# Encouraging Farmers to Retrofit Tractors: A Qualitative Analysis of Risk Perceptions Among a Group of High-Risk Farmers in New York

J. A. Sorensen, J. J. May, K. Paap, M. A. Purschwitz, M. Emmelin

**ABSTRACT.** *Tractor rollovers continue to be one of the most frequent causes of agricultural fatalities. Despite knowledge of rollovers and the efficacy of rollover protective structures (ROPS), few New York farmers have considered installing ROPS on their unprotected tractors. Qualitative interviews conducted with an "at-risk" segment of the New York farming community indicate that there are a number of barriers to safety in general and to retrofitting, in particular. The following themes and categories emerged in relation to safety and risk taking: constant exposures to risk with positive outcomes normalizes risk; the modeling of risk by significant others positions risk as part of a farming identity; and the pressure to reduce costs, save time, and accept risk frames risk-taking as the cost-effective option (especially in regard to retrofitting, which farmers believe is both expensive and time-consuming). Recommendations for researchers planning retrofitting interventions would be to focus safety messages on the risk to significant others or on the financial impact of rollovers, and to provide financial incentives and assistance to farmers considering retrofitting.*

***Keywords****. Perceptions, Qualitative research, Risk, Rollover protective structures, ROPS, Safety.*

Farming is a dangerous occupation. This is witnessed by the fact that agriculture is consistently listed among the industries with the highest occupational fatality rates in the U.S. (Hard et al., 2002; NSC, 2005-2006). Tractors are involved in approximately 32% of these agricultural related fatalities, with 44% of U.S. tractor-associated deaths related to overturns specifically (Donham et al., 1997; Hard et al., 2002; NSC, 2000). In the Northeast, the combination of hilly terrain, older operators, and the prevalence of old or poorly maintained equipment puts farmers in this region at particular risk for overturns (8.4 overturn deaths per 100,000 workers annually, as compared to 6.1, 6.2, and 1.9 for the Midwest, South, and West), as described by Myers et al. (1998).

Since 1985, tractors in the U.S. have been sold with rollover protective structures (ROPS) as standard equipment in the form of an open frame, a roll bar, or an enclosed cab (Myers et al., 1998). From the mid-1960s to 1985, ROPS were generally optional.

Submitted for review in March 2007 as manuscript number JASH 6921; approved for publication by the Journal of Agricultural Safety and Health of ASABE in November 2007.

The authors are **Julie A. Sorensen,** MA, Project Coordinator, New York Center for Agricultural Medicine and Health, Bassett Healthcare, Cooperstown, New York; **Maria Emmelin,** PhD, Senior Lecturer, Department of Epidemiology, Umea University, Umea, Sweden; **Kris Paap,** PhD, Professor, Department of Sociology, State University of New York Institute of Technology, Utica, New York; **Mark A. Purschwitz, ASABE Member Engineer,** PhD, Research Engineer, Agricultural Safety, National Farm Medicine Center, Marshfield, Wisconsin; and **John J. May,** MD, Director, New York Center for Agricultural Medicine and Health, Cooperstown, New York. **Corresponding author:** Julie A. Sorensen, New York Center for Agricultural Medicine and Health, Bassett Healthcare, One Atwell Rd., Cooperstown, NY 13326; phone: 607-547-6023; fax: 607-547-6087; e-mail: jsorensen@nycamh.com.

  ISSN 1074-7583 

These devices, when combined with routine seatbelt use, are 99% effective in preventing injury or death (NIOSH, 2004). Across the U.S. some 32% to 50% of farm tractors are ROPS-protected (Myers and Snyder, 1995), and similar rates have been documented in New York (Hallman et al., 1997; Hill et al., 1992; West and May, 1998). Unfortunately, many of the tractors manufactured before 1986 did not have ROPS installed and are still frequently used by farmers (Myers, 2000). In order to provide adequate protection, these tractors require retroactive installation of a rollbar or cab. This process requires tractor owners to research, purchase, and install these safety devices. Although a variety of efforts (including education and awareness campaigns) have been directed at encouraging New York farmers to retrofit unprotected tractors, the percentage of ROPS-equipped tractors in the state has increased only marginally over the last ten years (May et al., 2006; NIOSH, 2004).

