Increasing Adoption of Cost-effective Rollover Protective Structures (CROPS) by Farmers and Manufacturers

Section B

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B.1 Respondent Universe and Sampling Methods

According to the most recent data from the USDA Census of Agriculture (2007), there are over 47,000 farms in New York State and over 36,000 farms in Virginia. NIOSH has designed and tested five prototype cost-effective rollover protective structures (CROPS). A CROPS is a type of tractor roll over protective structure (ROPS). ROPS have been proven to be an effective engineering solution to deaths and injuries from tractor roll overs, which are the leading cause of occupational fatalities in the agricultural production sector (the one most closely allied with farming). These five prototype designs cover about 1/3 of all the unprotected tractors without ROPS which are operating on farms today. Representatives from two states which are currently conducting a limited ROPS retrofit program in their state, have agreed to be collaborators/contractors with NIOSH on the research study.

Since the state collaborators/contractors conduct a ROPS retrofit program in their state, they have a database of farm tractor owner/operators which includes contact information as well as the type of tractor(s) owned. The database also includes those farmers who previously expressed an interest in retrofitting a tractor, but did not follow through with the process. In order to develop a list of potential demonstrators, this group will be matched against the 5 models of tractors which the CROPS will fit. The state collaborators/contractors will select potential CROPS tractor owner/operator demonstrators (30 per state) according to geographic proximity in order to complete two CROPS demonstrations per day with the associated data collection. This is a selection criteria since a team of NIOSH Division of Safety Research (DSR) personnel are going to be at the demonstration sites to assist the farmers in the retrofitting process. A trailer of tools, parts, and equipment will be driven to the sites for this purpose.

An observer group of about 340 participants (5-6 observers for each of the 60 demonstration sites) composed of farm tractor owner/operators, fabricators that serve the community and could potentially serve as a community CROPS fabricator, and local influential community leaders will also be invited to observe installation of the CROPS in the field.

Thus, two samples will be utilized for the research project:

1. Farmers (subjects) who have been identified as having the required tractors from the two states' databases will be invited to participate as a demonstrator of how to install (retrofit) a CROPS on their tractor. Preliminary data from the states indicated that New York had 50 tractor owner/operators that matched these models and Virginia had 35 within their databases. The study population for demonstrating CROPS retrofitting on 30 tractors in each state would be 60% and 86% of the total respondent pool for the sample utilized. Those agreeing will be placed in a sample pool and state collaborators/contractors will select the farm tractor owner/operator to participate based upon geographic proximity and location. This requirement is needed since a NIOSH project team will be at each site and based on previous tests by NIOSH personnel, it is anticipated the demonstration process should require between 2 – 4 hours of time. It is anticipated that two CROPS retrofit demonstrations per day can be completed, with the associated data collection, while in the field. Video taping of the procedure will be done in order to capture the installation procedures and to determine if any ergonomic issues are revealed with the CROPS retrofitting process.

Base levels of knowledge, attitudes, and behaviors will be collected and established by means of a pre-test, which will be compared to a test and post-test. The pre-test will be given prior to the CROPS demonstration installation and the test after the demonstration (on-site). A one year follow-up will be conducted with the farm tractor owner/operator demonstrators to determine if they are satisfied with their decision to retrofit a CROPS and if they have any new or additional issues or concerns regarding the CROPS.

2. Five to six observers for each CROPS demonstration retrofit site will be sought. The demonstrator farmers will be asked to identify other persons who potentially would be interested in observing the demonstration of CROPS retrofitting i.e., their neighbors, fabricators in the community who could potentially serve as a community CROPS fabricator, and local influential community leaders. The state collaborators/contractors will also be utilized for their knowledge of these persons. State collaborators/contractors are ultimately responsible for enrolling the observers.

The observers will be queried for their perception as to the utility and value of the design, along with the process for retrofitting CROPS. Base levels of knowledge, attitudes, and behaviors will be established by means of a pre-test, which will be compared to a test and post-test to determine the role of the demonstration project in having an impact on the observers. A one year follow-up survey of the respondents will be conducted to assess any impact over time.

Based on prior survey research by the New York state collaborator/contractor (May et. al, 2006; Sorensen et. al, 2006), an 87% response rate was obtained on a survey dealing with similar subject matter. It is anticipated that an 80% response rate for this study will be achievable.

B.2 Procedures for the Collection of Information

State collaborator/contactors will be responsible for enrolling farm tractor owner/operator CROPS retrofit demonstrators and observers for the demonstration sites.

