Potential Impact of a ROPS Retrofit Policy in Central Iowa

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Abstract
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Keywords
Tractor safety, Tractors, Farm safety, Agricultural safety

Disciplines
Agriculture | Bioresource and Agricultural Engineering

Comments
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Potential Impact of a ROPS Retrofit Policy in Central Iowa

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Abstract

Research studies have shown that tractor rollovers are the leading cause of work-related death in U.S. production agriculture. Previous studies have also shown that while rollover protective structures (ROPS) are the most effective means of preventing these deaths, it is estimated that over half of the tractors in use on U.S. farms are not equipped with ROPS. To gauge the impact of a ROPS retrofit policy, tractor sales in Central Iowa were monitored for a three-month period in early 1998 to determine the proportion of tractors without ROPS being sold by equipment dealers versus those being sold through other channels such as auctions, farm sales, and private transfer. During the study period, 549 tractors sales were documented in Central Iowa. Of these tractors, 72% were equipped with ROPS. Of the 152 that were sold without ROPS, 43% were sold by equipment dealers. ROPS retrofits were readily available for 92% of the tractors that were not equipped with them at the time of the sale. A fully implemented ROPS retrofit program for equipment dealers would have reduced the number of tractors sold without ROPS in Central Iowa by over 40%. The results suggest that such a policy could have a significant impact in reducing the number of farm fatalities and thus should be investigated further.

Keywords: Tractor safety, Tractors, Farm safety, Agricultural safety.

Since World War II, worker death rates have been reduced by over 75% for all major industries in the U.S. except agriculture (National Safety Council, 1997). Agriculture has consistently been one of the most hazardous industries with a death rate per 100,000 workers at six to seven times the national average (National Safety Council, 1998). Safety features designed into today's agricultural equipment have significantly reduced hazards associated with their operation and the resulting toll of related injuries and fatalities. However, tractors continue to be the leading cause of agricultural work-related fatalities in Iowa (Iowa Farm Safety Council, 1997) and across the country (National Safety Council, 1998). Numerous research studies have shown that tractor rollovers are the leading cause of tractor-related fatalities (Lehtola et al., 1994; Etherton et al., 1991; Purschwitz and Field, 1990; Wilkinson and Field, 1990). To address this problem, all major tractor manufacturers voluntarily adopted rollover protective structures (ROPS) and seatbelts as standard equipment in 1985. However, the average age of U.S. farm tractors is approximately 23 years and it has been estimated that over 60%...
of the 4.7 million tractors in use on U.S. farms are not equipped with ROPS (Meyers and Snyder, 1995). As long as tractors without ROPS are in use, rollover fatalities will occur. The National Safety Council (1998) estimates that tractor rollovers still account for 52% of all U.S. farm fatalities. A five-year study of tractor-related fatalities in Iowa identified 76 deaths resulting from tractor rollovers (Lehtola et al., 1994). All 76 victims were operating tractors without ROPS.

In an effort to increase the use of ROPS, North America's five leading tractor manufacturers (AGCO Corporation, Case Corporation, Deere & Company, Kubota Tractor Corporation, and New Holland North America) started a ROPS incentive program in 1993. The program offers ROPS retrofit kits to local dealers and encourages them to sell these kits to producers without additional costs. Kits are available for most tractors manufactured from the late 1960s through 1985, when ROPS became standard equipment.

While the retrofit program reduces the financial burden placed on producers, Kelsey et al. (1996) found that regardless of cost, it is unlikely that producers will significantly increase the adoption rate of ROPS on non-ROPS-equipped tractors voluntarily. Policies or incentives encouraging equipment dealers to retrofit non-ROPS-equipped tractors before resale may address this problem. However, only non-ROPS-equipped tractors actually being sold through the franchised dealers would be impacted by this type of approach. Because of the lack of reporting mechanisms*, no studies were found that examined the transfer of ownership of older tractors (those manufactured prior to 1985), particularly the portion that are being sold outside of the equipment dealers (e.g., private sales, farm sales, auctions). Examination of this issue is essential to determine the potential effectiveness and impact of dealer conducted retrofit programs. This manuscript describes a study designed to address the issue of where tractors without ROPS are being sold and provide a starting point for evaluating the usefulness of a dealer conducted ROPS retrofit program.