In New York, recent investigations indicate that although educational efforts aimed at educating farmers on the importance of ROPS are working, researchers need to provide something more if farmers are to be persuaded to retrofit. Survey data revealed that while 82% of New York farmers were aware of the importance of ROPS, only 17% had ever considered installing one on their unprotected tractors (Sorensen et al., 2006), and only 7% had actually investigated the cost or possibility of getting a ROPS (May et al., 2006). For those who had stated that ROPS are important, but had never considered purchasing one, most considered their individual circumstances such that the need for this level of protection was unnecessary ("no hills," "have experience," "don't do anything stupid"). For those who stated that they had considered purchasing a ROPS, general safety concerns were listed as the most common reason for consideration of this safety measure (Sorensen et al., 2006).

In order to more clearly understand these perspectives and to design more effective ROPS intervention programs in the future, project researchers identified the need for a more in-depth analysis of farmers' attitudes regarding safety and retrofitting. A literature search revealed that few data are available on the qualitative assessment of farmers' risk perceptions (Green, 1999; Kidd et al., 1996; Rhodes and Hupcey, 2000). The purpose of this study was to provide a more complete analysis of New York farmers' attitudes and risk perceptions regarding farm and tractor safety.

# Material and Methods

## Sampling Strategy

Based on previous research in the New York farm community, researchers chose to recruit small crop and livestock farmers, since these farmers accounted for the highest percentage of farms with either no or only one ROPS-protected tractor. The informants were recruited from a database of New York farms that had been compiled from commodity association lists. This database contained information on farm size, commodity, farm tractors, and contact information. Livestock and crop operations were considered small if they fell in the lowest quartile regarding number of livestock or crop acreage in the database. Livestock farmers were defined as farmers with a primary commodity of beef cattle, sheep, goats, pigs, or chickens, and crop farmers were defined as farmers with a primary crop production of hay, corn, or wheat. According to our definition, crop farmers did not include fruit or vegetable farmers.

A random sample of principal male operators of small crop and livestock farms was initially selected in order to explore perspectives and attitudes towards safety in this specific demographic segment. Once saturation of themes was achieved in this group, other informants were purposively sampled from other demographic groups to provide

the maximum variation in safety perspectives, i.e., female principal operators, farm wives, and "retrofitters" (small crop and livestock operators who had retrofitted at least one of their farm tractors with a ROPS or cab). In total, twenty in-depth interviews were conducted. Fifteen of the interviews took place with no family members present, and five were conducted with another family member present. In three of the interviews, family members participated in the interview of their own initiative, and this was not discouraged. All family members who joined interviews were actively involved in the operation of the farm. Thus, including participating family members, seven male principal operators, two female principal operators, five farm wives, three farm sons, and six "retrofitters" were included in the analysis.

### Study Recruitment

The informants were contacted by phone and invited to participate in the study. All phone calls included a brief description of our research institute, the nature of the study, and a description of what study participation would entail. Approximately three-quarters of informants contacted agreed to be interviewed and were able to set aside time for an interview. For those interested, an interview time and place convenient to the informant were arranged. Based on their requests, all interviews were conducted in their homes. All study informants were offered a $25 gift certificate for their time. Take-out meals were brought to informants by the interviewer if the interview was conducted during a lunch or dinner break.

### Protection of Rights of Study Participants

The Mary Imogene Bassett Hospital Institutional Review Board approved this study. All farmers or family members provided written informed consent prior to participation.

### Data Collection

A semi-structured interview guide was utilized for each of the interviews. The lead researcher (JS) was present for all interviews and either conducted the interview or took notes for an assisting researcher (KP) conducting the interviews. Before each interview, farmers were asked for their permission to audiotape the interview and since all informants gave their consent, each of the interviews were audiotaped. The interview questions were structured around the farmers' or farm wives' chores on the farm, the safety issues that they worry about on the job, their concerns regarding tractor overturns, and issues that might impact their willingness to retrofit a tractor. Interviews proceeded from general items (e.g., "describe a typical day") to more specific items (e.g., "what are your concerns related to tractor rollovers?"), with further inquiry related to experiences, attitudes, and feelings. It is important to note that the interviews were not restricted to rollover concerns specifically. However, due to the nature of the research question, this topic was explored more thoroughly in interviews than other safety concerns. These interviews were carried out in the summer and fall of 2006. Interviews were conducted until saturation of themes was accomplished (i.e., subsequent interviews failed to introduce any new themes or perspectives). One exception was the principal female operator category. Although the two individuals interviewed in this category had fairly similar perspectives relative to safety and retrofitting, a larger sample would have been preferable. However, due to the scarcity of principal female operators in the sampling database (small crop and livestock farmers with no or only one ROPS-protected tractor), it was difficult to locate and schedule more interviews with this group in the allotted research time frame.

