SOUTHERN COASTAL AGROMEDICINE CENTER

FINAL REPORT

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Submitted by

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I. INTRODUCTION & ORGANIZATION

The Southern Coastal Agromedicine Center (SCAC or the Center) is a NIOSH funded component of the North Carolina Agromedicine Institute (NCAI or the Institute). The Institute is chartered by the University of North Carolina Board of Governors as an inter-institutional Institute. East Carolina University (ECU), North Carolina Agricultural and Technical State University (NCAT), and North Carolina State University (NCSU) are its constituent members. The SCAC afforded the Institute the ability to extend its service area beyond North Carolina to include Alabama, South Carolina, Virginia, Mississippi, Florida, Georgia, Puerto Rico, and the Virgin Islands. These states/territories face many common agromedicine issues related to climate, common crops, strong timber and commercial fishing industries, a common migrant stream, and endemic rural poverty.

During the period of NIOSH support, the SCAC has addressed many significant agricultural health and safety problems and concerns among the southeastern region's farmers, foresters, fishers and their families. Table A lists the 41 projects funded by the Center during the period of NIOSH support.

Since its inception the scope of the Center program has been comprehensive and highly relevant to workers in agriculture, forestry and fisheries. However, several important themes have provided a focus for the program. They are minority and migrant health, pesticide safety and accident prevention, all of which have been treated in research, education and prevention projects.

At the end of 2007 the center provided to the NIOSH project officer a comprehensive evidence package (as a hard copy) containing samples of all products resulting from Center projects to that date. Due to the comprehensive nature of the evidence package, the NIOSH program officer recommended that the Center provide only summary information in this final report.

SCAC has also developed an extensive web site that provides detailed information about its projects (as of Spring 2008) including samples of products generated by its projects. To shorten this report, we shall refer extensively to the web site.

Main Web Page for the SCAC/NCAI:
http://www.ecu.edu/cs-dhs/agromedicine/about.cfm
Research Web Page:
http://www.ecu.edu/cs-dhs/agromedicine/research.cfm
Education/Translation Web Page:
http://www.ecu.edu/cs-dhs/agromedicine/education.cfm
Prevention/Intervention Web Page:
http://www.ecu.edu/cs-dhs/agromedicine/prevention.cfm

For example, the entries in Table A have active web links to the project's web page on the SCAC/NCAI web site where more detailed information can be obtained. Thus, this report is best viewed electronically. Projects completed in the summer of 2008 are currently being added to the web site but also will be discussed in more detail in this report.

II. EXECTIVE SUMMARY

During the period of our grant, the Center sponsored 41 projects. The projects were divided into these activity areas:

Research:	16
Education/Outreach:	18
Prevention/Intervention:	5
Special:	1

(The special project was the National Agricultural Safety Database.)

Type:

Core: 11 – Major projects authorized by NIOSH

Pilot: 21 – Pilot discretionary projects of the Center

Discretionary: 9 - Smaller discretionary outreach/education projects.

The rate of completion was:

22 Projects were completed by September 29, 2005;

3 Projects were completed by September 29, 2006;

10 Projects were completed by September 29, 2007;

6 Projects were completed by September 29, 2008.

Pilot discretionary projects were selected through a competitive process involving a call for project ideas followed by merit review by the Director and the Internal Advisory Board of the SCAC. Discretionary projects were awarded from $10,000 to $20,000 per project. A number of these projects produced formative data to address health disparities among migrant, Hispanic, and minority agricultural workers (Hamilton-pesticide safety for Christmas tree workers, Griffith-El Puenté, Ibrahim/Thompson-surveillance of limited resource farmers; Borre- Food Security for Migrant Farm worker Families). Discretionary funding led to the genesis of the 1890

Agromedicine Alliance which is now associated with the Center.

See Table A for a comprehensive list of all SCAC project 2001-2008. Note the web links in project entries which are links to detailed information about these projects, including formal reports by the PIs and PD and samples of the project products. Formal listings of the projects by category can be obtained on the following NCAI/SCAC web site pages.

III PRODUCTIVITY OF THE CENTER

- 38 peer reviewed publications (journal articles),
- 9 peer reviewed publications, in press
- 9 articles in preparation for peer reviewed journals
- 57 other publications (e.g., book chapters),
- 35 other products (training, education materials)
- many newspaper and electronic media announcements,
- formal presentations to scholarly, trade, extension, and community groups,
- 52 outreach/education programs presented over a five year period in conjunction with service organizations serving 2200 farm workers and the health professionals serving them.

