attention to changing hazards that can lead to poor decision making by the farmer or farm worker. In the long term, prolonged stress can lead to chronic strain, depression, deterioration of societal functioning and even suicide. Furthermore, in considering the psychological health and stressors in agricultural work as it concerns the individual, it is important to examine the ripple effect on interpersonal relationships within rural societies, farm and farm worker families.

More research is needed to examine family, domestic and sexual violence as an adverse effect of stressful agricultural working conditions.

Action Step 5.5.1 - Develop a surveillance system to help qualify the types and extent of psychological disorders experienced by agricultural workers. Use those findings to develop research priorities.

Action Step 5.5.2 - Conduct targeted research on factors associated with psychological disorders, especially as they relate to specific regional concerns or patterns.

Action Step 5.5.3 - Develop, implement and evaluate culturally appropriate educational and outreach programs for promoting psychological well-being of agricultural producers, farms workers and their families. Involve agricultural workers in their development and delivery.

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STRATEGIC GOAL 6 – Forestry Safety

6. Strategic Goal: Reduce the number, rate and severity of traumatic injuries and deaths involving hazards of forestry.

The enumeration of workers in the forestry workforce may vary dependant on who does the counting. The numbers also may depend on States and how important forestry is to the economy of each state agency making the count. National counts by aggregating state numbers or Census data may not show the complete picture. For example, until 2001 (2003 in practice) logging was included in Standard Industrial Classification (SIC) code 241 and forestry tracts and services in SIC in 2008. The current North American Industrial Classification Standard (NAICS) moved the forestry workforce, in part, into the Natural Resources sector grouping of Agriculture, Forestry and Fishing. Previously, logging was associated with milling forest products and partially covered by the Census of Manufacturing periodically. There are persistent vagaries about which jurisdictional agency is primarily responsible for the safety and health of the forestry workforce. The Census of Agriculture covers farms and farmers and enumerates forestry products but not workers.

Reporting of acute, traumatic deaths and severe injuries related to commercial logging, while of not yet fully determined completeness, appears to be stronger than is the detection of related chronic injuries and illnesses. However, establishing the true causes of injury events is often not possible because of the method by which data are collected or investigations conducted. In states where good data exist on logging and forestry services, the rates of fatalities, disability claims, occupations, exposure events, nature of injuries, and source of injury provide the basis for interventions and tracking of progress trends (Information Management Division, Oregon Department of Consumer & Business Services, October 2007).

See Appendix 1. The Forestry Workforce, Statistics and Organizations for more information on this industry.

In order to develop performance measures and track improvements in safety and health working conditions, baseline data are needed. Since valid information is difficult to ascertain, the first goal is to improve injury and fatality surveillance options for the forestry sector. Refer to Strategic Goal 1 for a description of the surveillance goals and action steps.

Intermediate Goal 6.1 - Reduce logging-related deaths and traumatic injuries by 50% by 2018, through collection and analysis of injury data and evidence-based safety improvements.

Action Step 6.1.1 – Support ongoing improvements in data collection of forestry workforce subsectors (logging, forestry services, etc.) and associated illness/injury data collection. Assess Census of Agriculture for forestry sector uses and search for new surveillance approaches, e.g., the model used in New Zealand. Target: 2011.

Action Step 6.1.2 - Assess the adequacy of fatality and injury reporting by type of logging (e.g., manual vs. mechanized logging, worker job category, full-time vs. part-time workers) for determination of optimal injury prevention strategies. Target: 2012.

Action Step 6.1.3 – Use available data, research findings, program results, and other evidence of outcomes to identify cost-effective, practical approaches to safe forestry practices. For example, literature and organizational review of national and international forestry improvements can be shared with NIOSH forestry partners (e.g., Swiss: Safety and Health are Feasible in Forestry). Target: 2013.

Action Step 6.1.4 - Determine what approaches or studies might be needed to fill gaps in information needed for developing and testing new interventions, including engineering, information technology, guidelines and policies. Implement trials for improved data collection and review potentials for improvements. Target: 2013.

