Utilizing Expert Panels in Agricultural Safety and Health Research

D. M. Kingman, A. M. Yoder, N. S. Hodge, R. Ortega, W. E. Field

ABSTRACT. This article reports on the use of expert panels by Purdue University’s Agricultural Safety and Health Program staff to address three separate research questions related to: (1) developing strategies for the prevention of flowing grain engulfments, (2) evaluation of commercial lifts used by operators with restricted mobility to gain access to agricultural tractors and equipment, and (3) identifying essential competencies for youth enrolled in federally mandated tractor and machinery certification programs. Advantages and disadvantages associated with the use of expert panels are addressed, and specific examples of outcomes are presented. Recommendations for using expert panels during research projects are also included.

Keywords. Consensus, Ergonomics, Evaluation, Expert panel, Hazard rating, Safety.

Plans fail for lack of counsel, but with many advisors they succeed.

Hebrew Proverb

Seeking the wisdom, knowledge, and experience of others is an age-old decision-making process. It has been used by individuals, families, organizations, and nations to help in making plans and decisions that are more likely to have successful outcomes. In some cases, the problems or needed solutions are so complex that additional input is required and sought from several sources or a group of recognized experts. This collective information-gathering process provides multiple perspectives on the issues and a richer pool of information from which to derive potential choices or solutions. Over the years, many descriptors have been given to these groups including councils, boards, cabinets, committees, and expert panels. This article reports on the use of expert panels by Purdue University’s Agricultural Safety and Health Program (PUASHP) staff to address three separate research questions related to developing strategies for the prevention of flowing grain engulfments, evaluation of commercial lifts used by operators with restricted mobility to gain access to agricultural tractors and equipment, and identifying essential desired competencies for youth to learn while enrolled in federally mandated tractor and machinery certification programs. Advantages and disadvantages associated with the use of expert panels are addressed, and specific examples of outcomes are presented.

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The authors are Douglas M. Kingman, ASAE Member, Assistant Professor, Department of Agriculture, Illinois State University, Normal, Illinois; Aaron M. Yoder, ASAE Member, Instructor, Department of Agricultural and Biological Engineering, Pennsylvania State University, University Park, Pennsylvania; Natalie S. Hodge, Agricultural Science Teacher, Whiteland Community High School, Whiteland, Indiana; Robbie Ortega, Research Assistant, and William E. Field, ASAE Member, Professor, Department of Agricultural and Biological Engineering, Purdue University, West Lafayette, Indiana; Corresponding author: Douglas M. Kingman, Department of Agriculture, Illinois State University, campus box 5020, Normal IL 61790–5020; phone: 309–438–2925; fax: 309–438–5653; e-mail: dougkingman@ilstu.edu.
Literature Review

Upon review of the literature, it became apparent that the use of expert panels has become a well-documented tool for use in decision making (Egan and Jones, 1997; Hill, 1997; Murphy, 1992). There is considerable evidence to indicate that many industries and organizations have successfully utilized groups of individuals to participate in decision-making or problem-solving activities by soliciting informed opinion or recommendations from them. It further appeared that use of expert opinions has been widely accepted to assist in the identification of problems, formulation of ideas, development of intervention strategies, and policy making. However, few references were found that reported on the use of expert panels in areas related to agricultural safety and health.

The Delphi technique, for example, was developed in 1948 at the Rand Corporation to specifically elicit expert opinion using a systematic methodology consisting of questions, controlled feedback, information refinement, and iteration (Helmer and Rescher, 1960; Sackman, 1975). Typical methodology of the Delphi technique involves the use of a series of questionnaires. In the first round, open-ended questions allow the generation of a wide range of opinions, which are summarized and used to generate the second instrument. In the second and subsequent rounds, the participants are asked to rank the items (Delbecq et al., 1975; Dalkey, 1969; Brooks, 1979; Helmer, 1966) or use a Likert-type scale to rate the items (Bunning, 1979; Buriaik and Shinn, 1988; Steffen, 1990). These rounds also allow feedback and ask for defense of extreme ratings or rankings. “This process stops when consensus has been approached among participants, or when sufficient information exchange has been obtained” (Delbecq et al., 1975). The Delphi technique has been used by major industries to build consensus among experts even though information exchange was conducted through a moderator and experts had no direct contact with each other (Meyer and Booker, 1991). The Delphi technique has also been used successfully in agricultural safety and health research (Baker et al., 2001; Hubert et al., 2001; Kingman et al., 2004).