Farmer demonstrators will complete a pretest mailed to them prior to the date of the CROPS retrofit demonstration on their farm. On the date of the scheduled CROPS demonstration, the observers will have privacy act information and consent information read to them and take a pretest (all lasting approximately 15 minutes) while the demonstration is being set-up and the demonstrator is familiarizing himself with the CROPS assembly instructions. Farm tractor/owner demonstrators will retrofit a tractor with a CROPS while observers watch the process, which should take about 3 hours. At the end of the CROPS demonstration and while still at the farm demonstration site, observers and the demonstrator will take a test. About one year later both demonstrators and observers will be mailed a post test.

Farm tractor owner/operators indicating an interest in participating as a CROPS demonstrator will be selected from the participating state databases. The states chosen were selected because they currently conduct a limited ROPS retrofit program. There are farm tractor owner/operators

in their databases who indicated they were interested in retrofitting their tractor with a ROPS, but did not follow through with the process. The database also includes the farmer's contact information as well as the type of tractor owned. This information will be matched to the five types of prototype designs for CROPS which NIOSH engineers have developed and tested for five tractors: Ford-8N, Ford-3000, Ford 4600, Ford-4000 and Massey-Ferguson 135. Preliminary data from the states indicated New York had 50 tractor owner/operators that matched these models and Virginia had 35 within their databases. The study population for demonstrating CROPS retrofitting on 30 tractors in each state would be 60% and 86% of the total respondent pool for the sample utilized.

Finally, it is acknowledged that the study population contains only those farm tractor owner/operators who contacted their state's ROPS retrofit program (for the CROPS demonstrators) and thus are likely a biased sample. However, this population has not been studied before and may identify barriers and incentives to CROPS/ROPS retrofitting that would not be known otherwise. Similarly, the observers will likely be a convenience sample or a snowball sample. The demographic and economic data will be compared to each state's USDA Census of agriculture data to assess similarities and variations. It is likely the population sampled will not be representative of all farmers in each respective state and this will be acknowledged in any presentations and as a limitation in any peer-reviewed publications. However, given the general scarcity of research on the topic of ROPS retrofitting in production agriculture, the proposed project will be an important step in identifying barriers and approaches for encouraging farmers to retrofit a CROPS/ROPS to their tractor(s).

Farm tractor owners/operators who have a tractor for which NIOSH has developed a CROPS retrofit design, which accounts for over 1/3 of the tractors without a ROPS on farms, will be identified by the contractors in the states of New York and Virginia. These individuals will be allowed to self-select whether they wish to participate in the CROPS demonstration program. Thirty farm tractor owner/operators in each state will be selected based upon geographic proximity (in order to allow two CROPS retrofits per day) and the CROPS retrofit demonstration will be conducted on their farms. Based on previous tests by NIOSH personnel, it is anticipated the demonstration process should require between 2 – 4 hours of time and effort. In addition, these farm tractor owner/operator CROPS demonstrators will be asked to identify others who would be interested in observing the demonstration of CROPS retrofitting, allowing others to observe the CROPS demonstration retrofitting on their farm, and answering demographic questions and questions regarding their knowledge, attitudes and behaviors about ROPS/CROPS. Additionally, the demonstrator farmer will be asked questions regarding the difficulty or ease of the process of retrofitting the CROPS. Finally, a one year follow-up will be conducted with the farm tractor owner/operators to determine if they are satisfied with their decision to retrofit a CROPS and if they have any additional issues or concerns regarding the CROPS. Videotaping of the procedure will be done in order to capture the installation procedures and to determine if any ergonomic issues are revealed with the CROPS retrofitting process. Media release forms will be obtained from the demonstrators and the video camera(s) will be positioned so that no others will be captured on camera. This aspect of the study will provide user feedback to NIOSH and external developers on assembly issues for a CROPS design retrofit under field conditions.

Observers which consist of other farmers, fabricators, and local influential community leaders, will be invited by the state collaborators/contractors to watch the installation of the CROPS in the field. It is anticipated there will be 5-16 observers for each CROPS demonstration site. The observers will be queried for their perception as to the utility and value of the design, along with the process for retrofitting CROPS. Base levels of knowledge, attitudes, and behaviors will be established by means of a pretest, which will be compared to a test (to be conducted at the demonstration site), to determine the role of the demonstration project in having an impact on the tractor owners/operators and observers. A one year follow-up survey of the observation group will be conducted to assess any level of impact remaining over time.