Action Step 6.1.5 - Determine the impact of solitary work conditions and remote locations on fatality rates in order to design effective counter measures (more specific first-aid training, better communication devices, location/navigation aids for first responders). Target: 2013.

Intermediate Goal 6.2 - Assess current federal and state forestry safety codes (e.g., OSHA, Federal Forest Activities, and state laws) for their coverage and provide guidance to update them to maximize adoption of practices that minimize logging and forestry hazards.

Action Step 6.2.1 - Review 1994 OSHA logging standards at Federal level for currency and adequacy using industry, state agency, and cooperative review. For example, AgFF researchers could collaborate with OSHA and a National Logging Committee composed of experts, state OSHA agencies, etc. to review the standards. Target: 2012.

Action Step 6.2.2 - Review currency of state logging codes, plans for updating and processes used within three years. For example, forestry researchers could help organize regional OSHA offices, state OSHA agencies and industries to stimulate updating current state logging codes. Target: 2013.

Action Step 6.2.3 - Review Federal Safety Standards for coverage of forestry services activities and report within two years. Target: 2012.

Action Step 6.2.4 - Assist states in code revisions with research results and methodologies and model standards/approaches. Target: 2013.

Action Step 6.2.5 - Provide recommendations for a revised Federal OSHA Code for Logging. Target: 2015.

Action Step 6.2.6 - Prepare a model standard for forestry services at the Federal level. Target: 2014.

Action Step 6.2.7 - Provide a draft Federal OSHA Code for forestry services. Target: 2016.

Intermediate Goal 6.3 - Identify factors (e.g., risk-taking behaviors, workers compensation vs. self-insurance) that limit the adoption of safe logging practices and the treatment of logging-related injuries and propose interventions to address these factors.

Establishing cause and effect for forestry accidents can be difficult. Some injury investigations by state and federal organizations are not able to show specifics on cause. Comprehensive investigations of injuries and fatalities by competent forestry specialists with knowledge of equipment, conditions, and procedures would be helpful. The population of seriously disabled forestry workers might provide essential information on the actual cause of the injury after legal issues are resolved, workers' compensation issues settled, and disabled workers are providing information anonymously. There is a need to better understand risk-taking behaviors of forestry workers.

Action Step 6.3.1 - Assess populations of seriously disabled forestry workers, via legal and ethical interviews, to understand circumstances of the injury event that can be reported in a manner that maintains worker anonymity. Target: 2010.

Action Step 6.3.2 - Conduct trial regional studies (interviews), using interviewers with knowledge of the forestry industry, to assess disabled workers' circumstances of injuries. Target: 2013.

Action Step 6.3.3 - Develop models of risk-taking behaviors with testable hypotheses and assess models with research and data. Target: 2014.

Action Step 6.3.4 – Develop, implement and evaluate interventions designed to reduce risk-taking behaviors among forestry workers and employers. Target: 2016.

Intermediate Goal 6.4 - Establish a Forestry Sector Partnership to develop new technologies (e.g., synthetic rope, "smart" clothing) that reduce workloads and injury risks associated with logging and forest operations.

Action Step 6.4.1 - Establish partnerships between the forestry sector and NIOSH researchers and cooperators to reduce workloads in the sector. For example, NIOSH and the AgFF Council could support and participate in a "Future of the Forestry Workforce Conference" with sector leaders to establish working relationships with forestry researchers and Extension Forestry faculty to disseminate results. Target: 2010.

Action Step 6.4.2 - Establish a working group for future occupational safety and health research in the forestry sub-sector. Target: 2011.

Action Step 6.4.3 - Conduct trials with technologies (e.g., synthetic rope to replace wire rope) in logging and trucking to document workload reductions and establish best practices guidelines and/or policies. Target: 2012.