The health industry has also relied heavily on expert opinion. Panels, which have consisted of doctors, nurses, psychologists, other health care professionals, and even patients, have been used to validate the effectiveness of questionnaires, assign weights to assessment questions, and to derive assessment question topics (Seiler, 1973; McDowell and Newell, 1996). It was found, for example, that when the health industry attempted to validate the effectiveness of a questionnaire, researchers usually compared results to an established database. When new areas of research were addressed, those types of comparisons were irrelevant or impossible to make and the use of expert panels was relied on to provide validation (McDowell and Newell, 1996).

An approach to curriculum development, as emphasized by Pratt (1980), is the use of an advisory committee or curriculum team. Pratt looked at the formation of a curriculum team using individuals with expertise in at least six areas. Pratt stated that three of the expertise areas are critical to the development of a comprehensive curriculum, while three are important to curriculum development. Subject matter, pedagogy, and curriculum design are critical, while measurement, organization, and writing skills are important. Pratt also stated that it is necessary to include representatives from any constituencies that include potential users of the curriculum. “A more creative and broader interplay of ideas is possible than any member of the team could achieve autonomously” (Pratt, 1980).

The Nuclear Regulatory Commission (NRC) used expert opinion to estimate human error rates in order to conduct probabilistic risk assessments. After the Three Mile Island nuclear power plant disaster, efforts to determine the reliability of nuclear power
generation systems were demanded by the public and regulatory agencies. Human decision–making reliability was a major component of these analyses, but no credible probabilistic data existed related to human error rates (Embrey et al., 1984). Embrey (1986) derived human failure rates by eliciting information from an expert panel. With human failure rates derived, the estimates for the reliability of nuclear power plants and the probability of another major catastrophe were generated (Embrey, 1986; Gertman and Blackman, 1994).

Expert panels utilizing standard hazard rating matrices have been used by general industry to analyze system reliability and identify system–critical components and processes (Keyserling and Wittig, 1988; Murphy, 1992; Brauer, 1994; Nielsen, 1994; Closky et al., 1995; Hill, 1997). Examples were identified where panel members, such as process and design engineers, equipment suppliers and designers, construction and maintenance personnel, and systems safety specialists were asked to assign a likelihood–of–failure rating and a corresponding severity rating to system components (Brauer, 1994). These ratings were then used to fill in hazard risk assessment matrices.

Hazard rating matrices have been used by emergency management agencies to predict the probability of certain catastrophic events. In Sarpy County, Nebraska, officials formed a risk assessment and catastrophe preparation committee to rate the likelihood and potential severity of natural and man–caused events (Sarpy County, 2000). Tornadoes, floods, fuel spills, riots, and dam failure were included in the analysis. Each item was given an outcome severity score that determined the possible amount of property damage and a likelihood score that reflected the committee’s perception of the probability of occurrence. Based on rankings calculated by combining the scores, the committee recommended that preparations be considered for certain events with the highest probability of occurrence and the highest severity of damage.

In one case, a group of wildland firefighters, engine captains, hand–crew bosses, and dozer operators was used to obtain fireline production rates for use in stochastic simulations of initial attacks on wildland fires (Fried and Gilless, 1989). Tobin and Rajagopal (1990), using a mail survey, relied on over 1,000 experts to provide an estimate of the number and the level of contamination of private drinking water wells in the state of Iowa, when exact numerical values were impossible to attain. Lawrence et al. (1997) validated a prototype decision support system for evaluating four rangeland management systems by comparing the results to the observations of an expert panel. Neumann and Foran (1997) used expert opinion to construct the framework for conducting risk assessments of waterborne pathogens in rural drinking water sources. Egan and Jones (1997) solicited 20 experts using the Delphi technique to determine forest harvest impact assessment criteria. The Certified Safe Farm (CSF) hazard evaluation checklist was developed utilizing input from a five–member panel of experts (I–CASH, 1999).

Expert panels are extensively used in human factors and ergonomics research (Nielsen, 1994; Nielsen and Landauer, 1993; Nielsen, 1992; Keyserling and Wittig, 1988). For instance, Nielsen (1992) found that heuristic evaluation is difficult for a single individual to do because one person could never find all the usability problems. For instance, figure 1 shows a case where 19 evaluators (represented by rows) were used to find 16 usability problems (represented by columns) in a voice response system allowing customers access to their bank accounts (Nielsen, 1992). The far right column represents a usability problem that was easy to identify; whereas, the far left column represents a usability problem that was hard to identify. Figure 1 also shows that different evaluators identified a different variety of problems, justifying the use of more than one trained evaluator.