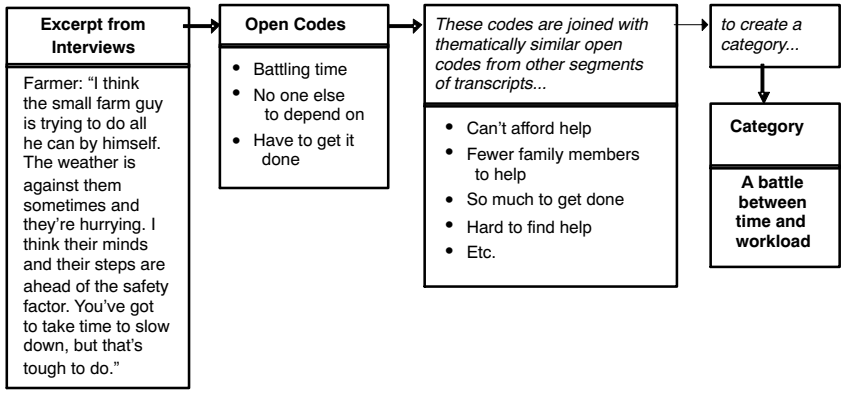


**Figure 1. Example of the grounded theory process in the analysis of farmer interview transcripts.**

## Data Analyses

The audiotaped interviews were transcribed and analyzed following the basic steps for grounded theory (Glaser, 1992, 1998, 2001). The aim was to identify prominent themes or patterns related to risk perceptions and attitudes related to retrofitting. At the start of the analysis process, each interview was reviewed several times from beginning to end by the lead researcher (JS) and initial impressions were recorded. Following this, key information was coded for each line of the transcript by the lead researcher. After coding completion, similar codes were grouped into broader category headings that encompassed the major idea or theme of the codes contained in that category. This process was then audited by one of the research supervisors (ME). Once categories were created, the lead researcher (JS) and the supervising researcher (ME) analyzed categories to locate patterns or relationships, i.e., axial coding. Throughout the process, transcripts were continuously consulted in order to keep analyses grounded in the text. Figure 1 illustrates the process of moving from text to category.

These categories were then organized in the same fashion as codes to create core categories. A core category can be defined as a category that illustrates a "key point" in the discussions (Dahlgren et al., 2004) and that summarizes some theme, which runs through the group of categories it seeks to represent.

# Results

## Study Participants

The 23 informants were all small crop and livestock farmers or family members. Besides the previously described distinctions relating to their role on the farm, (i.e., male principal operator, female principal operator, farm wife, son working on the farm, or "retrofitter"), the farmers represented a variety of farming "situations," i.e., twelve raised a particular variety of livestock, eight were diversified raising livestock and crops, six worked off-farm jobs, and five would be considered retirement farmers (USDA, 2001–2002). The age range of informants was 19 to 77 years of age. Table 1 provides further clarification of informant characteristics.

The analyses of these interviews resulted in agreement upon a series of categories that could be characterized under three themes. These themes summarize different aspects of risk perception and were transformed into the core categories of Risk Becomes "Normal," Risk Becomes Part of a "Farming Identity," and Risk Becomes "Cost-Effec-

**Table 1. Study informant characteristics.**

| Category[a] | Livestock | Crop | Full-Time | Off-Farm Job | Retired |
|---|---|---|---|---|---|
| Principal male operators (7) | 5 | 2 | 7 | 0 | 0 |
| Principal female operators (2) | 2 | 0 | 2 | 0 | 0 |
| Farm wives (5) | 3 | 2 | 1 | 2 | 2 |
| Retrofitters (6) | 5 | 1 | 3 | 0 | 3 |
| Farm sons (3) | 1 | 2 | 3 | 0 | 0 |

[a] Number of individuals interviewed in that category shown in parentheses.

tive." The categories, themes, and resulting core categories distilled from the 20 in-depth interviews are listed in figure 2.