Action Step 6.4.4 - Review the use of powered hand tools used in steep terrain to build fire trails and assess use of modified logging equipment to fight wildland fires for safety and health improvements. For example, NIOSH could work with the U.S. Forest Service Equipment Development Centers to reduce workloads in wildland firefighting. Target: 2013.

Action Step 6.4.5 - Review technologies that reduce workloads (e.g., radio-controlled chokers, robotic functions, and autonomous systems for harvesting) and conduct trials for documenting gains; establish best practices guidelines and/or policies. Target: 2012.

Intermediate Goal 6.5 - Build future capacity in safety and health for the forestry sector via advanced training programs.

The advancement of injury prevention principles in the forestry and logging sector will require a continuous influx of safety professionals dedicated to building our knowledge base and modifying recommendations as production methods change. Strategic Goal 3 addressed advanced training and certification needs. Specific requests for the forestry sector are noted here.

Action Step 6.5.1 - Establish a mechanism of supporting research capacity of forestry sector research partners for graduate students from the forestry sector to conduct safety and health research in cooperation with NIOSH. Target: 2011.

Action Step 6.5.2 - Produce a Forestry Safety and Health web-based curriculum with materials adapted for U.S. Regions that introduces undergraduate forestry students to safety and health concepts. Build support and connections to future forestry sector leaders. Request government funding with a university taking lead for development and production of the curriculum. Target: 2011.

STRATEGIC GOAL 7 – Forestry Health

7. Strategic Goal: Improve the health and well-being of forestry workers by reducing occupational causes or contributing factors to acute and chronic illness and disease.

Forestry workers face health risks related to the arduous jobs they perform, often in inclement weather and for long work shifts. Resulting musculoskeletal diseases and illnesses are often present in workers and may shorten working lives. Exposures to hazards and toxic materials require protective clothing and equipment. Drug (prescription and illegal) and alcohol use is raised as a major concern among forestry workers. The complete health status of workers is not known but has likely changed with mechanization.

Scant data are available regarding forestry workers, their occupational exposures and the disease outcomes associated with work. Without valid data, it is impossible to establish performance measures or track improvements in health status in the sector. Thus, the first priority will be to establish surveillance systems to gather and continuously improve data. Refer to Strategic Goal 1 for a description of the surveillance goals and action steps.

Intermediate Goal 7.1 - Develop and implement interventions to minimize the frequency and causes of work-related musculoskeletal diseases (MSDs) and other acute and chronic illnesses leading to premature disability.

Action Step 7.1.1 - Assess tree planting operations for possible mechanization and means to reduce workloads causing muscle strain, e.g., delivering trees to planters in steep terrain. Target: 2012.

Action Step 7.1.2 - Compare and contrast mechanized harvesting operations versus manual systems for health effects. Target: 2012.

Action Step 7.1.3 - Review technologies that reduce workloads, e.g., radio-controlled chokers, robotic functions, and autonomous systems for harvesting to reduce MSDs and other negative health effects. For example, research documentation is needed to show how efforts to reduce workloads result in fewer diseases and illnesses with the long term goal of maintaining the working lives of people. Target: 2013.

Intermediate Goal 7.2 - Improve the quality and availability of protective equipment (PPE and Equipment Protection) suitable for the forestry working environment and facilitate the adoption of its use within the forestry sector.

Several of the developments below could come from research partnerships with Forestry researchers within Universities, U.S. Forest Service research units, and NIOSH research units. Research issues include performance related to age, temperature extremes, response to cleaning materials and solvents, and hazards of thrown objects.

Action Step 7.2.1 - Assign a NIOSH and forestry sector team to continue and monitor developments in this research area, at the NIOSH National Personal Protective Technology Laboratory (NIOSH-NPPTL). Target: 2010.

Action Step 7.2.2 - Assess potentials of "smart clothing" currently used in other sectors (e.g., sports, military) for use in logging and forestry services to provide feedback and data on workers during operations and worker status on tasks. Target: 2011.