**Methods**

Tractor sales were monitored for a three month period (February, March, April) in early 1998† in the Central Iowa Region. The Central Region consists of 14 counties as shown in figure 1. The population of interest was all tractor ownership transfers within the 14 county area during the study period. Tractor sales were identified through newspaper classified advertisements and through direct contact with agricultural equipment dealerships within the region. The Des Moines Register is the primary newspaper in Central Iowa and covers the entire Central region. Potential tractor sales were identified in the classified section of the Sunday Des Moines Register throughout the study period. A commercial newspaper clipping service was also utilized to identify classified advertisements involving tractors in smaller daily and weekly newspapers throughout the 14 county area. The classified advertisements included advertisements from individuals, dealerships, and farm sales and auctions. In addition to newspaper classified advertisements, a list of regional agricultural equipment dealerships was obtained from the Iowa-Nebraska

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* Unlike automobiles, there are no registration or licensing requirements for agricultural tractors, thus, there is no comprehensive method for tracking the sale of tractors outside of equipment dealers, particularly when dealing with the transfer of ownership from one farmer to another.

† The project time period was based on the project budget and the availability of student labor to assist the author in contacting the people who placed the classified advertisements.
Equipment Dealers Association, Inc. These dealerships were then contacted directly to obtain their sales records for the study period.

The data collected for each tractor included the manufacturer, model number, year manufactured, the presence of a ROPS, whether or not it was being sold through a dealer, and the date sold (no information was requested concerning the purchaser or the selling price). Thus, it was not enough for a tractor to just appear in a classified advertisement to be counted. Only tractors that were actually sold during the study period were counted. To obtain this information, the person who placed each classified advertisement was contacted by phone. If the tractor in the advertisement was sold, then the relevant data was collected and the tractor added to the database. If the tractor was not sold, the individual who placed the advertisement was contacted again until the tractor was sold or the study period expired.

Regional agricultural equipment dealers were sent a letter at the beginning of the study outlining the purpose of the study and explaining that their names and addresses were obtained from their Dealer's Association. The dealers were then contacted by phone after the study period had expired to obtain the desired information for all tractor sales during the study period.

Duplicate sales between the newspaper classified advertisements and the dealership records were eliminated by comparing phone numbers if two tractors of the same model and year were sold on the same day. However, there were still limitations associated with the sampling methods. If an individual farmer did not place a classified advertisement in a local newspaper (e.g., placing a for sale sign on the tractor and parking it near a roadway, or word-of-mouth among neighbors) it was not possible to identify that type of transfer in ownership. Additionally, addresses were not obtained from individuals who had placed the classified advertisements. If the telephone area code was outside the central region, or if a town was included in the advertisement that was outside the central region, then that particular advertisement was ignored. However, it is possible that advertisements were placed in central region newspapers from individuals bordering, but outside the region. If the tractor was sold from a location outside the central region, the number of tractors being sold within the central region would be inflated.

Figure 1-Central Iowa Region.
Based on the author's observations and experience, it is estimated that the sampling techniques described above represent 80 to 90% of the population of all transfers of tractor ownership within the 14-county area during the study period. Since there is no evidence to indicate to the contrary, it is also believed that the sample collected is representative of the ratio between tractors with and without ROPS being sold and the method in which they are being sold in Central Iowa.

Results

Data was collected on 549 tractor sales during the study period. Sixty-two percent of the tractors were sold by equipment dealers. Seventy-two percent of all tractors sold were equipped with some type of ROPS. See table 1 for a breakdown of the presence of a ROPS versus whether it was sold by a dealer. The tractors sold were manufactured from 1954 to current 1998 models (see fig. 2). The average tractor sold was 14 years old. The median tractor sold was 15 years old. Eighty percent of the tractor sales took place in March and April with March being the peak month for tractor sales by equipment dealers as well as for sales outside of the dealers (see table 2).

Discussion

In 1976 OSHA mandated that all agricultural tractors manufactured after 25 October 1976 that have a 20 hp or larger engine must have a seatbelt and a ROPS. In response, tractor manufacturers developed ROPS for their tractors and some included them as part of the standard equipment package. However, the OSHA standard did not apply to family farms (with no non-family workers) and was not “enforced” on farms that employed fewer than 11 employees. In 1985, agricultural tractor manufacturers voluntarily adopted ROPS as standard equipment that could not be deleted as an option by the customer. With a few specific exemptions (usually related to vertical clearances), nearly all agricultural tractors sold in the United States since 1986 have been equipped with some type of ROPS.

The average and median age of tractors sold during this study places their date of manufacture in the pre-1986 era when ROPS were available but not required. Fifty-seven percent (57%) of all tractors sold during this study were manufactured prior to 1986. Table 3 shows a breakdown of tractor sales by year manufactured. The changes in ROPS availability are readily apparent with only 37% of the tractors manufactured prior to 1977 being equipped with a ROPS at the time of sale, 74% of the tractors sold that were manufactured from 1977 to 1985 were equipped with a ROPS, and 91% of the tractors manufactured after 1985 were equipped with a ROPS at the time of the sale. It is interesting that ROPS were not present on all post-1985 tractors sold during this study. This would imply that previous owners

| Table 1. Tractor sales in Central Iowa, February-April 1998 |
|-----------------|-----------------|---------------|-------|
| ROPS | No ROPS | Total | % |
| Dealer | 277 (81%)* | 66 (19%) | 343 | 62 |
| Other | 120 (58%) | 86 (42%) | 206 | 38 |
| Total | 397 | 152 | 549 | 100 |
| % | 72 | 28 | |

* Internal percentages are associated with data rows (81% of tractors sold by dealers had a ROPS at time of sale).
Figure 2–Tractor sales by year manufactured and method.

