

An Economic Motivator for Safe Farming: Changing Perceptions Through Learning

P. S. Kidd, S. G. Isaacs, H. P. Cole, M. Parshall, T. Scharf, T. Struttman

Abstract

Farm owner-operators and workers tend to make safety decisions from a subjective cost/benefit perspective. Our research has supported that farmworkers do not recognize the direct and indirect costs associated with work-related injury and thus are not making safety decisions on an accurate basis. We have developed two injury prevention interventions that require the active participation of the farmworker, acknowledge that farm economics and productivity are influential in shaping the structure and organization of the enterprise, and relate safe work practices and safety improvements to economic viability of the farm. The two interventions, Kayles' Difficult Decisions exercise and the Farm Planning Tool, are discussed from a developmental and testing perspective. Considerations for using these interventions in agricultural health and safety are addressed.

Keywords. Agricultural economics, Agricultural safety, Injury prevention.

From preliminary research (Cole et al., 1997; Kidd et al., 1997; Kidd et al., 1996) we discovered that farm owner-operators and workers failed to adjust to a changing work environment with respect to labor and economic issues. When confronted with a dwindling profit margin, farm expansion is a frequent solution. However, expansion creates greater labor needs, and adequate labor in numbers or quality may not be available in farming communities. If the farm owner-operator and worker change or add enterprises in an attempt to increase productivity, seasonal labor availability may again become an issue. Frequently

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overextended, farm owner-operators and workers do what they feel they can do to hold costs down: use old equipment in disrepair, or continue working—far beyond reasonable limits of fatigue. In an attempt to reduce expenses and maintain productivity, all too often farmers allow their children to perform tasks for which the children are not cognitively or physically mature. What is needed is an injury prevention intervention that visually conveys the realities of the work, highlighting the direct and indirect costs associated with injury. This approach helps farmers to see that safety is relatively inexpensive and that farm expansion, labor requirements, and commodity choices all have safety implications. We developed a computerized farm planning tool and a narrative-based exercise to communicate this message. The purpose of these interventions is to demonstrate the consequences of performing work unsafely.

Interventions

The Stress and Injury Model

An inductively derived model for linking stress, economics, and injury served as the theoretical foundation of the two interventions (fig. 1, Kidd et al., 1996). This model was created using data obtained through a secondary analysis of focus group transcripts with 180 Kentucky farm family members, originally collected as part of the Kentucky Farm Family Health and Hazard Surveillance Program (FFHHS, see Kidd et al., 1993, 1994). The model was further refined using a series of five farm family focus groups conducted prospectively to explore the issues of safety performance and safety demand (Kidd and Parshall, 1996). The model suggests that economic stressors influence safety decision making and ultimately the likelihood of an injury event through inadequate safety performance (e.g., failure to adjust workload when labor is not available) and/or increased safety demand (e.g., using equipment in various states of dis-repair).

The first intervention discussed in this article, Kayle's Difficult Decisions (KDD), was developed to allow the farm owner-operator or worker to experience the economic ramifications of an injury event vicariously through a fictitious, but

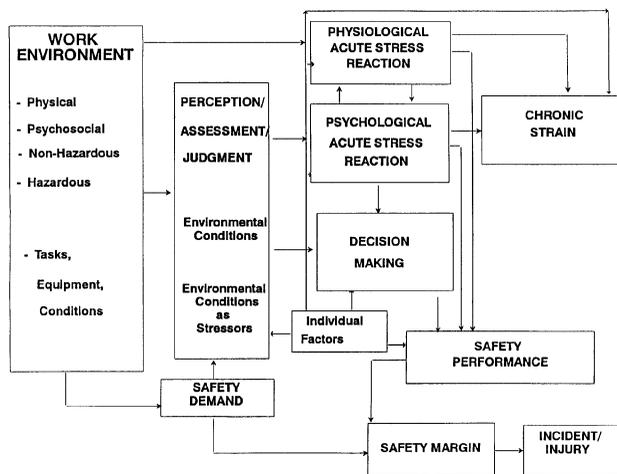


Figure 1—Farm stress and injury model.