Action Step 7.2.3 - Implement trials of "smart clothing" in the forestry sector to collect workload data (e.g., heart rate) and worker status (e.g., heat stress) then facilitate adoption of effective, practical interventions. Target: 2010-2015.

Action Step 7.2.4 - Continue research on inhalation hazards, including dust, and respirators for use in wildland firefighting and assess exposure to smoke for wildland firefighters. Develop a complete product certification standard for respirators. Target: 2012.

Action Step 7.2.5 - Review safety hard hats for improvements (e.g., head and neck protection during falls) that can be applied during hot weather conditions. Target: 2012.

Action Step 7.2.6 - Develop eye protection that is effective in both sun and rain conditions. Target: 2011.

Action Step 7.2.7 - Develop PPE for hand application of chemicals that is effective in varying forestry environments. Target: 2012.

Action Step 7.2.8 - Review glazing materials for their performance and specifications as a means to protect machine operators from hazards. Target: 2012.

Intermediate Goal 7.3 - Evaluate the frequency of, impact of, and possible interventions for the use of alcohol and illicit prescription or other drugs, by forestry workers, especially as it pertains to transportation of workers and products.

Action Step 7.3.1 - Assess current data sets on forestry worker injuries and fatalities for drug involvement to determine if recordkeeping provides basis for assessment. Target: 2011.

Action Step 7.3.2 - Modify recordkeeping procedures consistent with legal and ethical guidelines to provide data for future assessments. Target: 2012.

Action Step 7.3.3 - In states where "medical use" of Cannabis is allowed, assess the extent of legal and illegal use by forestry workers. Provide assessments of other drug use (e.g., methamphetamines) on the job. Target: 2013.

Action Step 7.3.4 - Assess current methodologies available to employers and improve them for field testing of workers for drug impairment. Target: 2014.

Action Step 7.3.5 - Develop strategies for eliminating "perceived" need for drug use on the job. For example strategies might address wake/rest cycles, alert warning devices, workload reduction, and rest/refreshment breaks. Target: 2010-2015.

Intermediate Goal 7.4 - Assess the health conditions of forestry workers to improve work design and work practices for workers entering the sector and those at later career stages.

Action Step 7.4.1 - Conduct preliminary health screening of workers entering the workforce for mechanized logging, manual logging, tree planting, wildland firefighting, etc. Target: 2011.

Action Step 7.4.2 - Conduct expanded health screening of workers entering workforce by age, occupation, pre-existing conditions, etc. Target: 2012.

Action Step 7.4.3 - Assess health conditions of workers and work demands at selected career points and by occupation in logging, forestry services, etc. Target: 2014.

Action Step 7.4.4 - Assess health conditions of workers over age 45 in forestry for health conditions that will affect continuing in the same occupation or will need review for work modifications in their future.

Action Step 7.4.5 - Assess design improvements to work arrangements to address worker health conditions by occupation in logging, forestry services, etc. For example, health screenings may suggest

worker pre-conditions for illness or disease that adjustments in work practices can help alleviate. Target: 2015.

Action Step 7.4.6 - Assess interventions to worker health conditions related to work demands in logging, forestry, etc. Target: 2016.

STRATEGIC GOAL 8 – Fishing Safety

8. Strategic Goal: Reduce the number, rate and severity of traumatic injuries (including deaths) involving hazards of commercial fishing.

Commercial fishing remains one of the most hazardous occupations in America. Despite reductions in fatalities since passage of the Commercial Fishing Industry Vessel Safety Act of 1988, commercial fishermen remain over 30 times more likely to die pursuing their occupation than the average worker in America. According to Bureau of Labor Statistics for 2007 [U.S. Department of Labor, 2008] the fatality rate for commercial fishing sector was 111.8 per 100,000 workers (previously 141.7 for the 2007 report). This compares to the national average of 3.7 per 100,000 workers making commercial fishing the most dangerous occupation in America. From 1994-2004, 641 commercial fishermen died in the United States, an average of 58 per year. During this same time period, 127 vessels were lost on average each year. These lost-vessel events resulted in 332 fatalities. Another 184 (29%) fatalities were due to falls overboard. The remainder of the fatalities were due to deck injuries (51, 8%), diving (31, 5%), fires or explosions (31, 5%), and other causes (12, 2%) [U.S. Coast Guard, 2006].