IV SIGNIFICANT ACCOMPLISHMENTS OF THE CENTER

As noted, the themes of minority and migrant health, pesticide safety and accident prevention have been of particular importance. Most of the Center projects impinge upon one or more of these themes and some of the more significant are as follows:

Ergonomic Interventions for the Agricultural Industry (Research)
Gary A Mirka PhD, NCSU
http://www.ecu.edu/cs-dhs/agromedicine/interventions.cfm

Summary: Developed and tested interventions that eliminated or reduced the severity of musculoskeletal disorders in agricultural workers, e.g., reduced the risk of farm workers injury when performing repetitive lifting tasks on slippery or latterly slanted surfaces.

Educating Agricultural and Health Practitioners about the Agricultural Health Study (Education)
Julia Storm MSPH, NCSU
http://www.ecu.edu/cs-dhs/agromedicine/practitioners.cfm

Summary: The Agricultural health Study (AHS) is a landmark epidemiological study of agricultural pesticide exposures and health outcomes. Resources and presentations developed through this education project have successfully communicated research results from the AHS and resulting preventive measures to agricultural, extension and health provider audiences nationwide

North Carolina Farm Vehicle Roadway Safety Study (Research)
Michael Schulman PhD NCSU
http://www.ecu.edu/cs-dhs/agromedicine/roadway.cfm

Summary: Due to the increased suburbanization of North Carolina, there has been an increase in traffic on what were once predominantly rural roads. This project identified the factors that increased the risk of farm vehicle involvement in accidents (especially crashes) when they are driven on public roads.

Skin Disorders among Commercial Fishermen (Prevention)
William Burke MD, David Griffith PhD, East Carolina University
http://www.ecu.edu/cs-dhs/agromedicine/skin.cfm

Summary: Commercial fishermen experience a higher incidence of skin disorders than workers in other industries but have proven to be a more difficult population to access. This project has developed innovative approaches to reach this demanding population.

Timber Medic Certification Program (Education)
Juan March MD, Jane Pollack EMTPT
http://www.ecu.edu/cs-dhs/agromedicine/timber.cfm

Summary: Logging is a very hazardous occupation; Moreover, the forest environment where accidents occur is extraordinarily difficult for rescue and medical personnel. The investigators have developed an Emergency Medical Technician (EMT) training and certification course that allows first responders to successfully work in this environment. The current program will 'train the trainers' to increase the number of training programs and the number of logging accident capable EMTs in the southeastern US.

Human Metabolism of New and Emerging Pesticides (Research)
Randy Rose PhD (deceased) NCSU, Ernest Hodgson PhD, NCSU, Andrew Wallace PhD, NCSU
http://www.ecu.edu/cs-dhs/agromedicine/pesticides.cfm

Summary: This project seeks to provide a scientific basis for the risk analysis and management for new and emerging pesticides by understanding their metabolism and gene induction properties in humans. In particular, the project seeks to understand the source of the variability in risk seen in different populations. The finding that organophosphorus insecticides inhibit human metabolism of both male and female steroid hormones is important and the significance of this for agricultural workers needs to be explored. Recent results have shown that the pyrethroids, deltamethrin and permethrin, are cytotoxic to human hepatocytes and to HepG2 cells. Furthermore, these insecticides have been shown to induce several CYP protein isoforms in hepatocytes.

Mountain Pesticide Education and Safety Outreach (Education)
James V. Hamilton PhD
http://www.ecu.edu/cs-dhs/agromedicine/pesticide.cfm

Summary: A successful pilot pesticide and farm safety education and outreach program was developed in western North Carolina's Christmas tree industry to train Hispanic field workers and their employers in safe pesticide application methods. Appropriate advertising, Spanish speaking trainers, involvement of the growers, educational materials for the Latino workers, and demonstration and distribution of free personal protective gear for the workers were among the methods employed. Response by workers was very positive and expansion of the program is planned.