It is important to note that, in order to capture the lived experiences of these farmers and their families, the groupings have been structured to best reflect the informants' descriptions of how the events and perceptions of these events fit together. These codes and categories are not necessarily mutually exclusive, and elements from one category may also be visible in other categories. For example, "no time/energy for safety" is a code that often came up in sections of transcripts where farmers and their families were trying to explain how the daily struggle to complete the myriad tasks involved in running a farm eclipses the desire to work safely (Risk Becomes "Normal"). However, this lack of time or energy is largely influenced by the overarching financial difficulties that constrain their ability to more productively deal with issues of safety (Risk Becomes "Cost-Effective"). In addition, these perceptions of risk and safety were not exclusively related to the process of retrofitting. The discussions related both to safety in general and to retrofitting and overturns specifically.

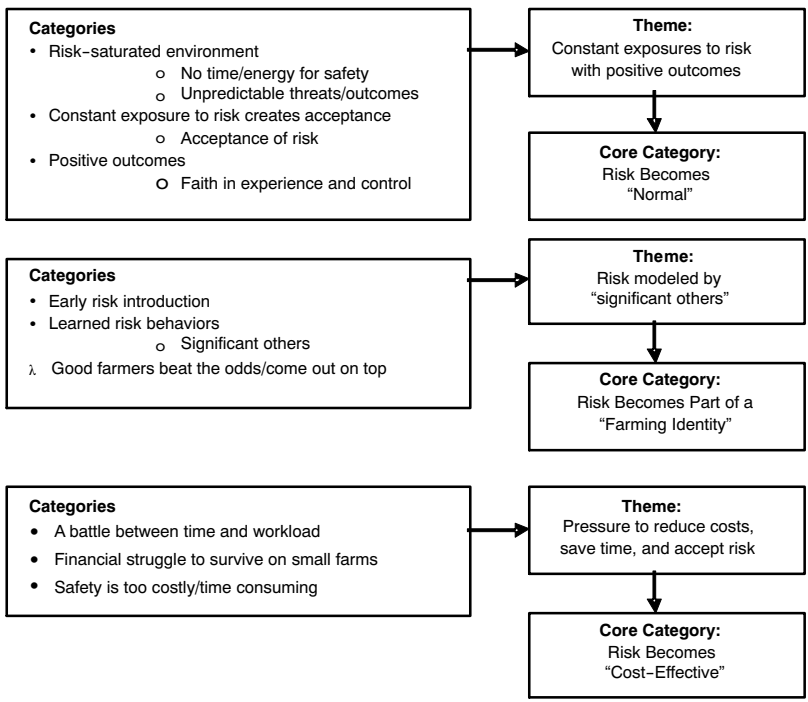


**Figure 2. Categories, themes, and related core categories summarizing farmers risk experiences/ perceptions.**

**Theme: Constant Exposures to Risk with Positive Outcomes First Core Category: Risk Becomes "Normal"**

The perceptions in this core category relate to the effects of immediate, daily exposures and the individuals direct processing of these events. This locus of influence appears very concentrated around the individual's immediate experience of exposure and resulting cognitive response.

*A Risk-Saturated Environment*

According to informants, working conditions inherent to the farm environment combine in a manner that reduces a person's ability to work safely (i.e., fatigue, hurrying to beat the weather, juggling many tasks). These conditions can make concentrating on the job, or taking the time to do a job safely, difficult and increase the exposures to risk. As explained by one farmer, it is easier just to get the job done than to worry about safety.

