Virginia Cooperative Extension
Knowledge for the CommonWealth

Identifying Hazards and Causes of Accidents on Virginia Farms

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Introduction

In an effort to obtain more up to date farm injury data in Virginia, a statewide farm accident survey was mailed to a random sample of Virginia farmers in late April 1991 to obtain accident data for the calendar year 1990. All materials were mailed through the Virginia Agricultural Statistics Service (VASS) to ensure anonymity of the respondents.

The objectives of the survey were to identify: 1) farm activities most frequently resulting in injuries; 2) high risk groups with regard to farm accidents; and 3) hazards associated with using tractors without rollover protective structures (ROPS).

The results of this survey provided a basis for developing effective agricultural safety programs directed toward a reduction in farm related injuries, illness and fatalities. The results of the survey were also provided to the National Institute for Occupational Safety and Health for inclusion in their national survey data base.

Response Rate

A random sample of 1,520 farms across the commonwealth was selected by type of operation, size, and geographic location. The 1,520 farms in the sample represented nearly 3.5% of the 44,000 farms in Virginia.

The response to the survey was relatively low. Of the 1,520 survey forms sent, 915 were returned. This represented about 60% of the sample. However, only 695 of the 915 returned surveys were usable. The responses of the other 220 returned forms were as follows:

Farm rented out	56
Retired	55
Not completed	32
Deceased	18
Farm had been sold	18
Farm idle	16
Refused to participate	6
No longer farming	5

The usable response rate for the survey was approximately 46%. The reluctance of farmers to disclose accident information may have been a factor in the low response rate. In addition, the timing of the survey may also have contributed to the low return rate. The Virginia survey was conducted in late April and early May, which probably conflicted with normal spring field work for most Virginia farms.

Farm Size

The survey information on the size of farms indicated that 18.4% of the farms were less than 50 acres, 18.6% were 50 to 100 acres, 22.4% were 100 to 200 acres, 25.8% were 200 to 500 acres, and about 10% were 500 to 1,000 acres. Farms comprising more than 1,000 acres accounted for the remaining 5% of the surveys (Figure 1).

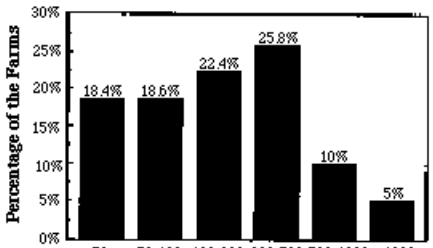

Figure 1. Size of Farms, Acres

Type of Farm Operation

The replies from the 695 farms indicated that 6.8% were grain operations; 24.6% mainly grew field crops such as cotton, tobacco, peanuts and hay; 62.7% raised livestock and poultry; and 3.6% produced specialty crops such as fruit, plants and vegetables. The remaining 2.3% of the farms conducted a variety of agricultural operations (Figure 2).

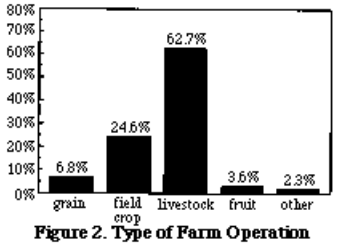

Figure 2. Type of Farm Operation

Injury Rates

An accident in this survey was considered to have resulted in injury if: 1) medical attention (including a phone call to a physician) was required or 2) a half day or more of restricted activity such as staying in bed, missing school or work, or reducing other normal activities occurred.

Among the 695 respondents, 40 reported one injury and five reported two injuries during the period of 1990. This resulted in a total of 50 injuries, with one being a fatality. Since the survey only requested injury information for the most recent accident, descriptive injury data were obtained for 45 of the 50 injuries. Among the injuries, 40 were reported as work related and one as leisure or recreation related. The classifications of the other four injuries were not specified. Assuming all unknown injuries were work related, a total of 49 work related injuries were reported in the survey. The injury rate, i.e., the number of work related injuries (49) divided by the number of farms (695), was calculated as 0.07 work injuries per farm. In other words, seven percent of the farmers surveyed experienced at least one work- related injury in 1990. Because of suspected under-reporting, this injury rate probably represents the lower bounds for the actual rate of work injuries occurring during 1990.

On a statistical basis, this represents one injury per every 14 farms in 1990. A total of 1.90 million hours of exposure to farm work was reported in the survey. Family members accounted for 64.4% or 1.22 million hours, and hired workers accounted for 35.6% or 0.68 million hours. Injury rates, per million hours of work exposure, for family members and hired workers were calculated. Twenty-eight of the work- related injuries were identified as having occurred to family members and 19 to hired workers. The injury rate for family members was 22.9 injuries per million hours of work exposure. The rate for hired workers was 27.9 per million hours of farm work.