plausible, farm family. This injury event occurred due to inadequate safety performance and increased fatigue that resulted from the economic stress associated with farm expansion. The second intervention discussed in this article, the Farm Planning Tool (FPT), allows the farm owner-operator or worker to experience the economic consequences of positive safety decision-making (e.g., hiring part-time labor during peak times) and/or decreasing safety demand (e.g., purchasing a used, more powerful tractor with a ROPS—rollover protective structure—in better operating condition than the current tractor) as compared with the economic impact of an injury event on the farm operation.

Kayle's Difficult Decisions Exercise

The Kayle's Difficult Decisions (KDD) has been explained in other sources (Cole et al., 1997). This intervention is a story based on narrative learning principles where one can see the effects of decisions in a risk free environment (Bruner, 1995). Story repair occurs as the learner tells the story differently, through choosing different options in the concluding sections of the exercise, to get more desirable outcomes.

The information used to construct KDD came from: (1) a secondary analysis of focus group interviews conducted as part of the Kentucky FFHHS and the Kentucky Farm Youth projects; (2) farm fatality cases collected in the Kentucky Fatality Assessment and Control Evaluation (FACE) project; (3) farm injury cases at a regional level one trauma center; and (4) rehabilitation data from the Kentucky Agrability project.

The exercise has several parts: (1) a background section that introduces the characters and context; (2) a developing story with predicaments; (3) questions with alternative answers; and (4) immediate feedback. The KDD exercise depicts a farm family that has the opportunity to purchase adjacent land at a fair price. The son wants to farm and the current farm size is inadequate to support two families. As the story unfolds, the son is injured from using an underpowered tractor in rushing to complete a farm task. The son's injuries require physical therapy and a period of recovery where he is not available to work on the farm. The wife is unable to work while transporting the son to physical therapy. The labor shortage results in lost productivity. The farm operation, which was fiscally stable prior to the son's injury, becomes endangered due to increasing debt load.

Ten question areas or issues are placed within the story where the reader selects from among 58 options he/she thinks are appropriate and fills in these choices using a latent image marker. (The KDD exercise has also been written in CD-ROM, multi-media format.) Table 1 displays issue area content in relation to the stress and injury model.

For example in the opening issue-area prior to the injury—the reader is asked to predict consequences of purchasing the adjacent land in terms of cash flow, debt size, and commodities. In a subsequent issue—leading up to the injury event—the reader is asked to identify hazards that arise out of the need to complete the farm work. Immediately post-injury, the reader is asked to identify steps to take to minimize future injury. Later post-injury, the reader is asked to view the Kayle's financial situation again and to select alternatives for managing the increased debt load that has resulted as a consequence of the injury. Completing the exercise takes about 45 min. Immediate feedback is given to the reader as the reader selects options for each decision point. Answers and rationale (printed using "invisible ink") become visible when stroked with the marking pen.

Table 1. Question content and model link

Question Area/Issue	Content	Key Model Links
A	Anticipating economic and labor consequences of second farm	Work Environment → Safety Demand → Perception/Assessment/Judgment
B	Planning for increased labor needs related to the second farm	Work Environment → Perception/Assessment/Judgment → Decision-making - re: farm labor supply
C	Planning to increase production, income, and safety	Work Environment, workload → Perception/Assessment/Judgment → Decision-making
D	Injury risk/hazard recognition when rushed during harvest	Safety Demand → Perception/Assessment/Judgment → Decision-making → Safety Performance
E	First-aid care of tractor roll-over injured person	Decision-making → Safety Performance
F	First-aid care of tractor roll-over injured person	Decision-making → Safety Performance
G	Planning to pay injury-related debt	Work Environment, economics → Perception/Assessment/Judgment → Decision-making
H	Planning to maintain farm payments, production, and labor	Work Environment, economics, and workload → Perception/Assessment/Judgment → Decision-making
I	Retrospective recognition of cost effectiveness of a larger ROPS-equipped tractor in terms of dollars, labor, and health	Work Environment, economics, and workload → Safety Demand → Perception/Assessment/Judgment → Decision-making
J	Reflection on ways the Kayles' may have reduced stress that contributed to the injury event	Work Environment → Safety Demand → Perception/Assessment/Judgment → Decision-making → Safety Performance