Data will be overseen by the project officer, David Hard, in Morgantown, WV. Hard copy information will be entered electronically into SAS data entry forms/fields which will have been designed by DSR/AFEB personnel and reside on firewall and password protected CDC computer's hard drive or a LAN with controlled access. Personal identifiers (name) will not be entered into the electronic file; numeric codes will be used which will not be based on any personal identifying information. Hard copy survey's will be kept in lockable file cabinets in a lockable office, inside a lockable office suite. Access will be controlled by the project officer.

State collaborators/contractors will be responsible for contacting and enrolling CROPS demonstrators and observers and making any follow-up contacts. They will also collect all hardcopy data. Upon completion of the proposed research, the data will be maintained by the DSR as "active" files for a period of up to five years due to their unique and intrinsic value to researchers. Subsequently, the data will be maintained as archived protected data files for a period of up to 20 years in accordance with the CDC Records Control Schedule. Any NIOSH (DSR) staff who handles the data will be required to keep their confidentiality training up-to-date.

Pretest surveys of the observers and CROPS farm tractor owner/operator demonstrators will collect demographic information (size of farm, income, age, off-farm work, etc.) and baseline knowledge, beliefs and attitudes regarding ROPS/CROPS. This information will be reported as univariate analyses. The demographic data will be compared to each states' farm population as captured by the Census of Agriculture to determine if the sample reflects the states' general farm characteristics. The pretest, test and post-test responses of the observers will be assessed and reported as a percent change to determine the impact of the demonstration on these variables. Statistical significance of this percent change will be determined via McNemar's test. The one-year follow-up post-test will assess the percent change from the initial test to assess any lasting impact of the demonstration over time.

Farm tractor owner/operator data will be analyzed for why they have not previously retrofitted their tractors with a ROPS, thus helping to identify barriers to adoption. Additionally they will be asked questions to assess the level of effort required to retrofit the CROPS, their overall assessment of whether the process was worthwhile and if they would consider retrofitting another tractor with a CROPS or ROPS. The subset of the population who are farm tractor owner/operators will be compared to previous survey results from the state of New York to assess whether there are any differences or similarities between them. Additionally, while not a

main research emphasis, analyses will be conducted for any significant differences among the means of this subset of the population between the two states.

It is anticipated there will be 400 observers of the CROPS demonstration retrofits. Assuming all 400 complete surveys, and the scales are collapsed into agree/neutral/disagree, precision (in terms of what the 95% confidence interval would be) for the percentage who agree is presented in Table 1 below for varying values of the estimate of the percent of people who agree (based on the formula 1.96*sqrt[p(1-p)/n]):

Table 1. Precision of prevalence estimation of attitudes from survey

Percent agree	Precision
10%	±3%
25%	±4%
50%	±5%
75%	±4%
90%	±3%

Power for pre-post tests on changes in attitudes
The assumption is that 400 persons have pre-post data completed. For the purpose of power calculations, persons are classified as either agree or disagree for a specific question. All power calculations were performed using a SAS simulation program employing McNemar's test in the analysis and setting alpha to 0.05.

Condition 1:
Assume that on the pre-questionnaire, a specific question results in 20% agreeing with the question. Assume that out of the 80 persons who agree, 60 will agree after the demonstration and out of the 320 who disagreed prior to the demonstration, 280 will still disagree after the demonstration. This will lead to a total 25% agreement after the demonstration (which is a 25% increase from the original 20%). The power to detect a difference from pre to post demonstration is 76%.

Condition 2:
Assume that on the pre-questionnaire, a specific question results in 50% agreeing with the question. Assume that out of the 200 persons who agree, 150 will agree after the demonstration and out of the 200 who disagreed prior to the demonstration, 100 will still disagree after the demonstration. This will lead to a total 62.5% agreement after the demonstration (which is a 25% increase from the original 50%). The power to detect a difference from pre to post demonstration is 99.7%.

Condition 3:
Assume that on the pre-questionnaire, a specific question results in 75% agreeing with the question. Assume that out of the 300 persons who agree, 280 will agree after the demonstration and out of the 100 who disagreed prior to the demonstration, 60 will still disagree after the demonstration. This will lead to a total 80% agreement after the demonstration (which is a

6.67% increase from the original 75%). The power to detect a difference from pre to post demonstration is 77%.