Injury Information

The injury data indicated that about 85% of the total injuries occurred to male farm workers and 15% to females. Work injuries appear correlated with worker's age. Nearly one-third of the injuries occurred to workers aged 45 to 64 years. No children under the age of 15 were reported to be injured. The oldest victim of an accident was 77 years old. Table 1 shows the percentage of work injuries experienced by age groups. The work injury rates by age group could not be calculated due to lack of data. Although agricultural workers in the age groups of 25 to 64 were reported to experience more injuries, it is likely they have lower injury rates per hours of exposure because they usually work more hours.

Table 1. Injuries by Age Groups

Age group	*% of injuries*
Under 15	0.0
15 to 24	13.6
25 to 44	20.5
45 to 64	29.5
65 & over	13.6
Unknown	22.7

Analyzing the injury data by month revealed that November was the top month for injuries, accounting for 17.5% of the total injuries, as shown in Table 2. June and September had the next highest number of injuries, each accounting for 12.5% of reported injuries reported. Few injuries occurred during the period from February to May. Further examination of the accident descriptions disclosed that many injuries occurring in the winter months were associated with harvesting fire wood and using hand and power tools.

Table 2. Month Injury Occurred

Month	*% of injuries*
January	7.5
February	2.5
February	2.5
April	10.0
May	2.5
June	12.5
July	10.0
August	7.5
September	12.5
October	7.5
November	17.5
December	7.5

The severity of injury data indicate that 85% of the injuries required medical attention and 12.5% of the injuries resulted in restricted activities. One fatality was reported from the survey due to a tractor overturn. A total of 561 lost workdays were reported as a result of 38 work-related injuries. Nearly two-thirds of the injuries resulted in at least one full day of lost time. Thirty-two percent of the cases involved six or more lost workdays. The maximum number of lost workdays reported in the survey was 120. Time lost per injury averaged 15 workdays. Table 3 lists the number and percentage of injuries by the number of lost workdays.

Table 3. Lost Workdays Due to Injury

Lost workdays	*Number*	*Percentage*
less than one	15	34.1
one to five	9	20.5
six to ten	4	9.1
11 to 20	4	9.1
21 to 50	3	6.8
over 50	3	6.8
Unknown	6	13.6

The nature of injuries is displayed in Table 4. Cuts were the most common injury, accounting for about 27% of the total injuries. Sprains/strains and fractures were the next two most common types of injuries, resulting in 15.9% and 13.6% of the total injuries, respectively.

Table 4. Nature of Injury

Nature of injury	*% of injuries*
Amputation	2.3
Bruise	6.8
Burn	2.3
Cut	27.3
Crushed/mangled	4.5
Fracture	13.6
Puncture	9.1
Sprain/strain	15.9
Multiple injury	6.8
Other/unknown	11.4

Table 5 gives work injury by part of the body. The hand/wrist was the most frequently injured body part, accounting for about 18% of the injuries. The leg/ knee was injured next most frequently and accounted for 15.9% of the injuries. Then, the arm/shoulder and finger follow, each with 13.6% of the total injuries. The back accounted for another 11.4% of the injuries.

Table 5. Work Injury by Body Part

Body part	*% of injuries*
Hand/wrist	18.2
Leg/knee	15.9
Arm/shoulder	13.6
Finger	13.6
Back	11.4
Foot	6.8
Multiple	6.8
Head/neck	4.5
Eye	2.3
Chest/trunk	2.3
Other/unknown	4.5

Information about work injuries by type of accident is presented in Table 6. Contact with a sharp object was the most common type of accident occurring on Virginia farms. These accounted for about 20% of the total injuries. Another 20% of the injuries were caused by one of the "struck by" categories. The "caught" type of accidents were responsible for 16% of the injuries. Falls resulted in approximately 9% of the injuries.

Table 6. Work Injuries by Accident Type

Type of Accident	*% of Injuries*
Contact with sharp object	20.5
Struck by or against object	11.4
Struck by flying object	6.8
Struck by falling object	2.3
Caught between objects	9.1
Caught under object	4.5
Caught in object	2.3
Fall from elevation	6.8
Fall from same level	2.3
Overexertion	6.8
Other/unknown	27.3

Causes of Accidents

Animals were found to be the leading cause of accidents to Virginia farm workers with about 18% of the injuries, as shown in Table 7. Agricultural machinery (excluding farm tractors) was the second most prominent cause of injuries, accounting for 16% of the injuries. Hand and powered tools were responsible for about 18% of the injuries. Another 11.4% of the injuries were attributed to the working surface (ground, floor, etc.). Tractors caused only 6.8% of the total injuries. However, injuries involving tractors were much more severe than other injuries. The one fatality reported in the survey was associated with a tractor overturn. The average of workdays lost for other tractor-related injuries was 60 days, the

highest among all injury sources. In conclusion, farm tractors, animals, agricultural machinery and equipment, and liquid (including water, manure, etc.) caused the most workdays lost due to work-related injuries on Virginia farms. A study by Hetzel et al. (1991) on the death certificate data for Virginia farm workers revealed that agricultural machinery, including tractors, was responsible for over 50% of the fatal accidents for the period from 1975 through 1989.