Expansion and Maintenance of the National Agricultural Safety Database (NASD) (Special Project)
Carol Lehtola PhD, University of Florida
http://www.ecu.edu/cs-dhs/agromedicine/database.cfm

Summary: The National Agricultural Safety Database (NASD) is an extensive collection of information about health, safety and injury prevention in agriculture and consists of more than 2,000 publications from 25 states, federal agencies, and national organizations. This project will update the database by soliciting quality publications to ensure its ongoing quality and relevance. www.cdc.gov/nasd

National Tractor Safety Initiative (Prevention)
http://www.ecu.edu/cs-dhs/agromedicine/tractor.cfm

Summary: The Southern Coastal Agromedicine Center participated in this major inter-institutional project funded by an NIOSH award to the University of Kentucky. Our project was the design of social marketing strategies for Tractor Safety. Additional work, funded directly by the Center, commenced in 2007 and was completed in 2008. Please see the summary in the next section.

V REPORT ON PROJECTS COMPLETED IN 2007-08

Assessment of Health & Safety of Black Farmers in the Southern Coastal Region
Alton Thompson PhD, Mohammed Ibrahim, PhD, Mohammed Ahmedna PhD, Ralph Okfor MS, North Carolina A & T University

This major core research project of the Center was initiated in 2004. A preliminary progress report on this project appears as part of Dr. Ibrahim's report on the SCAC/NCAI web site at http://www.ecu.edu/cs-dhs/agromedicine/minority.cfm entitled: Assessment of Minority Health & Safety in Selected Counties of North Carolina.

The two major goals of this study were to examine the health and safety of African American farmers in seven states in the southern coastal region (Alabama, Florida, Georgia, North Carolina, Mississippi, South Carolina and Virginia) and to recommend prevention and intervention strategies to reduce farm-related injuries and illnesses. A two-stage quota sample was used to collect data from 1,055 African American farmers. The face-to-face interview instrument was jointly developed and pilot-tested by researchers and extension specialists at North Carolina A&T State University, and at the Southern Coastal Agromedicine Center at Eastern Carolina University. HBCUs in the target states participated in the data collections in their areas.

Data collected included demographic information, health and injury histories, current health status, farming practices including tractor equipment (age, maintenance practices, safety features), pesticides usage (types, preparation and application methods, safety practices), injury histories including rehabilitation and cost of care, and personal vulnerability assessments for the farmers and their families to injury or illness. The following Table 1 is a sample of the type of data collected.

Table 1. Cross Tabulation Results of Accident and Farmers' Educational level and Age Group

Did you have accident on the farm in the past 12 months?

	Educational Level			
	0-11	**12**	**13-15**	**16-up**
No	57.1	85.0	87.9	94.7
Yes	42.9	15.0	12.1	5.3

χ^2 3df = 1.289E2 p = .000 Gamma = -.608 P = .000

Did you have accident on the farm in the past 12 months?

	Age Group of the Farmer			
	Less than 44	**45-54**	**55-64**	**65-up**
No	90.3	62.5	66.5	91.0
Yes	9.7	37.5	33.5	9.0

χ^2 3df =94.366 p = .000 Gamma = -.256 P = .000

The collected data show that there are many ways the health of African American farmers can be improved. For examples, according to the data, only 15 percent of the farmers "always" use respirators when applying pesticides, while 29 percent never use respirators when working with pesticides. The risks to these farmers associated with the use of tractors, machinery and other agricultural equipments are also relatively high mainly due to avoidable hazards. Over 50 percent of the farmers admit applying some type of chemicals yet more than 38 percent of them do not keep records of the chemicals or pesticides used on their farm. Large percentages do not use protective gear (e.g., 15 % do not use goggles).

Farm safety training is an effective means of managing risks associated with farm work. Training which inculcates safety rules in farmers and farm workers will reduce fatalities and serious injuries, if participants embrace the rules and the overall concepts of safety. Data from this study has shown that African American farmers and farm workers need training in the areas of tractor safety, adequate farm equipment maintenance and personal protective equipment when handling chemicals. We are now developing culturally appropriate training modules in these areas for this population.

Food Security and the Diets of Young Latino Children from Migrant Worker Families: Creating a Culturally Competent Intervention for Healthy Weight among NC Migrant Day Care Center Participants

Kristen Borre, PhD, MPH, Luke Ertle, MPH, and Mariaelisa Graff, PhD, RD, East Carolina University

This project was initiated in 2004 and a progress report appears on the NCAI/SCAC website: http://www.ecu.edu/cs-dhs/agromedicine/food.cfm This summary updates the information on the website to Sept 29, 2008.