Principal male operator: *"Sometimes when you do all the safety procedures it might take 25% to 50% of your time. The job may take 15 minutes, but it might take 30 to 45 minutes to get it set up. People don't want to do that because that is time they could be doing other work."*

Or from another farmer and principal male operator: *"The big issue is taking shortcuts and being tired. These are the two things. Most farmers know better. But that shortcut ... it's a simple example of not putting the shield [power take-off shield] back on after you have fixed something. [You] haven't got time to do it, the hay is ready to bale, got to get out there, got to make this happen, so the shield gets put off to the side. It doesn't get put back on."*

The unpredictable environment also creates inherent risk that is difficult to change. As informants stated, it is often difficult to predict when something will go badly. Knowing when an animal will suddenly become violent or when the weather will turn and make conditions dangerous is often impossible. Even something that appears relatively risk-free or that they have "done a million times before" without incident can suddenly go wrong. The following farmer describes a task he believed to be relatively straightforward, but which resulted in a hazardous situation when the material he was handling did not behave the way he expected.

Principal male operator: *"So I'm throwing the stuff out, and then, something doesn't sound right. I looked down the chute and it was plugged. I had no way to get out. On the silo chute, the metal part, there is one tin that goes two ways ... up and down. I chopped that out with the pick ax. I chopped through the tin to open it up, then I used my power cord as a rope and I came down the outside. I was up twenty to twenty-five feet."*

*Constant Exposures to Risk Creates Acceptance*

This constant and daily exposure to risks appears to normalize risk and may explain the popular adage used by informants: "Injury risk is simply the cost of being a farmer."

Principal male operator: *"We had six or eight injuries in the barn over a twenty-year period. Some of them [workers] were inexperienced, some of them were very experienced ... it's just going to happen once in awhile."*

*Positive Outcomes Create a Faith in Experience and Control*

Farmers stated that despite these risk exposures or close calls, the majority of the time they came out unharmed or with minor injuries. The farmers' comments indicate that these positive outcomes engender in them a sense of confidence in their ability to come out of dangerous situations unscathed.

Principal male operator: *"It gets to the point where if you've done something many times and you've managed to avert catastrophe each time, you think, probably you won't have a catastrophe."*

Or as another farmer's son described the risks involved in farming: *"I think that my brother and my father have a really good sense about risk and safety. I think that when it's compromised, it's because they're in a hurry or things are not going well. It's not a matter of not knowing what is safe, or what is the right way to do it, or learning like, oh no, I need to have a ROPS. It's more of having a close call that makes them say, okay, I need to slow down in a situation or I need to think this through better next time or something."*

Interviewer: *"So there's a perception of control of the situation."*

Farmer's son: *"Yeah, there is, I would say. I don't know how accurate it is, but I'm sure they have a good sense of feeling that they are able to handle these kinds of things."*

However, farmers' confidence in the likelihood of positive outcomes to risk exposures did not often extend to others working on the farm, such as family members or workers. Principal male operators described concerns about the workplace safety of children, wives, or workers.

Principal male operator: *"Nothing else would do more to get that [a ROPS] on than the wives, the children, the employees. I can't imagine anything else ... not for themselves anyway."*

Retrofitter (full-time farmer): *"I had some older tractors and as my son got older, I had it in my head that I hadn't better have an underage operator on a tractor that didn't have rollover protection and a belt on it. So I did go to my dealer and buy one [ROPS]."*

When asked to explain, they often stated that they believed these individuals' lack of experience or ability to remain calm and focused in dangerous situations seriously compromised their ability to avoid injury or death.

*Deviations from Risk Normalization*

Our analysis also indicated deviations from the perspective that risk is normal or can be controlled. The interviewed farm wives, principal female operators, and retirement farmers appeared less confident in their ability to ensure positive outcomes. In general, farm wives did not engage in risky tasks, opting instead to hand over the more dangerous jobs to others.

Farm wife: *"I am the baler. I do all of the baling except on very steep hills. When I get scared, I get off the tractor. I don't feel as if I should be there. So, someone else finishes, and when it gets off the steep area, I get back in and continue baling."*

One of the principal female operators used this same strategy, getting assistance from her husband who had an off-farm job or a neighbor. The other principal female operator had a very small operation that lacked the heavier, more dangerous equipment and large animals. All of the retirement farmers stated that they often hired out dangerous tasks to others, or purchased safety equipment.