In the same study, Nielsen (1992) stated that determining the number of evaluators needed for an evaluation is a difficult task. Similarly, Nielsen (1994) found that single
evaluators found only 35% of usability problems associated with a voice response system for accessing bank accounts. However, referring back to figure 1, different evaluators can find different problems. Nielsen and Landauer (1993) constructed a model (eq. 1) that predicted the number of usability problems found, Problems Found \( (i) \), based on the total number of usability problems \( (N) \), the number of evaluators \( (i) \), and the proportion of problems found by a single evaluator \( (l) \):

\[
\text{Problems Found } (i) = N \left[ 1 - \left( 1 - l \right)^i \right] \quad (1)
\]

Averages from six case studies by Nielsen (1994) were used in this equation to determine that three to five experts would be the optimal for determining usability problems in the case based on the proportion of usability problems found by using various numbers of evaluators (fig. 2).

Continuing the search for the optimal size of an expert panel for determining usability problems, Nielsen (1994) used a total cost equation (eq. 2) to determine the cost of an expert panel:

\[
\text{Cost } (i) = \left[ \text{Fixed Cost} + \text{Variable Costs } (i) \right] \quad (2)
\]

Figure 1. Usability problems associated with a voice response system for accessing bank accounts (Nielsen, 1992).

Figure 2. Proportion of usability problems found by using various numbers of evaluators (Nielsen, 1994).
The result of equations 1 and 2 were used to develop a ratio of costs to benefits, which peaks at four, showing that based on the cost–benefit ratio, four is the optimal number of experts to have in the panel (fig. 3). This confirms Nielsen’s earlier prediction that three to five experts should be used. Despite the fact that these equations provide a good baseline, they may not apply to all expert panel situations.

Hill (1997) stated that the use of expert panels to perform risk ranking and other functions in risk–based programs is likely to greatly increase as economic considerations make risk–based programs more popular and the expert panel becomes an integral part of risk–management programs. However, Hill continues that the outcomes of an expert panel process may not be fully documentable or reproducible. This does not mean that expert panels are not useful, but they are more of a soft science. This is documented in the findings shown in figure 2, which suggest that even with a large number of experts all the problems are not identified.

The evidence found, however, justifies the use of an expert panel as a cost–effective tool in agricultural research. It also suggests that three to five members should be used for an expert panel when conducting usability studies related to ergonomics research. However, this does not imply that three to five experts is the optimum size for other types of expert panels.

**Use of Expert Panels by Purdue University’s Agricultural Safety and Health Program Staff**

Through a collective evaluation process involving researchers conducting three separate assessment projects at Purdue University, a decision was made that each project could benefit from the use of external expert opinions. Even though there were similarities between the projects, each was complex enough that relying only on the available data and the knowledge and experience of the researchers involved would have led to incomplete results. The following section describes the three projects and how expert panels were utilized.
Identifying Contributing Factors To Flowing Grain Engulfments

Research was initiated to develop intervention strategies aimed at reducing engulfments in flowing grain that occur in on–farm grain bins. In order to focus the strategies on the most important areas, a list of causative factors had been developed. However, this list had only been produced within the bounds of a literature review, on–site investigations, and other in–house research activities and had possible shortcomings. It was believed that there was the potential for the existence of unidentified contributing factors and ambiguity in the terminology used to define causative factors. In addition, it was necessary to prioritize the factors by determining their level of importance in contributing to flowing grain engulfments. As a means of validating the completeness and significance of the causative factors identified, an external expert panel was utilized. The panel also reviewed and provided feedback on the potential effectiveness of a draft ASAE standard being developed for on–farm grain bin storage safety.

Potential expert panel candidates were identified who met at least one of the following criteria: university agricultural or occupational safety specialist or instructor, grain farmer, industrial safety consultant, knowledgeable about hazards related to confined spaces, hazard analysis experience in conducting on–site investigations of engulfment in flowing materials, epidemiologist, manufacturer of grain storage bins, experience with the management of stored grain, or experience with confined space entry and rescue procedures.

Since this was not an ergonomics–related usability study, more than five members were selected for this expert panel. Twenty–three individuals were contacted by phone or e–mailed to assess their willingness to serve and their availability to attend a two–day meeting. Ten individuals agreed to participate in the study, and each was sent a letter of invitation that was accompanied by the 2001 fatal engulfment summary (Kingman et al., 2001) and the draft ASAE standard on grain bin safety. Invitees were asked to review the findings and the standard and provide feedback. Not only did this activity facilitate the generation of initial feedback, it familiarized the panel members with the research process related to the project and the characterization of engulfment deaths.