The impact of the high rate of death and injury on fishing communities and fishermen's families is severe. The independent culture of those within the F3.2
industry and the limited safety and health regulations combine to create an environment where high risk practices may be accepted as part of the job. Working conditions on board fishing vessels include a working platform exposed to the elements of weather in some extremely harsh conditions and which is continually in motion, most frequently wet, and reliant upon heavy machinery. Fishermen endure these conditions for extended periods of time adding fatigue as a significant safety issue. Exacerbating this situation, some of the industry is overcapitalized and competition for a tightly controlled resource adds competitive pressure to support risk taking.

We have outlined the NORA Strategic Goals focusing on the commercial fishing industry to address the highest safety and health priorities.

According to an analysis by the U.S. Coast Guard, 51% of fatalities in the commercial fishing industry are attributed to flooding, sinking, or capsizing of the vessel [U.S. Coast Guard, 2006]. Another 29% of the fatalities were due to falls overboard. With three-quarters of all fatalities, water exposure is by far the most significant factor in personnel loss. Current safety regulations are focused on mitigating adverse events rather than preventing them, for example, keeping fishermen warm and afloat as they wait for rescue vs. preventing the vessel from sinking. Mitigating these events has resulted in measurable decreases in fatalities.

Injury solutions have focused on education and other outreach efforts and should continue. Some notable examples of the positive impact of ensuring compliance with existing regulations and aggressive education have resulted in notable improvements in fatality rates such as the pre-season boarding program in Western Alaska [Lincoln et al., 2007]. The Intermediate goals 8.1 and 8.2 address the most significant causes of fatalities.

Intermediate Goal 8.1 - Reduce the vessel sinking and fatality rate due to vessel sinking by 50% by 2018.

Action Step 8.1.1 - Identify the fishery-specific hazards across the country for vessel sinking and subsequent fatalities. Apply risk management techniques. Target: 2009.

Action Step 8.1.2 - Develop tailored interventions for the highest risk fisheries in each region to reduce injury and fatality rates by half. Such interventions may include pre-season safety checks similar to the ones conducted in Western Alaska. Target: 2010.

Action Step 8.1.3 - Evaluate if safety training reduces the fatality rate of commercial fishermen involved in vessel sinking. Target: 2010.

Action Step 8.1.4 - Evaluate the effects that fisheries management practices have on safety in 6 different fisheries in the United States. Target: 2010.

Action Step 8.1.5 - Develop a Top 10 list of fisheries management practices that contribute to unsafe practices in the commercial fishing industry. Target: 2011.

Action Step 8.1.6 - Determine the cost effectiveness and benefits of safety training in reducing the rate of fatalities. Target: 2013.

Action Step 8.1.7 - Determine the benefits of self inspection of fishing vessels in reducing maintenance related vessel sinking. Target: 2014.

Action Step 8.1.8 - Determine factors affecting the risk taking behaviors of fishermen that lead to vessel sinking. Target: 2014.

Action Step 8.1.9 - Determine the benefits of stability training in reducing vessel capsizing and sinking. Target: 2015.

The Coast Guard, at the recommendation of the Commercial Fishing Industry Vessel Safety Advisory Committee, will propose regulations for mandatory stability training for masters and owners of documented commercial fishing industry vessels. Documented vessels are those vessels required by federal regulations to register with the Coast Guard because of vessel size (generally over 40 feet in length) and so consequently operate further from shore and in more extreme environmental conditions. The Commercial Fishing Vessel Safety Act of 1988 specified different requirements for documented vessels. Similar requirements have recently been adopted by the Workers Compensation Board of British Columbia.