**Theme: Risk is Modeled by Significant Others Second Core Category: Risk Becomes Part of "Farming Identity"**

In this second core category, the influences on risk perception are one step removed from the individual's immediate experience and are connected to the way significant others have modeled risk behaviors. Although this core category appears similar to the first in that risk is "normalized," interviews indicated that the experience is somewhat different from the normalization that occurs through an individual's immediate exposures and interactions with risk. More specifically, the modeling of risk by others was a socially supported mechanism that nurtured risk-taking through the implicit acceptance of exposures by significant others. Sixteen of the 23 informants were generational farmers who had grown up on farms and continued to farm after marrying or finishing college.

*Early Risk Introduction/Learned Risk Behaviors*

Informants openly shared experiences of observing fathers, uncles, or grandparents taking risk. They also discussed situations in which they were allowed or encouraged to take risk as children. Often this modeling was carried out at a time when informants were too young to judge the wisdom of these risk-taking behaviors.

Principal male operator: *"Oh, the stuff I did when I was a kid! You guys would cringe ... my grandfather baling hay, smoking a cigar, with me on the fender on a tricycle tractor. Luckily, I never got hurt."*

This farmer later went on to state: *"[We] don't even think about it [risk]. We've always gotten away with it and nobody ever got hurt, so why should we change now?"*

This way of understanding risk was most consistently shared by the principal male operators who were raised on farms, although all informants seemed to accept or distance the risks of farming to some degree. Every participant related a story of a family member, friend, or neighbor who had been injured or killed in the process of farming.

*Good Farmers "Beat the Odds" or "Come Out on Top"*

Indeed, taking on risk and coming out on top appears to be part of an identity that the long-time farmers shared. Due to the challenges of farming today, several of the informants identified themselves as "survivors," i.e., having the ability to beat the odds.

Principal male operator: *"They [farmers] win every day on their farm, and they win in their organizations. So they will take on the government, they will take on any entity they are confronted with. It's their nature to survive and to win."*

*Deviations from Risk Identity*

This risk identity was not shared by all informants. One comment from a farmer who did not grow up on a farm seems to support the hypothesis that risk acceptance may be part of the legacy left by previous farm generations.

Male retirement farmer: *"I remember not being born on a farm probably made me a little more conscious of, hey, it's easy to get hurt."*

It was interesting to note that in the interviews, risk modeling did not seem to have the same influence on the farm wives as it did the principal male operators. Although they described childhood experiences that illustrated risk acceptance among peers and family members, their risk perceptions were not always so dismissive of potential hazards.

Farm wife: *"I always worry about that [power take-off entanglement]. Always. They [husband and two teenage sons] tell me that I'm paranoid. But so did the other people that are dead now. I just worry about that stuff all the time."*

Another farm wife [in reference to one of her husband's close calls]: *"I was panic struck and I was mad at him, too, for going that close to the edge. I mean, it's hard to see [the edge], but I'd just leave it. If you just stay in another two feet, you don't have that risk."*

**Theme: Pressure to Reduce Costs, Save Time, and Accept Risk Third Core Category: Risk Becomes "Cost-Effective"**

In this last core category, the locus of influence emanates from the economic and structural changes that have occurred in the farming community over the last few decades.

*A Battle Between Time and Workload*

Many of the informants, with the exception of retirement farmers, described a work environment with consistently more work than help, chronic stress and fatigue, and a belief that the only person you can count on to do things is yourself. Informants described a trend in which there is consistently more work and fewer people to help with it. As the size of the farm family decreases and the profitability in agriculture continues to shrink,

it is difficult for farmers to recruit either children or farm hires. They state that the work is too difficult and the financial returns too limited. This creates labor shortages on farms, which further exacerbates the issue of profitability.

Principal male operator: *"...you don't have big families growing up on farms. Like, my mother is one of eleven kids, and she had five [kids], and now you have twos and threes. So the ones that are born on farms and that want to stay in farming are very few. You can't take someone out of Long Island or the city. Very rarely could you teach that person to be a farmer. Most of them aren't going to want to go down in January when it's minus ten or twenty out, the wind is blowing like crazy and it's snowing, with boiling water to thaw out water pipes in the wind. They are not going to do that. Now, how can I hire somebody to do that kind of work?"*

*A Financial Struggle to Survive*

In all of the interviews, the issue of financial pressure and the difficulties of making the farm financially solvent were discussed. As costs of farm maintenance rise and profits from products remains stable and externally controlled, many of the farmers stated that small farming is increasingly challenging. Many of these informants worked off-farm jobs or had spouses who worked off the farm to make ends meet. As a result, all of the informants who were financially dependent on the farm described enormous pressure to maximize profits, decrease expenditures, and save time.

