Fatal Farm Accidents in New York: Estimates of Their Costs

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A telephone survey of all of the surviving families of people killed in farm accidents in New York between 1985 and 1987 (52 of 87 families interviewed, 60% response rate) found the average total annual present value of expected income foregone because of fatal farm accidents in New York is over $8.6 million (in 1987 dollars). Less than five years after the accidents, 67% of the families who operated the farms where the accidents occurred no longer operate them and 44% no longer live on the farms.

Agricultural workers have a greater chance of dying in a work-related accident than people in any other occupation, including other traditionally dangerous occupations such as mining and construction (National Safety Council). The National Safety Council estimates that over 1,500 people die each year in agricultural accidents.

Despite the high rate of injuries and death, and the recognized need for economic research about these issues (Daberkow and Fritsch), there is only anecdotal evidence about the consequences of fatal farm accidents on farms and farm families. Existing economic studies of farm accidents have primarily concentrated on nonfatal accidents, while studies on fatal accidents have generally considered only the causes of accidents and to whom they occur. It is important to gain perspective on the income losses such accidents inflict on the surviving families.

Much research has been conducted to determine the number, rates, and kinds of fatal farm accidents that occur (Fritsch; Smith, Rogers, and Sikes; Murphy; Stallones). The cost-of-farm-accident literature has concentrated on consequences of permanent disabilities (Stout and Darbee; Tormoehlen and Field; Tormoehlen) and nonfatal farm accidents (Pfister; Pugh, Stuckey, and Phillips; Robbins). Monk et al. (1984, 1986) estimated the financial costs to the employer and the economic costs associated with fatal farm accidents in Great Britain as part of a larger study of farm accidents, but because full information on costs was obtained for relatively few fatal accidents, Monk et al. assumed that all workers killed were full-time workers. The dearth of economic research on farm-accident fatalities is in sharp contrast to that conducted on other types of fatal accidents (e.g., Muller; U.S. Dept. of Transportation; Rice et al.; and Hartunian, Smart, and Thompson).

This study estimates the income foregone and opportunity cost of labor lost because of fatal farm accidents in New York using survey responses from surviving family members and discounted future earnings. Foregone income includes off- and on-farm wage income, on-farm nonwage remuneration, and the value of household work. The sensitivity of the estimates is then discussed with respect to the data and several of the major methodological assumptions involved in the analysis.

Methodology

Surviving family members of people killed in New York farm accidents, identified using a comprehensive list of victims derived from earlier research by McCullough et al., were interviewed by telephone during the late fall of 1989. The McCullough study, based on a newspaper clipping service and death certificates, identified 94 fatal farm accidents that occurred in New York during 1985–87. This period had a number, type, and incidence of fatal injuries typical of such accidents in New York. Eighty-seven of the 94 victims could be identified by name. Contacts were found for all 87 victims, and attempts were made to interview each contact.

Because discounted future earnings (DFE) is relatively unambiguous in nature (Hartunian et al., p. 44) and best matches "the concepts normally associated with accident costs" (Etter, p. 635),

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Table 1. Formula for Discounted Future Earnings

$$DFE_{n,s} = \sum_{n=i}^{70} P_{i,s}\,(Y_O + Y_F + Y_N + Y_H)\,(1 + r)^{-(i-n)},$$

where: $DFE_{n,s}$ = discounted future income for a person of age n at time of death and sex s;
$P_{i,s}$ = probability of an upstate New York resident of age i and sex s surviving to age $i + 1$;
Y_O = annual off-farm wage income;
Y_F = annual on-farm wage income or opportunity cost;
Y_N = annual on-farm nonwage income;
Y_H = annual value of household labor;
r = discount rate.

DFE was used to estimate the income foregone and opportunity cost of the accidents (Table 1). DFE, however, has been criticized for conceptual problems (Schelling; Mishan; Jones-Lee; Jones-Lee, Hammerton, and Philips). It places, for example, low value on homemakers, children, retirees, and others who receive low wages, and instead favors those in the midst of their peak lifetime earnings. As a measure of the value of human life, this is clearly problematic, but as a measure of the income foregone and opportunity cost of accidents, this is not a major limitation; an accident to those in the peak of their lifetime earning cycle has more of an opportunity cost than an identical accident to someone with less earning potential.

Foregone expected income was estimated by discounted future earnings, weighted by age and sex-specific survival probabilities for upstate New York residents (calculated from data by the New York State Department of Health), and using a 5 percent discount rate. This discount rate approximates the real interest rate. Its use also provides some consistency between this study and other farm business analyses in New York (see, for example, Casler; Smith, Knoblauch, and Putnam). The average retirement age for all victims was assumed to be 70 years. All dollar estimates are in 1987 dollars.

Off-farm wage income was specified by most respondents but had to be estimated for one hired worker and three male owners by multiplying the victim's hours of off-farm work by the average New York wage for the person's nonfarm occupation. Wage rates for 1987 were obtained from the New York Department of Labor. On-farm wage income was also specified by most respondents but had to be estimated for one hired worker by a similar process using agricultural hired-worker wage rates in the Northeast during 1987, obtained from the New York Agricultural Statistics Service (1987). On-farm income foregone due to a death to an owner was estimated by the opportunity cost of his or her labor, using the victim's hours of on-farm work and the average wage of supervisory agricultural labor in the Northeast. This wage rate provides an estimate of the value of an owner's labor and management.