Prior to the meeting, each panel member was sent a pre–meeting packet that contained: (1) a cause and effect diagram of contributing factors (the diagram was provided so the panel could visualize the preliminary list of contributing factors), (2) three contributing factor rating sheets, (3) directions for filling out the factor rating sheets, (4) a return addressed envelope with postage, and (5) directions and details concerning the meeting site.

The rating sheets were intended to ascertain the experts’ perception of the importance of each contributing factor. The panel members were asked to weigh the potential contributions each factor made to the likelihood of engulfment on a scale of 1 to 20, with 1 being a less significant contributor and 20 being the most significant contributor. The summary of ratings assigned by the expert panel members was reviewed to determine the potential for building consensus with respect to ranking the factors during the group sessions. Because of the diversity of the initial ratings, it was determined that an agreement of experts on a numerical value (ranking) for each factor during the meeting was unlikely, and that a ranking system with narrower limits was needed.

The meeting of the panel occurred over a period of two days. The first day was designed to allow the attendees to become familiar with each other and provide them with additional background of the related research activities and preliminary findings of the project. Each attendee was given an opportunity to introduce himself to the group and provide a short background of his professional experience and his purpose for serving on
the committee. These team–building activities led to increased group interaction and the building of rapport between panel members.

Following the introductions and the presentation of engulfment research findings, members engaged in a group discussion with a survivor and witness of an engulfment. A farmer, who had survived an engulfment, and his brother, who witnessed the engulfment, provided an account of the incident. The panelists identified the contributing factors to the engulfment during the questioning. This portion of the meeting provided panelists with a direct link to the engulfment problem and increased their interest in being part of an effort to develop intervention strategies.

Following a tour of a facility with a large number of grain storage bins, the consensus–building sessions were held. During these sessions, previously identified contributing factors were presented by a facilitator, and members were asked to place each factor in one of four categories, low, medium, high, and maximum, to reflect its level of importance in contributing to the likelihood of an engulfment (fig. 4). Some factors were quickly placed in a category, while other factors were the focus of intense debate. The time required to arrive at a consensus was directly related to the discrepancy between the preliminary ratings of the factors assigned by the experts prior to the meeting. The greater the difference in opinion, the longer the time that was required to arrive at a consensus.

Contributing factors, which were pre–printed on small sheets of paper, were taped to the board under one of the weighted categories after a consensus was achieved. This process was continuous, and members were allowed to revisit a previously placed factor and could suggest moving it to another category. The facilitator also recorded new factors derived during the discussions and recommendations to accommodate changes in terminology. The result of the consensus activities was a comprehensive list of factors that were categorized by level of importance. This was viewed as an important achievement in determining which factors were most likely to contribute to an engulfment.

A week after the consensus–building sessions were completed, the panel members received factor ranking sheets and directions for completing the sheets. This provided another opportunity for the panel to rank the contributing factors that were categorized by level of importance. Results were combined and a final prioritized list of factors was developed for final review by the panel. The findings reflected a high degree of

Figure 4. Categories of importance for contributory factors.
consistency among the panel members and were used to develop a hazard assessment tool for on–farm grain storage and to modify the draft grain bin safety standard.

**Ergonomic Analysis of Operator Lifts with an Expert Panel**

The second project was designed to develop and administer a systems approach for evaluating ergonomic and safety issues related to the application of commercially available operator lifts on agricultural and other off–road machinery to provide a means for operators with restricted mobility to gain access to the operator’s station. Findings should lead to improved operator safety and comfort, broader use of operator lifts on off–highway equipment, and increased vocational opportunities for individuals with severe disabilities.

One of the needs of this study was to validate newly designed analysis strategies and survey instruments for operator lifts. This was accomplished by utilizing a panel of experts in the field of assistive technology to conduct an independent ergonomic evaluation of the operator lifts.

Since this was an ergonomics–related usability study, four members were selected for this expert panel. Three external individuals representing strong engineering and service delivery experience and one internal staff member working with the Breaking New Ground Resource Center were invited to participate on the expert panel to conduct an assessment of the most widely used commercial lifts fabricated by LifeEssentials of West Lafayette, Indiana. Upon their confirmation to participate, each of panel member was mailed an information packet consisting of background information about operator lifts mounted on agricultural machinery, a description of the research project, an introduction to heuristic analysis, and an introduction to error modes and effects analysis.