The preliminary data collection was successfully completed in two Migrant Head Start Center sites in which the research team conducted one-on-one interviews and/or home visits with 60

families and 17 teachers as well as two focus groups. Data analysis revealed participants are knowledgeable of the benefits of having a diet that promotes health and understand the problem of overweight for themselves and their children, however, due to difficulty accessing healthy foods for reasons such as high cost, lack of transportation and job instability, the families tend to buy cheaper foods such as meat and sugars.

In light of these dietary issues, the Institute initiated additional phases of the project: 1) an intervention and 2) expanding research into food security issues among Latino migrant farm working men.

1) Intervention: After extensive discussion with many community groups about appropriate and feasible interventions, the idea of developing a Commercial Community Kitchen, to be named the Training Ladle, was selected. This community kitchen would provide many different services, e.g., nutrition and vocational education, and would become self sustaining through its own business ventures. Available funding sources that might be interested this type of program include: Golden LEAF Foundation, W.K. Kellogg, Tobacco Trust Fund, and the Sodexho Foundation. A letter of intent has been completed and submitted to W.K. Kellogg.

2) Food Security among Male Latino Farm Workers: This project investigated similarities and differences in food security status from the earlier study with children. Results: 55% percent of Latino farm worker men working in Eastern North Carolina without spouse or family are food insecure and 25% are experiencing hunger. This is higher than that reported recently in North Carolina among MSFWs, which estimated food insecurity levels to be between 36 and 42% in adults and 56.4% for families with children. From the group of families that we surveyed and interviewed for food security status, 68% were experiencing food insecurity. The Eastern part of North Carolina may be more prone to food insecurity than other areas because of lower income levels and more spread out cities and towns where food can be bought.

   In our sample, men with food insecurity without hunger were more likely to be married. While the amount they spent weekly on food did not differ significantly from men who were food secure, their answers to the questions about food patterns suggested that they were not secure with the amount of food they had to eat. If and how family responsibilities limited the amount they had to spend on food or what they ate may be relevant questions to further pursue.

National Tractor Safety Initiative: Designing Community-Based Social Marketing Programs for Tractor Safety--A Rollover Protective Structure Initiative: Pilot Study

Kristen Borre PhD, Duane Shaw Rowe, Jr. MPH, Robin Tutor, MPH, OTR/L, Luke A. Ertle MPH, Southern Coastal Agromedicine Center.

This project was initiated in July 2007

Presentations resulting from the research presented below can be obtained on the SCAC/Web Site at http://www.ecu.edu/cs-dhs/agromedicine/tractor.cfm . The NIOSH Center funded work is an extension of a project begun with funding provided through the University of Kentucky.

Technical solutions to prevent tractor-related deaths have been known and used for years; yet,

fatalities from agricultural tractors, especially from rollovers, remain the leading cause of death and serious injury in agriculture in the United States. While there is overwhelming data showing the danger of rollovers and proving that rollover protective structures (ROPS) with seatbelts are virtually 100% effective in preventing fatalities, many farmers and farm workers do not understand the reality of the risks.

The goal of this research was to determine the characteristics of farmers who use or do not use ROPS in order to determine a target population and an appropriate message for a social marketing campaign. This research identified the number of tractors without ROPS still being used on farms in North Carolina while identifying the appropriate means of communicating the risk of older equipment and communicating safety information to the farmers and farm workers.

Significant Findings: The feasibility of reaching farmers through interviews was established through this pilot study. We learned that to reach maximum response from participants, interviews should take place in late fall or winter, a time of least crop production as to not interfere with farmers' labor. Only 2 respondents out of 20 interviewed had taken advantage of Farm Bureau's incentive program for retrofitting ROPS on existing tractors. Respondents were willing to be educated on ROPS and other tractor safety items at the time of the interview.

The major recommendation for education and social marketing from this study is that there should be frank and open one on one discussions with farmers regarding the dangers of tractor rollovers and the risks associated with not wearing seat belts in conjunction with ROPS use. These discussions are essential to reducing the risk of tractor related fatalities in North Carolina. There is a strong need for increased safety awareness among all farmers regardless of educational level.