Principal male operator: *"Most farmers are going to sacrifice safety and purchase something that will get the job done as best as they think it can get done. They'll do it [tasks] themselves with very little regard to how safe it is. They will just get a job done as economically as they can."*

Interviewer: *"And the reason for that is..."*

Principal male operator: *"The dollar. Our food prices aren't high enough. Food prices need to be higher. If you look at the cost of diesel fuel and the cost of insurance, for labor, for help, and the price of automobiles, food is ridiculously low."*

*Safety is "Too Costly" or "Time Consuming"*

With the pressure to maximize profits, spending money or time on machinery upgrades, maintenance, or safety often becomes a low priority. Farmers state that it is far easier to skip safety, especially when they think they can get away with it, than to take the time and money to use caution.

Principal male operator: *"I think some people are inclined to be a little relaxed in maintaining their equipment. They'll use a tractor where maybe the brakes aren't too good. So the part is they know it, but it could get you into trouble."*

When asked why the farmers would not take the time to maintain their equipment, this participant went on to say: *"I would say probably the time you have to fix them and then the cost of the stuff to fix them. If you can't fix it yourself, you tend to put it off."*

## Strengths and Limitations of the Study

The benefits of qualitative research studies are that they allow for an in-depth exploration of a phenomenon using a comparatively small number of informants. Our informants were purposively sampled on the basis of certain experiences, in this case, being small crop or livestock farmers, and they provided valuable insight into their thought processes. However, we cannot claim statistical generalizability, i.e., that we have captured all perspectives shared by New York farmers or even small crop and livestock farmers. In addition, there was a relatively small sample of principal female operators, so the attitudes or perceptions recorded may be more varied than our analysis indicates. Research seeking to compare the safety attitudes of male and female principal

operators carried out by Cole et al. (2000) indicated that, contrary to our findings, there were few differences between the two groups. However, it is important to note that this study was quantitative in nature and the exploration of attitudes was fairly limited in that respondents were asked to answer multiple-choice questions. In light of this, further qualitative inquiry directed at the safety and risk perspectives of the principal female operator group would be beneficial. Despite these limitations, we believe that we have explored the concept of risk and safety enough to develop a variety of theoretical conclusions. These conclusions (e.g., the normalization, modeling, and cost-effectiveness of taking risk competes successfully with the alternative, which is to work safely) can be tested in future interventions, continuously compared with results from supporting quantitative studies, and can serve as a comparison for future qualitative studies exploring safety perceptions in similar populations.

# Discussion

## Risk Becomes "Normal"

The normalization of risk through repeated exposures was an interesting theme that developed from the interviews with study informants. This phenomenon was somewhat evidenced by the fact that the informants who were less exposed to risk (i.e., farm wives, principal female operators, or retirement farmers) appeared less optimistic about positive risk exposure outcomes than the informants with more routine risk exposures (principal male operators). The normalization of risk that is discussed by these informants has been noted in other investigations of how individuals process risk (Gibbons et al., 2002; Halpen-Felsher et al., 2001). In a study of adolescent risk behaviors, researchers found that study subjects utilized an "absent-exempt" line of inductive reasoning, which posits that "if I haven't experienced negative health consequences by a certain age, then perhaps I have some immunity to those consequences" (Weinstein, 1984). This perception provides distinctive challenges to health and safety researchers, and interventions aimed at encouraging change need to work to alter this perception or provide alternative motivations for safe behavior (Cole, 1995; Mayer, 1996). As Cole (2002) states, "Safety behaviors like having a ROPS and a seat belt installed on a tractor and then always wearing the seat belt are maintained not by fear of punishing overturn injuries. The probability of an overturn and an injury is small and uncertain. Maintaining consistent compliance with safety behaviors like always driving ROPS-equipped tractors and always wearing a seat belt requires frequent positive reinforcers" (p. 147).