All hired workers receiving nonwage farm income were employed on dairy farms, so the value of their nonwage benefits was estimated by discerning benefits received and then valuing each using estimates from a study of workers on larger-than-average dairy farms in New York (Maloney and Woodruff). It is assumed that any such nonwage benefits accrue to owners through their ownership of farm resources and that the value of these benefits is capitalized in the value of those resources. Estimates of owners' nonwage farm income were therefore not made because the surviving families would still own their homes and the farm businesses after the accidents and thus could continue to receive the benefits.

Changes in returns to capital, such as asset-value appreciation or depreciation, were omitted from the study, as were any costs associated with accident-related disruption of the businesses. Appreciation of assets is a major source of income for farm families; even though the fatalities may have affected the families' use of assets, they did not affect the family *ownership* of the assets. Even when a principal operator was killed, the families were still free to continue to operate or rent out the assets if they so decided. Families who chose to sell their farm assets quickly may have sold those assets at a loss, but estimating the amount of this loss would be difficult without directly appraising the value of the farm and comparing it to the sale price. Such an effort was beyond the scope of this study. Disruption costs were omitted for similar reasons. Both asset losses and disruption costs would likely be minor compared to the income losses included in the study, so their omission would not dramatically affect the estimates.

The loss of household work was estimated for all married victims (both male and female) using data from Gauger and Walker's (1980) study of the value of household work and stratifying by sex, age, and by the number and age of the victims' children. Similar estimates were not conducted for single people without children because their deaths did not deprive any household of their labor (their own households ceased to exist when they died). It was assumed that all single people without children lived alone.

The accidental death of farm children has an on-farm opportunity cost for the hours the children

would have helped on the farm as they grew and the foregone income for their expected earnings if they had reached adulthood. Data on average number of hours children of different ages help on their parents' farms are unavailable, so members of several farm families were asked about their experience. Using this information, the hours of adult-equivalent work were assumed to be an increasing function of age, rising from an average of half an hour a week for 4 year olds to 27 hours a week for 17 year olds. These hours of work were valued using nonsupervisory agricultural hired-worker wages. It was not possible to predict which occupations these children would have chosen as adults, so the average weekly wage income in New York was used to estimate their foregone expected income.

Results

Successful interviews were conducted with 52 families for a response rate of 60%. Five families (6%) had moved without a forwarding address and 13 families (15%) refused to participate. Eleven of the successful interviews were discovered to be nonfarm fatal accidents typically involving farm animals or farm machinery, but neither occurring to someone working on a farm nor in the course of farm work. These were excluded from the analysis.

Some respondents either had poor recall or were sensitive about the questions. Economic analysis could only be conducted on 7 of the 12 completed hired-workers' responses, 17 of the 21 responses about male owners, and 3 of the 4 responses about females, for response rates of 37%, 50%, and 50%, respectively. The estimation procedure for the on-farm opportunity cost and off-farm foregone expected income because of accidents to children did not require survey responses, so the response rate is not relevant.

The sparse data available on the nonrespondents do not allow checking for the complete representativeness of the sample, though the sample was not statistically significantly different by sex, age, or the victims' roles on the farms. Each of the subgroups of hired workers, males, and females that was analyzed was also checked for its representativeness and was not statistically significantly different from its peers.

Information on two hired workers lacked data on the employer-provided insurance and whether the employer provided housing and utilities. Instead of omitting these workers from the analysis, a low estimate of foregone hired-worker income was calculated by assuming they had not been given these benefits, and a high estimate was calculated by assuming they had received these benefits.

The per fatality calculations in Table 2 allow estimation of the total annual income foregone and opportunity cost of fatal farm accidents in New York. Assuming that the surveyed victims are representative of the nonrespondents and the 7 unidentified victims, an average of approximately 7 hired workers, 13 male owners, 2 female owners, and 3 children die each year in New York farm accidents, with an average present value income loss of $8.6 million a year.

These results are strongly dependent upon the assumptions used in the analysis. The study's reliance upon opportunity cost estimates of owners' foregone returns to labor and management overestimates foregone income. The average annual opportunity cost of $20,634 exceeds the average $11,042 labor and management income on medium-to-large New York dairy farms estimated by Smith, Knoblauch, and Putnam, even though the Smith study itself probably overestimates this income. The Smith study population represented a "cross section of better-than-average commercial dairy farm owner-operators" (p. 1). Substituting the average income estimated in the Smith study for the opportunity cost estimates would have resulted in a one-fifth smaller estimated foregone income.

The small number of observations involved in this study exacerbates the size of the variance that could be expected from the data because of the large differences between farms. The estimates associated with individual victims have wide variability, influenced by the age of the victims, their off-farm work status, and the size of the farm where the accident occurred. If the estimates included direct measurement of each farm's output, the variability would be even greater. The aggregated estimates in Table 2 are averages across all farms experiencing fatal accidents and thus cannot be expected to reflect accurately economic impacts in individual situations.