B.3 Methods to Maximize Response Rates and Deal with Nonresponse

Based on prior survey research by one of the state collaborators (New York), an 87% response rate was obtained on a survey dealing with similar subject matter. Farm tractor owner/operator demonstrators will be asked to complete a pre-test prior to the demonstration dates/sites and then the test immediately after the CROPS retrofits demonstration. Observer respondents will be asked to complete both pre-test and test questionnaires at the demonstration sites. Both groups of participants will be asked to complete a post-test questionnaire about one year later and return it in a pre-paid pre-addressed mailer. Thus we anticipate at least an 80% response rate. The following steps will be taken to encourage participation in the research study and assure achieving this response rate:

1. The states will notify their constituents of the study via newsletters and electronic notifications. The dissemination effort may help to influence potential respondents to participate.

2. The pre-test and post-test will have a cover letter signed by their respective state organizations' director indicating their support for the study and encouraging them to participate. The support by state leaders should help influence potential respondents to participate.

3. The questionnaire has been designed to be as non-burdensome as possible. This includes ordering the questions in a logical sequence and asking only those questions that are needed for analytic purposes.

The possibility for non-response bias is present in any study utilizing self-reported survey data. The demographic data in the state's database for the CROPS demonstrators will be compared to any non-respondents. For the observers, early and late responders will also be compared, since there is no database available for them. This will provide insight on any potential response bias.

It is acknowledged for the CROPS farm tractor owner/operator demonstrators, the study population contains only those farm tractor owner/operators who have expressed an interest in retrofitting their tractors with a ROPS and thus are not representative of all farmers in their respective states. However, at the present time, these databases offer the best potential for identifying farmers with the requisite tractor models needed and can provide insight into why they did not elect to complete the tractor ROPS retrofit process. Given the general scarcity of research on ROPS tractor retrofitting and since tractor roll overs are the leading source of occupational deaths in the agricultural production sector, the proposed project will be an important step in identifying barriers and approaches for encouraging farm tractor owner/operators to install CROPS/ROPS on their tractors.

B.4 Test of Procedures or Methods to be Undertaken

Pretest surveys of the observers and CROPS farm tractor owner/operator demonstrators will collect demographic information (size of farm, income, age, off-farm work, etc.) and baseline knowledge regarding ROPS/CROPS. This information will be reported as univariate analyses. The demographic data will be compared to each state's farm population as captured by the USDA Census of Agriculture to determine if the sample reflects the states' general farm characteristics. The pretest and test responses of the observers will be assessed and reported as a percent change to determine the impact of the demonstration on these variables. Statistical significance of this percent change will be determined via McNemar's test. The one-year follow-up post-test will assess the percent change from the initial post-test to assess any lasting impact of the demonstration over time. The questions used from New York's earlier survey and their findings will be compared to the current research findings to determine if there are any similarities or differences among this group.

Farm tractor owner/operator demonstrator data will be analyzed for why they have not previously retrofitted their tractors with a ROPS, thus helping to identify barriers to adoption. Additionally they will be asked questions to assess the level of effort required to retrofit the CROPS, their overall assessment of whether the process was worthwhile and if they would consider retrofitting another tractor with a CROPS or ROPS. The subset of the population who are farm tractor owner/operators will be compared to earlier survey results from the state of New York to assess whether there are any differences or similarities between them. Additionally, while not a main research emphasis, analyses will be conducted for any significant differences among the means of this subset of the population between the two states.

B.5 Individuals Consulted on Statistical Aspects and Individuals Collecting and/or Analyzing Data

The following individuals will be involved in the design, collection and analysis of the data obtained in this study:

David L. Hard, Ph.D. – Project officer/Research Health Scientist, Analysis and Field Evaluations Branch, Division of Safety Research, NIOSH, Morgantown WV, 304-285-6068, dlh6@cdc.gov will be involved in the design, collection and analysis of data.

Scott Hendricks, M.P.H. – Statistician, Analysis and Field Evaluations Branch, Division of Safety Research, NIOSH, Morgantown WV, 304-285-6000, sah5@cdc.gov will be involved in the design and analysis of data.

Lunette Utter – Data Collection Specialist, Analysis and Field Evaluations Branch, Division of Safety Research, NIOSH, Morgantown WV, 304-285-6001, lku1@cdc.gov will be involved in the collection of the data.
John May, MD – Director, New York Center for Agricultural Medicine and Health, Cooperstown, NY, 607-547-048, john.may@bassett.org will be involved in the collection of data.

Bruce Stone – Safety Manager, Virginia Farm Bureau Insurance Company, Richmond, VA, 804-290-1381, Bruce.Stone@vafb.com will be involved in the collection of the data.