Intermediate Goal 8.2 - Reduce fatal falls overboard events and rates by 50% by 2018.

Action Step 8.2.1 - Develop and evaluate best practices for preventing falls overboard and fatalities due to falls overboard. These would include activities such as field evaluations of Personal Flotation Devices (PFDs), surveys of fishermen, developing better recovery devices and practices. Target: 2010.

The Commercial Fishing Industry Vessel Safety Advisory Committee has begun working on this best practices guidance.

Action Step 8.2.2 - Publicize best practices and recommendations for preventing falls overboard and reducing fatalities due to falls overboard. Target: 2012.

The Commercial Fishing Industry Vessel Safety Advisory Committee has chosen to focus on this effort.

Intermediate Goal 8.3 - Understand and reduce the number, rate, and severity of hospitalized injury rates by 50% by 2018.

Injuries on commercial fishing vessels are required by regulations to be reported to the U.S. Coast Guard. While the Coast Guard is confident in data related to fatal injuries, it does not believe that most injuries are reported. NIOSH has begun to collect data from other agencies, including state trauma registries. Obtaining adequate and consistent injury data will remain a challenge. Determining rates will be similarly challenging as there is no hard source of employment data.

Action Step 8.3.1 – Identify data sources to analyze and determine high risk operations leading to serious non-fatal injuries by fishery (see Action Step 1.2.6 Commercial Fishing Injury Database and Action Step 1.3.5 for the Census of Fatal Occupational Injuries). Target: 2010.

Action Step 8.3.2 – Develop regional or fishery-specific interventions to address highest risk operations for serious non-fatal injuries. Target: 2011.

Action Step 8.3.3 – Complete fishery-specific outreach plans to share best practices for high-risk operations (see Action Step 3.3.2 for best methods of communication). Target: 2016.

Intermediate Goal 8.4 - Make commercial fishing vessel safety an interagency effort/priority.

Safety regulations, training, and equipment are not the only factors affecting health and safety within the commercial fishing industry. Federal authority to engage in commercial fishing is controlled by nine Fisheries Management Councils (FMCs) and the National Marine Fisheries Service (NMFS). FMCs develop proposed regulations specifying equipment, areas of operation, restrictions, timing, and other details of fisheries openings. Some decisions can have the unintended consequence of increasing risk. For instance, a recent requirement did not recognize that a vessel returning to port because of weather penalized the owner because the trip counted against the limited fishing days although no fishing activity was undertaken. Other regulations are based on hypothesized improvements in safety such as individual quotas. Understanding if these types of management decisions affect safety should be documented.

Intermediate Goal 8.4 addresses this secondary contributing factor to casualties; fisheries management decisions that may unintentionally require unnecessary risk taking, penalize operators for safety-related decisions, or otherwise place a higher priority on fisheries issues at the sake of safety concerns. This is especially germane as fisheries management decisions place additional restrictions on commercial fishing to the point that many fisheries cannot support the number of operators permitted in those fisheries. This recommendation stems from a study of fishing vessel safety sponsored by the U.S. Coast Guard in 1999 [U.S. Coast Guard, 1999].

Action Step 8.4.1 - Develop a Memorandum of Agreement among NIOSH, NMFS, OSHA, and the Coast Guard on cooperation in improving commercial fishing safety. Target: 2010.

Action Step 8.4.2 - Form a National Fisheries Management and Safety Coordination Committee to coordinate national policy integrating fishery management and safety regimes. Target: 2011.

Action Step 8.4.3 - Through the National Fisheries Management and Safety Coordination Committee, develop specific guidelines for fisheries managers to use when assessing the potential safety issues that a proposed or current fisheries plan contains (such as overcapitalization, human resource issues, and economic pressures). Target: 2012.

References

Lincoln JM and Conway GA [2007]. Preventing commercial fishing deaths in Alaska. Occupational and Environmental Medicine, Vol 56 (10): 691-695.