The expert panel then met for two days at Purdue University in West Lafayette, Indiana, where they conducted a heuristic analysis and error modes and effects analysis on three different configurations of operator lifts manufactured by LifeEssentials and evaluated the preliminary lift user’s questionnaire. Two of the three lifts evaluated were vertical–mast chair lifts that were mounted on individual tractors, and the third was a vertical–mast sling lift that was mounted independently on a trailer. The heuristic analysis and error modes and effects analysis were conducted in a laboratory setting and not in the field.

The first morning of the expert panel meeting was used to reintroduce some of the materials that had been mailed to the panel members, including an introduction to operator lifts and the project. A tour of LifeEssentials was also conducted during the first morning. At LifeEssentials, the panel was given the opportunity to see how the lifts were made and work on team building.

Approximately four hours of the first afternoon were used to conduct the heuristic analysis. First, the panel members were introduced to basic heuristic analysis techniques. Since heuristic analysis can be a complicated process, it was necessary to take additional time to train the panel members in its use. They were trained using Lund’s 1997 article on expert ratings of usability maxims and then verbally completed a heuristic analysis of a common object, a vacuum cleaner, as a group. Once trained, the panel members were given the heuristic analysis forms (fig. 5), provided adequate time to become familiar with the use of the three lifts, and completed their heuristic evaluation forms. Once the forms were completed, the researcher led a discussion on the observations made.

Approximately four hours of the second morning were devoted to conducting an error modes and effects analysis (EMEA). Again, the panel members were trained to conduct an EMEA and were presented with the error modes and effects analysis forms (fig. 6). The training consisted of reviewing Lehto’s 1996 article on designing warning signs and labels, which used an EMEA, and performing an EMEA on a vacuum cleaner. The panel
was again given time to use the three lifts and complete their EMEA. Once the forms were completed, the researcher led a discussion on the results of the observations.

Approximately three hours of the second afternoon were used for validation of the draft questionnaire that was designed to gather additional input from farm equipment operators who used operator lifts to gain access to their equipment. The questionnaire consisted of 40 questions in a variety of formats, including questions designed to collect demographic and ergonomic–related information. The panel members were given a draft copy of the proposed lift user’s questionnaire and asked to evaluate it based on the results of their heuristic and error modes and effects analysis as well as their professional experiences. Following time for review, a discussion was held on the design of the questionnaire. The panel made suggestions that enhanced the clarity of the questions and that increased the likelihood of more useful responses.

Figure 5. Sample heuristic analysis form.
After the recommended changes were made to the questionnaire, it was sent to the panel members individually for a final review and comment. Their additional comments were incorporated into the final questionnaire before it was administered. The results of the expert panel contributed several meaningful outcomes, such as recommendations for future lift designs and modification of current lifts.

**Tractor Safety Certification Curriculum Development**

For the third project, an expert panel was convened as part of an ongoing CDC/NIOSH sponsored project at Purdue to develop a new curriculum for the federally required youth safety certification programs under the Fair Labor Standards Act of 1938 (U.S. Code, 1971). The purpose of the panel was to develop and prioritize a list of critical agricultural safety and health competencies on which an interactive computer-assisted instruction/multimedia curriculum would be based and to provide guidance to the project throughout its duration. Two 2-day work sessions of the panel were held approximately one year apart with a regular exchange of information between meetings.

The first step in the expert panel process was to develop a list of possible candidates for the panel. The curriculum design team met and identified those groups or organizations that should be represented on the panel. The team selected groups that included agricultural safety specialists, agricultural equipment manufacturers, 4-H tractor leaders, high school agricultural educators, agricultural news media, the Hispanic/migrant worker population, and farm youth. A list of candidates was then developed for each of these areas. Panelist were selected not only for their knowledge, background, and ability to add meaningful discussion and criticism to the process but also for their potential to be stakeholders in the successful implementation of this project.
Since this was not an ergonomics–related usability study, more than five members were selected for this expert panel. A final group of 15 individuals was selected to serve on the panel.

The design team developed an initial list of competencies using *Safe Operation of Agricultural Equipment* (Stillette and Hull, 1998) and other available tractor and machinery safety resources from both the U.S. and Canada. This list was complimented with an additional set of competencies that was generated by reviewing data and recommendations published on the issue of child adolescent injuries in agricultural workplaces (Lee et al., 2002).