The fatal accidents had effects beyond the lost income. Sixty-seven percent of the families who operated the farms where the accidents occurred no longer operate them and 44% no longer live on the farms. The families who quit operation did so quickly; of those who could recall, 62% quit within a year of the accident and all had done so within two years after the accident. Though not statistically significant, data on the percentage of the farms' labor and management performed by the victims suggest that the greater the victim's contribution

Table 2. Average Present Value of Lifetime Expected Income Foregone and Opportunity Cost (1987 Dollars)

	Number of Observations	Average Age (yrs.)	On-Farm Nonwage Income	On-Farm Wage Income	On-Farm Opportunity Cost	Household-Work Opportunity Cost	Off-Farm Income	Total
Male owner	17	49	—	—	$265,539	$41,335	$55,173	$362,047
		(16.8)[a]			(175,610)	(27,141)	(102,233)	(174,831)
Hired worker	7	31	$60,048[b]	$236,565	—	$35,183	$19,918	$351,715[c]
		(14.8)	(62,256)	(180,061)		(34,898)	(52,697)	(246,048)
Female owner	3	52	—	—	$109,187	$108,814	$0	$218,001
		(10.02)			(81,638)	(96,842)		(173,338)
Child	12	7	—	—	$25,728	—	$286,431	$312,159
		(4.5)			(5,470)		(68,754)	(64,740)

[a]Standard errors are in parentheses. Does not add due to rounding.
[b]High estimate. Low estimate is $43,131. See text for explanation.
[c]Using high estimate of hired-worker nonwage on-farm income.

to the farm's labor or management, the more likely the family was to quit or move. The data suggest an average of 17 families quit operation and 11 families move off their farms annually because of fatal farm accidents in New York.

It cannot be inferred from the data whether this displacement occurred out of economic necessity. Some families, for example, said they quit farming simply because the accident took all of the enjoyment out of farming. Furthermore, 86% of the families did not report being made financially insecure by the accidents. Eighteen farm-owner families reported being financially secure before the accidents, and all but one (94%) also reported being financially secure after the accidents. The family that did become financially insecure had health insurance and life insurance on the victim, and the victim was not the family's sole provider at the time of the accident. In contrast, half of the families of hired workers who said they were financially secure before the accident were not secure after the accident. All of these families had life insurance on the victims.

"Financially secure" is a subjective concept, dependent upon the respondents' perceptions and values. There is no way to verify whether respondents gave accurate responses to these questions without imposing an outside definition of the term that may be inconsistent with their own. If the responses do accurately reflect the respondents' views, one likely reason most of the owner families did not report becoming financially insecure after the fatal accidents is because their equity in their farms provided some cushion beyond the insurance. Hired-worker families had no such additional resource to fall back upon, helping to explain why a greater percentage of them reported being financially insecure after the accident.

Conclusions

Attention to the safety of agriculture is warranted. The number of fatal accidents in farming is high relative to other occupations, causing loss of income and major disruption in many surviving families' lives. Families of male owner-operators on average suffered a greater income loss because of an accidental death than did families of hired workers. The available data do not clarify whether owners' families were most hurt by the accidents; the income foregone by hired workers' families could easily have been a much larger share of household income than that foregone by owner-operators' families. The families' reports about changes in financial security, however, imply that hired workers' families on average are especially hard hit when such accidents occur.

Despite the tragic consequences of these accidents on the surviving families, the effect of these accidents on the rest of the agricultural community or society is less clear. Fatal farm accidents do not seem to have contributed much to the overall loss of families and people from farming. At least 1,000 New York farms quit operation every year during 1985–87 (New York Agricultural Statistics Service 1988, p. 6). Furthermore, the foregone income is relatively minor when compared to the total farm income generated in New York. The income foregone by deaths to owners was only equivalent to less than 0.4% of farm household income in New York (New York Agricultural Statistics Service 1988, p. 9).

More research into the economic consequences of fatal farm accidents is necessary. Research issues include examining the productivity losses that occur when farm businesses are disrupted by injury, the effect of the injuries on the value of the

farm and household assets, and whether inadequate levels of insurance coverage are a major influence on the economic stability of surviving families. Further research into family displacement is also warranted to determine whether counseling services affect the survivors' decision to stay and operate their farms.

The combination of relatively small population, extremely sensitive subject matter, recall limitations, and large differences between farms makes it difficult to produce results without large variance. This could be partially overcome by studying the deaths that occurred over a wider range of years or across more states and by relying upon personal visits (instead of telephone interviews). The latter would help make the interview more personal and could help overcome respondents' recall limitations or reluctance to answer all the questions. It may, however, also reduce the number of respondents willing to talk because face-to-face interviews could be perceived as less anonymous than a telephone survey.

The importance of the subject matter, however, should not be neglected because of the research difficulties. The results of this study demonstrate that the effect of fatal farm accidents is more than just the loss of life; the income losses to families can be large, and the accidents are associated with the exit of families from farming.

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