Field Test Results

The KDD exercise has undergone two rounds of field testing. The first version of the exercise was administered to 58 college students enrolled in an undergraduate agricultural economics course and to 10 experienced farmers. The performance of these individuals, their comments and suggestions were examined and used to revise the exercise. The revised exercise was then administered to a convenience sample of 34 people, all with farming backgrounds and experience.

Characteristics of the Field-test Participants

The 34 participants averaged 47 years of age with an average of 24 years of farming experience. Approximately 92% (n = 24) who reported their gender were males. Nine (27%) of the 34 participants were full-time farmers. Twenty five (71%) of the participants were agricultural extension agents, all with farming backgrounds and most currently own, live, or work on a family farm. Approximately 18% of the 34 participants reported that their family had personally experienced an injury event that had a large economic cost and impact on their farming operation.

Participants' Evaluation of the Exercise

An 18-item exercise evaluation scale was administered to the participants immediately after they had answered the exercise questions. The 18 items were arranged in four scales. Scale scores were calculated by summing over items. Scale 1

assesses the participants' judgments of the instructional quality of the exercise including such things as its length, written directions, reading level, questions and answers, graphics, and scoring procedures. Scale 2 solicits participants' evaluations of the exercise authenticity including work activities depicted, farm and family economic information presented, and overall realism of the case. Scale 3 assesses the participants' judgments of the utility of the exercise for helping them to make better farm safety and productivity decisions, as well as to learn more about the relationships between injury and productivity. Scale 4 is a single item that asked participants to assess the degree to which they themselves had encountered predicaments like the Kayle's and, as a result, had compromised safety in the interest of getting the job done (table 2).

The KDD exercise was judged to be well designed by participants (mean = 3.5, s.d. = 0.63, on a four-point scale). The utility of the exercise for changing and promoting farm safety behaviors was rated high (mean = 3.2, s.d. = 0.70, on a four-point scale). From a utility perspective, the exercise was rated high (mean = 3.2, s.d. = 0.70, on a four-point scale) and participants indicated that completing the exercise helped the participant make better economic and safety decisions. Initial testing indicated that participants found the exercise authentic (mean = 3.7, s.d. =

Table 2. Persons' rating of exercise quality, validity, relevance, and utility (frequency %) and rating scale means and standard deviations (n = 32)