The initial set of 68 critical competencies were developed into a questionnaire and mailed to the 15 members of the panel. Using the questionnaire, the panel was invited to independently weigh the importance of each competency using a Likert–like scale. The members of the expert panel were also encouraged to include any additional competencies they felt were necessary for youth to safely operate tractors and equipment and perform other typical farm work. The feedback from the questionnaire was analyzed and competencies prioritized using the weighted averages of the scores given by the panel members. These results were presented at the first two–day work session of the expert panel.

At the first meeting of the expert panel, the design team provided an overview of the history of tractor safety certification programs, the current state of childhood agricultural injury, and a summary of project goals. Panelists were given the summary of the topic rankings. They were broken into two groups to prioritize the topics. Rankings ranged from “must be included” to “omit from the curriculum.” Although a member of the design team took notes and answered questions, the panelist worked largely without interference or input from the research team. There was intense discussion within the groups about nearly every topic. It became apparent early in the meeting that, due to the diverse opinions expressed, the groups were not going to complete the list without considerable compromising. At the end of the day, the two groups met together to compare and discuss the rankings they had finished.

The following day, the same two groups were independently asked to develop a list of 10 to 12 chapters or units to represent the core areas of the curriculum and to draft outlines of these chapters using the initial set of competencies. The two groups met and compared outlines. Consensus building was used to mesh the two outlines and subject matter into a draft outline of the curriculum. From this first two–day work session, a revised set of 72 competencies categorized into 11 major subject headings was prepared, with additional emphasis given to drafting each as a measurable skill or knowledge. Revisions were made by the design team and sent out to the panel for review and comments. This follow–up review resulted in additional competencies and the re–ordering of how some were categorized.

The expert panel met for a second time the following year, with the panelists given a summary of the evaluation procedure of the project and a brief overview of the history of computer–assisted instruction. The panelists, who had previously been sent a copy of the revised draft of the outline competencies, were asked to provide feedback on the content and structure of the materials provided. The design team led an open discussion, recording comments on a flipchart. Comments from the expert panel were later consolidated and summarized, leading to the identification of additional competencies and modifications of the outline. The expert panel was used to evaluate all of the evaluation pieces that would be used during the field testing of the curriculum. The panel was encouraged to read through each individual evaluation piece and comment on readability, age appropriateness, and gender and cultural issues. All of the pieces were returned with comments that added clarity and inclusiveness for all participants of the study.
The expert panel proved to be highly useful in the development of the core components of the tractor safety certification curriculum. The group provided new ideas and insights into the curriculum and validated the work that had already been done on the project. After the second two−day meeting, the design team had a workable outline of the contents of the manual, including the core competencies. A sense of camaraderie and teamwork was also developed between the design team and the panel of experts that would continue to benefit the overall development process and increase the likelihood of successful implementation.

Conclusion

For years, expert panels have been effectively utilized to assist in the decision−making process. At Purdue University, expert panels were successfully incorporated into several agricultural safety and health−related research projects. In all three cases, it was determined that without the input from external sources, the outcomes of the projects would have been deficient in scope and relevancy. The feedback that was provided by panel members included more diverse observations, expert knowledge not available from existing sources, and the opportunity to “word smith” the concepts being developed. The use of expert panels proved to be rewarding.

Recommendations

The following recommendations are provided in order to encourage and guide the further use of expert panels by researchers working in agriculture safety and health:

1. Prior to the convening of the panel, the panelists should be provided with relevant information, such as recent research findings related to the topic that prepares them for the meeting.
2. When an expert panel is convened, a facilitator should be utilized to promote a stable environment where ideas can be shared and progress toward consensus can be made. Specifically, the facilitator should:
   - Allow frank discussions
   - Provide a comfortable atmosphere
   - Maintain control of the meeting by limiting the impact of overbearing individuals
   - Be a good time manager
   - Treat all participants with respect, honoring all opinions.
3. When working with expert panels, building a sense of teamwork is very important. Although in some cases panelists knew each other and had worked with together in the past, new relationships and friendships were built when the groups had time to converse during breaks, meals, and activities such as tours, when they were unofficially convened. Informal, “get to know each other” activities should be scheduled prior to lengthy discussion meetings.
4. When possible, assign panel members to generate lists and ideas prior to arriving at the panel meeting so that more meeting time can be focused on discussion and deliberation.
5. Use flexible visual aids, such as whiteboards, to organize lists and promote communication during the discussions.
6. Select the participants carefully to ensure that both they and others recognize their expertise in the area being addressed. This is reflected by prior and present work in the field, a record of contributions through publications, and a clear indication of interest to participate.
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References