## Risk Becomes Part of a "Farming Identity"

Early introductions to risk by role models and a risk-taking identity that is engrained in the farming culture also present challenging obstacles for health and safety researchers. This study suggests that social norms highly influence an individual's risk-taking exposures and behaviors. If risk-taking behaviors are admired traits and the influential people in a farmer's life have been risk takers, it seems unlikely that the farmer would put much value in safety messages. More pernicious is the effect on the processing of facts or research results that provide clear evidence of the benefits of safety. Cognitive psychologists have noted that once a person's views regarding a particular hazard have been formulated, new evidence is considered reputable and informative if it is consistent with these views and inaccurate or unrepresentative if it contradicts them (Nisbett and Ross, 1980).

### Risk Becomes "Cost-Effective"

The results of this study indicate that, as well as understanding farmers' attitudes towards risk and how this impacts the reception of safety messages, it would be important to make safety the easier choice for farmers. This is especially true in regard to retrofitting tractors. The cost to retrofit a tractor is anywhere from $600 to $2000. In addition, the process is potentially complex and often involves identifying the correct part numbers and repeated communication with several different manufacturers to determine availability, cost, date of shipping, cost of shipping, etc. If time and money are the two resources that small farmers consistently find themselves lacking, then retrofitting tractors will inevitably lose out in the cost-risk calculation. A recent analysis of farmers' attitudes regarding retrofitting revealed that the costs related to retrofitting outweigh the perceived benefits of protection from a low-probability, but highly severe, outcome such as a rollover (Myers, 2005; Myers et al., 2006). Repeated messages asking farmers to change their safety behaviors, without providing the resources to allow them to take these steps, may eventually evoke rejection of the messages in an effort to cope with the cognitive dissonance that problems without solutions can create (D'Alessio and Allen, 2002).

## Conclusion

In summary, our analysis indicates that the following factors are highly influential in the safety decision-making process:

- Safety precautions are more likely to be taken if they are perceived as necessary.
- Safety precautions are less likely to be taken if they compete with work, require time, or are difficult.
- Safety precautions are more likely to be taken if they are easy, habitual, make sense, or have utility.
- Safety measures are most often assessed by their short-term financial costs, a primary consideration.

If these factors are employed by many New York farmers in their decision to retrofit tractors with ROPS, then it appears that a successful safety intervention would require: (1) either altering farmers' perceptions of personal susceptibility, focusing on the potential risk to others, or highlighting the financial setbacks that come with injuries and fatalities; and (2) making retrofitting a more logistically and financially accessible option.

Altering farmers' perceptions of personal risk may prove considerably more difficult than focusing on the clearly recognized risk to wives, children, and employees. Although education is indeed an important component of changing risk behaviors, educational interventions alone are unlikely to overcome long histories of risk exposures and risk modeling. Because financial concerns are so influential in the decision making process, messages that highlight the financial impact or liability related to a death or serious injury could prove more convincing than traditional safety appeals. However, as documented in the literature (Witte, 1997), the use of fear appeal messages should be used with caution and be theoretically guided.

As well as utilizing messages to alter risk perceptions, future interventions aimed at promoting ROPS retrofitting will need to make ROPS more financially and logistically accessible. As stated previously, if money is tight, then messages will do very little to change farmers' behaviors. Assistance with retrofitting costs, insurance breaks, or payment plans may provide the added incentives required for farmers to consider the process. It may also prove important to offer logistical assistance with the process itself.

Previous research in New York noted that for many farmers the "hassle factor" associated with ROPS retrofitting created a significant barrier to retrofitting (Hallman, 2005). Widely varying parts and shipping costs, unavailability of parts, and general uncertainty about the process can make this a complicated and time-consuming endeavor.

In summary, our analysis indicates that there are a number of factors that influence a farmer's decision to work safely. These include a farmer's daily exposures to risk, the risk modeled by others, and farmers' ability to incorporate safety measures under the structural and financial constraints they experience. Although these factors influence safety decisions, in general, interviews indicate that they are operational in the process of deciding whether or not to retrofit unprotected tractors. Interventions aimed at encouraging farmers to retrofit would benefit greatly by tailoring messages to the stated concerns of the population and by making the process of retrofitting more accessible to farmers.

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