U.S. Coast Guard [1999]. Report of the Fishing Vessel Casualty Task Force - Living to Fish, Dying to Fish. Available at: http://uscg.mil/hq/g-m/moa/docs/fvctf.doc.

U.S. Coast Guard [2006]. Analysis of Fishing Vessel Casualties - A Review of Lost Fishing Vessels and Crew Fatalities, 1994 – 2004. Available at: http://www.uscg.mil/hq/g-m/moa/docs/fvstudy9404.pdf.

U.S. Department of Labor [2008]. National Census of Fatal Occupational Injuries in 2007. Available at: http://www.bls.gov/news.release/pdf/cfoi.pdf.

STRATEGIC GOAL 9 – Fishing Health

9. Strategic Goal: To improve the health of commercial fishermen by reducing occupational causes or contributing factors to illness and disease.

Commercial fishing workers face an exceptionally wide range of acute and chronic health exposures at work. However, little research has been completed in regard to these health issues or their prevention. Commercial fishing is hard physical labor that involves long hours under difficult conditions and repetitive exposure to musculoskeletal strains and sprains, physical factors such as noise, psychological stresses and toxic chemicals.

There is also no surveillance system or reporting requirement for health hazards present in the commercial fishing industry. The data collection challenge remains a problem and is addressed throughout this document. The three intermediate goals which follow are not meant to be all inclusive but represent decisions of the Council regarding priority attention.

Intermediate Goal 9.1 - Measure and reduce work-related musculoskeletal disease due to acute and chronic exposures and ergonomic factors.

Action Step 9.1.1 - Conduct continued research on MSD risk factors as they relate to commercial fishing workers.

Action Step 9.1.2 - Conduct research on alternative methods to accomplish tasks with high incident rates of MSD.

Action Step 9.1.3 - Develop best practice models for MSD prevention in specific fishing operations.

Action Step 9.1.4 - Conduct research on MSD injury recovery and return to work in a commercial fishing setting that provides guidelines to health care providers, injured workers and employers.

Action Step 9.1.5 - Develop and distribute guidelines for prevention of musculoskeletal injuries specific to the commercial fishing sub-sector.

Action Step 9.1.6 - Continue research into and development and validation of MSD exposure assessment tools as well as the etiology of MSD's.

Intermediate Goal 9.2 - Measure and reduce illnesses and disease due to exposures to physical factors such as noise, cold, heat, and ultraviolet radiation.

Action Step 9.2.1 - Conduct continued research on exposures and related disease/injury rates to physical factors such as noise, cold, heat, and ultraviolet radiation.

Action Step 9.2.2 - Test and evaluate interventions that lead to implementation of best practices and behavioral change.

Intermediate Goal 9.3 - Measure and reduce acute and chronic illnesses due to exposures (such as biological organisms, chemicals, particulate matter).

Action Step 9.3.1 – Conduct continued research on exposures and related disease rates to other exposures such as biological organisms, chemicals and particulate matter.

Action Step 9.3.2 - Test and evaluate interventions that lead to implementation of best practices and behavioral change.

Appendix 2: Resources and Contact Information

Appendix: Resources and Contact Information

AgFF related References & Websites:

NASICS codes for AgFF - http://www.census.gov/epcd/www/naics.html
AgFF Program Portfolio – http://www.cdc.gov/niosh/programs/agff/
NASICS codes - http://www.census.gov/epcd/www/naics.html
NIOSH Agriculture Topic Page - http://www.cdc.gov/niosh/topics/agriculture/
National Academies evaluations - http://www.cdc.gov/niosh/programs/agff/naseval.html
National Academies AgFF Evidence Package - http://www.cdc.gov/niosh/nas/agforfish/
NORA AgFF Sector Council - http://www.cdc.gov/niosh/nora/councils/agff/default.html
NORA AgFF Strategic Plan – http://www.cdc.gov/niosh/nora/comment/agendas/AgForFish

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