Table 7. Major Causes of Accidents and Average Workdays Lost

Cause	*No.*	*% injuries*	*Average workdays lo*
Animals	8	18.2	40.86
Machinery	7	15.9	10.00
Work surface	5	11.4	0.75
Hand tools	5	11.4	4.80
Power tools	3	6.8	0.67
Tractors	3	6.8	60.00
Plant/tree	3	6.8	1.00
Liquid	3	6.8	12.33
Chemicals	1	2.3	0.00
Other/unknown	6	13.6	6.50

The type of work being performed when an injury occurred is tabulated in Table 8. Livestock treatment or handling was the most common activity performed when injuries occurred, resulting in nearly one-third of the total injuries. Persons engaged in field work and machinery maintenance experienced the next highest percentage of injuries, each accounting for 11.4 percent of the total injuries. Another 27% of the injuries resulted from "other" kinds of agricultural activities.

Table 8. Activity When Injured

Activity	*% of injuries*
Livestock handling	31.8
Field work	11.4
Machinery maintenance	11.4
Building maintenance	9.1
Routine chores	4.5
Other	27.3
Unknown	4.5

Hazards Presented by Farm Tractors

The information on farm tractors reveals that serious problems exist regarding the safe use of tractors on Virginia farms. The survey data showed there were 1393 tractors in use on 620 farms, for an average of 2.25 tractors per farm. About 70% of these tractors were not equipped with a ROPS. Table 9 depicts the presence of ROPS on Virginia farm tractors.

Table 9. Tractor Rollover Protection

Rollover protection	*% of tractors*
None	69.8
ROPS	15.6
Cab	12.0
Unknown	2.6

Of the 620 respondents that provided tractor information, only 240 reported that at least one tractor on the farm was equipped with some type of ROPS. The remaining 380 farms used tractors that had no ROPS/protective cabs at all.

Hours of tractor use revealed that, on average, tractors without ROPS were used about 290 hours per year. Tractors with ROPS averaged approximately 330 hours of use. Tractors equipped with cab type ROPS were used about

450 hours. However, the total hours of use for tractors without ROPS (280,000 hours) were 85% higher than those for tractors with ROPS or cabs (148,000 hours) because the majority of tractors used on Virginia farms were not equipped with ROPS or protective cabs. Table 10 shows the average annual hours of tractor use by kind of rollover protection.

Table 10. Average Yearly Hours of Tractor Use by Rollover Protection Status

Rollover Protection	*Number of Tractors*	*Average Hours of Tractor Use*
None	972	288
ROPS	218	332
Cab	167	453
Unknown	36	297

Based on the authors' information, some 10 to 20 people lose their lives each year in Virginia as a result of tractor overturns. Most of those fatalities occurred to older farm workers, probably because they were more likely to use old tractors that had no rollover protection. Three tractor overturns were reported from this survey, and one of them caused a fatality. The hazards resulting from using tractors without ROPS are very evident.

Conclusions

Based on the information from this survey, the following conclusions can be derived:

1. Hired workers had a higher injury rate per million hours of work exposure than family members.

2. More injuries occurred during the winter months.

3. Animals, agricultural machinery, and hand or power tools were leading causes of work injuries on Virginia farms. Farm tractors, machinery, and animals normally resulted in more severe injuries than other sources.

4. Tractors used on Virginia farms that had no ROPS presented serious safety problems for agricultural workers. Although, on average, the hours of annual use for tractors equipped with ROPS were higher than for tractors without ROPS, the total hours of use for tractors without ROPS were 85% higher than for those with ROPS.

Recommendations:

A number of recommendations follow regarding action that can be undertaken to reduce the number of injuries occurring on farms in Virginia:

1. Provide training for family members and hired farm workers on how to operate tractors and machinery and perform work tasks safely.

2. Emphasize safe practices to follow when harvesting fire wood and when using hand tools.

3. Provide training on how to work with livestock safely.

4. Encourage farmers to retrofit older tractors with a certified ROPS and seat belt or to purchase replacement tractor equipped with a ROPS and seat belt.

5. Increased efforts and research should target how to retrofit tractors with ROPS.

References

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