Subscale and Item Content	Rating Scale				Mean	s.d.
	Definitely "No" 1	2	3	Definitely "Yes" 4		
Scale 1: Quality of exercise instructional design						
Exercise is about the right length (not too long)	0	6.3	53.1	40.6	3.3	0.60
Written directions in the exercise are easy to follow	0	0	31.3	68.8	3.7	0.47
Reading level is appropriate (not too difficult)	6.5	3.2	38.7	51.6	3.4	0.84
The exercise questions and answers are well written	0	0	51.6	48.4	3.5	0.51
The figures in the exercise are easy to understand	0	6.5	54.8	38.7	3.3	0.60
Exercise scoring procedure is easy to understand	3.3	3.3	33.3	60.0	3.5	0.73
Enjoyed working the exercise	0	6.3	37.5	56.3	3.5	0.62
Scale 2: Authenticity (validity) of exercise content						
The exercise is a realistic case	0	0	24.2	75.8	3.8	0.44
Work activities described in the exercise are realistic	0	0	25.0	75.0	3.8	0.44
Economic information in the exercise is realistic	0	0	28.1	71.9	3.7	0.46
Scale 3: Utility for promoting safety through planning						
Will help me to make better farm safety decisions	0	6.1	57.6	36.4	3.3	0.59
Will help me to make better farm productivity decisions	0	18.2	69.7	12.1	2.9	0.56
Taught me new information about the relationship between injury and productivity	0	9.4	46.9	43.8	3.3	0.65
Prior to exercise had not thought about economic costs of injury and implications for my farm	6.3	34.4	28.1	31.3	2.8	0.95
What I learned will help me prevent injuries	0	18.8	56.3	25.0	3.1	0.67
Exercise help me to think about tradeoffs between expanding farm size and productivity versus safety, increased debt and work load	0	0	48.4	51.6	3.5	0.51
More exercises like this would help me to anticipate workload based on farm planning decisions	0	10.0	46.7	43.3	3.3	0.66
Scale 4: Have experienced plights/risks like the Kayles						
Have experienced predicaments like the Kayles and taken shortcuts and compromised safety to get the job done	20.0	10.0	36.7	33.3	2.8	1.12

0.44 on a four-point scale), and over two-thirds (70%) indicated they had experienced similar dilemmas on their farms. Currently, a study is underway to follow participants longitudinally for assessing transfer effectiveness of learning to their own farm. Another study is being conducted administering the exercise with different samples of farmworkers.

Perceived Injury Risk, Impact, and Behavior Change

At the end of the exercise, but just before completing the exercise evaluation scale, the participants were asked to answer three questions using a 0 to 10 visual analog scale: (1) to what degree he or she, or other family members were at risk of an injury event on their farm similar to the one experienced by the Kayle's; (2) to what degree completing the exercise had convinced the participant to make safety a higher priority on their farm and to take steps to protect family members from injury risk; and (3) what impact would a serious injury event or fatality have on their farm? Eleven of the 19 participants who answered question number 1 rated their degree of risk of a similar injury at 6 or higher (mean = 5.6, s.d.= 2.61). Seventeen of the 20 (85%) participants that answered question number 2 stated the exercise was very effective (mean = 7.5, s.d. = 2.01) in convincing them to improve their safety performance and decrease their safety demands on their own farms. Nineteen of the 20 (95%) participants that answered question number 3, rated the impact of a serious injury or fatality on their farm at 7 or above with a mean rating of 9.1 and a standard deviation of 1.33. These 19 participants recognized that a serious injury on their farm would have a major, detrimental economic impact on their farming operation.

Farm Planning Tool

The farm planning tool (FPT) incorporates the concepts of enterprise budgeting, investment analysis, capital budgeting, partial budgeting, and whole farm analysis in a spreadsheet format. The FPT allows the user to experience the stress and injury model link between decision-making and safety margin through altering safety performance (e.g., modifying enterprises to reflect actual labor availability) and safety demand (e.g., financing equipment that is safe and powerful enough to perform the needed farm tasks). It is substantially different from the KDD exercise. The FPT is a spreadsheet that is a blank slate until the user fills in enterprises and figures from their own farming operation (such as size of crop and herd size). Costs and budgets are calculated by the software. It has built in capabilities for integrating up to seven crop budgets and up to five livestock budgets (as determined by the farming operation of the user). These operating costs reflect labor needs, purchase or financing of new/used equipment, feed, maintenance of structures and equipment, and other items. Fixed expenses can be specified. The aim of this tool is to get farm owner-operators and workers to appreciate that a low probability event (in this case an injury) may have a very high economic cost in both direct expenses and in lost productivity and that costs entailed in avoiding the event are not excessive or unmanageable. In fact, one purpose of the FPT is to manage the costs of safe work practices and the reduction of hazards just like any normal business expense.