Pilot Study of Possible Interventions to Improve Occupational Safety and Health among Shrimp Fishermen

Michael Behm, PhD & Lena Carawan, PhD, East Carolina University

This Project was initiated in April 2008.

The purpose of this pilot study was to explore the occupational safety and health hazards, risks, and perceptions among shrimp fishermen in eastern North Carolina. A particular focus was that of potential boat design or re-design for improved occupational safety and health conditions. The researchers accompanied a shrimp boat captain and four crew members on a three-day trip in the Pamlico Sound. The pilot study had two components: observations of conditions and activities during the three days and to perform (nearly 60 hours) of interviews with the captain and crew. Observations revealed numerous physical occupational safety and health related issues including but not limited to ropes in aisle ways as tripping hazards, slippery floors, ergonomic issues with sorting shrimp, exposure to noise and sun, and various housekeeping issues.

Conclusions from the interviews were:

1) Occupational safety and health are neither priorities nor values among crew.
2) Illnesses are an even lower priority than injuries.
3) Government regulation, licensure issues, and fuel prices adversely affect the captain's risk taking in terms of preventative maintenance and priorities while planning fishing trips and at sea.

4) Because of the fishers' past negative experiences with academic researchers, access to this population remains an issue for researchers from any discipline.

The authors plan a journal article on this last point to stress the need for sensitivity among researchers when dealing with small-scale fisherman population.
Future Plans: 1) Using the data provided in the pilot study, seek funding for interventions (boat modifications) to address the hazardous conditions noted. The researchers have been encouraged to apply to the federal Sea Grant Fisheries Resource Grant by the program officer. 2) Using data from this study, seek funding from the University of Kentucky to continue to investigate workplace stressors among southeastern US commercial fishermen with a focus on the external context (economic, legal, political, technological, and demographic forces at the national/international level) as an influence on organizational and work contexts leading to occupational related stress. 3) The authors also plan to extend their research by participation in a planned NCAI survey to study the number of fishers, farm workers, and foresters with illnesses and injuries related to their occupations who report to rural health clinics. This data will complement the data provided by the pilot study

Qualitative Analysis of Farm Worker Risk Behavior with Tractors: A Pilot Study
Anne McLaughlin, PhD, Christopher Mayhorn PhD, North Carolina State University

This Project was initiated in March 2008.

Tractor accidents result in higher fatality and injury rates than any other agricultural danger. Our archival analysis of documented case studies of fatal accidents revealed an awareness of the risks associated with tractors especially among older farmers, yet the behavior still occurred. Older farmers are often highly experienced but they are at higher risk to die from tractor accidents. To understand the reasons behind this apparent disconnect between experience and safety among older farmers, it is necessary to gather information from them as to their daily practices, attitudes, and perceptions of hazards. Qualitative research is most suited to the beginning stages of such a project; thus focus groups were chosen as a data collection method. Focus groups allow deep exploration in a minimally structured environment and often reveal issues unimagined by researchers. Following a moderators guide specially developed for this project, farmers detailed what equipment they used, how often it was used during the year, what dangers they perceived from their equipment, and what strategies and safety systems they used to protect themselves. From this we learned which dangers are the most salient and which could be termed "hidden hazards."

The focus groups identified several areas that would benefit from research and design/redesign of farm equipment. The first of these areas are the hidden hazards. Farmers indicated much training occurs through an apprenticeship model rather than formal training. Hidden hazards may not be addressed in this training either because they are poorly understood by the trainer, occur infrequently, or there is not time to discuss them. A brief list of hidden hazards includes: fumes from machinery being repaired in an enclosed area, fumes from animal feces, the deceptively solid appearance of grain in an auger wagon, the speed of some machinery, and approaching someone working in an open field. The second area ripe for research and redesign contain many well known hazards which the work environment makes contact unavoidable. Farmers reported many tasks that required interaction with running equipment, typically for repair or maintenance activities. The last area of research concerns technology acceptance and adoption of safety equipment practices. Farmers were concerned with safety but accepted that

agricultural tasks often resulted in injury. An investigation of how to design to work with these attitudes would be highly beneficial.

VI. Southern Coastal Agromedicine Center Publications

2003

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Mirka, G, Shin, G, Kucera, K and Loomis, D, (In Press) "Use of the CABS Methodology to Assess Biomechanical Stress in Commercial Crab Fishermen", To Appear in *Applied Ergonomics*.

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