The format for the FPT was adapted from the University of Kentucky Dairy Systems Manual and software (Isaacs and Garland, 1997). Initial budget figures were drawn from a central Kentucky beef and tobacco farm (similar to the farm described in KDD). The FPT runs on a windows platform using commercially available spreadsheet programs (such as Excel or Quattro pro).

The FPT can be used as a separate injury prevention intervention or in conjunction with the KDD exercise. When used in conjunction with the KDD exercise, the Kayle's crops and livestock budgets are inserted. Direct and indirect costs of the Kayle's injury are included. Farm and program changes inserted reflect options selected from the available options within the exercise. A base farm plan is available that depicts the Kayle's farm prior to expansion. A second farm plan illustrates the Kayle's situation after the purchase of the second farm was made. A third farm plan shows the impact of the son's injury. These "hard copy" farm plans are included in the latent-image form of the KDD exercise. When the FPT is used with the KDD exercise, in a group format, the group facilitator can illustrate the minimal financial impact that buying a tractor with a roll-over protection structure would have on farm debt. The resulting calculations demonstrate that buying a ROPS-equipped tractor with enough horsepower for the size and commodity mix of the farm could have been managed within the resources available at the time of expansion. Further, if an injury had been averted, the purchase would have paid for itself. Other decisions can be modeled, such as the positive impact of a part time job (e.g., insurance benefits) as well as negative effects (less time available for farm work).

When the FPT is used independently, farm owner-operators and workers can insert the operating figures from their farm and program changes that they are considering in acreage, commodities, selling prices, equipment, and insurance purchases. The program automatically processes the information and adjusts the figures so that the potential impact on farm operations can be assessed immediately. By using the FPT, farm owner-operators and workers are able to test several "what if" scenarios for a farm plan in just a few minutes. Graphs are included that illustrate labor needs versus labor availability.

The initial version of the FPT was evaluated in two focus groups of farm owner-operators. The tool was revised based on their comments and suggestions. The revised FPT has not been field tested. Efforts are underway to field test the FPT and evaluate its impact on safety decisions, both as an independent intervention and in conjunction with the KDD exercise. Dialog boxes, pick lists, and other user interfaces are being designed to facilitate the use of the FPT. As with the KDD exercise, the FPT can be used by the individual farmworker or in a group setting.

Implications and Considerations

Agricultural extension agents are frequently called upon to help farmworkers in making farm planning decisions such as purchasing equipment and building new structures. Agents in Kentucky have requested the availability of tools like the FPT and KDD exercise as decision making resources. With very little additional training, these agents have used both interventions in their farm communities.

More research is required to answer basic questions about formatting these interventions. For example, should injuries be averted in simulations or should they occur? Should the simulation be written in second person (What would you do?) versus third person (What should Mr. Kayle do?). What kind of economic data are viewed as meaningful by the farm owner-operator and worker as opposed to being meaningful to an accountant or bank representative?

Little is known about the effects of exposing one's economic vulnerability. Does it produce a negative, almost hopeless response? Or do farmworkers view it as empowering? Does this knowledge influence the purchase of health and workers' compensation insurance? How is the safety decision making process altered after

highlighting economic issues? Is the process altered more effectively by using the KDD exercise and the FPT individually or together as an intervention?

The technology required to use the FPT and the CD-ROM version of the KDD exercise may not be part of every farm family's home, but increasingly the technology is becoming available. In addition many agricultural extension service offices have the necessary technology to use the KDD exercise and the FPT. The farm owner-operator and worker may find the use of computer applications stressful if they lack basic computer skills.

The novel aspect of the FPT and the KDD exercise is their reliance on active participation of the farmworker, for whom the interventions are intended. Farm economics and productivity are recognized as influential in shaping the structure and organization of the enterprise. Safe work practices and safety improvements are related to productivity and economic viability of the farm. If further research demonstrates these interventions to be effective in promoting agricultural health and safety, then there will be support for integrating economics, stress, and injury (Kidd et al., 1996) in injury prevention interventions.

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