Table 2. Tractor sales by month

<table>
<thead>
<tr>
<th></th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dealer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R O P S</td>
<td>63</td>
<td>110</td>
<td>104</td>
<td>227</td>
<td>50</td>
</tr>
<tr>
<td>N o R O P S</td>
<td>14</td>
<td>31</td>
<td>21</td>
<td>66</td>
<td>12</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R O P S</td>
<td>23</td>
<td>54</td>
<td>43</td>
<td>120</td>
<td>22</td>
</tr>
<tr>
<td>N o R O P S</td>
<td>12</td>
<td>39</td>
<td>35</td>
<td>86</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>112</td>
<td>234</td>
<td>203</td>
<td>549</td>
<td>100</td>
</tr>
<tr>
<td>%</td>
<td>20</td>
<td>43</td>
<td>37</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Table 3. Tractor sales by year manufactured

<table>
<thead>
<tr>
<th></th>
<th>R O P S</th>
<th>N o R O P S</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1976</td>
<td>49 (37%)*</td>
<td>82 (63%)</td>
<td>131</td>
<td>24</td>
</tr>
<tr>
<td>1977-1985</td>
<td>131 (74%)</td>
<td>47 (26%)</td>
<td>178</td>
<td>33</td>
</tr>
<tr>
<td>1986 -</td>
<td>212 (91%)</td>
<td>20 (9%)</td>
<td>232</td>
<td>43</td>
</tr>
<tr>
<td>Total</td>
<td>392</td>
<td>149</td>
<td>541†</td>
<td>100</td>
</tr>
<tr>
<td>%</td>
<td>72</td>
<td>28</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

* Internal percentages are associated with data rows (37% of tractors sold that were manufactured prior to 1977 had a R O P S at time of sale).
† Year manufactured was not known for eight tractors.
removed the ROPS on at least some of the 20 tractors sold. Eight of the 20 tractors without ROPS from this era were sold by dealerships.

ROPS were readily available for 140 (92%) of the 152 tractors sold without ROPS during the study period. Availability of ROPS was determined by examining the database for tractors of the same model that were sold with a ROPS, by searching the National Farm Medicine Center's A Guide to Agricultural Tractor Rollover Protective Structures (Strack et al., 1997), and by contacting local agricultural equipment dealers. As can be seen in table 4, the ratios of ROPS availability were the same (92%) for tractors sold by dealers and for tractors sold outside of the dealerships. If a ROPS retrofit program for dealers were in place and ROPS were added to only those tractors for which ROPS were readily available, the number of tractors sold without ROPS would have been reduced by 61 tractors. This would have increased the percentage of all tractors equipped with ROPS sold in central Iowa from 72% to 83%. If all the tractors for which ROPS were readily available were retrofitted prior to resale, the percentage with ROPS would have increased from 72% to 98%.

**Conclusions**

The following conclusions can be made concerning the sale of tractors in Central Iowa during February, March, and April 1998:

1. The average age of the tractors sold was 14 years. The median age of the tractors sold was 15 years. This resulted in 57% of the tractors sold being manufactured in the time period prior to ROPS being required as standard equipment.
2. Fifty-seven percent of the tractors sold without ROPS were sold outside of the dealerships.
3. ROPS were readily available for over 90% of the tractors sold without ROPS.
4. A ROPS retrofit program for dealers would increase the percentage of all tractors sold with ROPS from 72% to 83%.
5. A ROPS retrofit policy for anyone selling a tractor would increase the percentage of all tractors sold with ROPS to nearly 100%.

Based on the author's experience, the following general observations concerning the sale of tractors in Central Iowa during the study period came as a surprise and thus merit mention:

1. More 1998 tractors were sold than expected. With the general condition of the agricultural economy, it was somewhat surprising to see so many new tractors being sold.
2. More tractors without ROPS were being sold by dealers than expected. In the author's travels around agricultural communities, older non-ROPS-equipped

### Table 4. Availability of ROPS for tractors sold without ROPS

<table>
<thead>
<tr>
<th>Available ROPS</th>
<th>No Available ROPS</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dealer</td>
<td>61 (92%)*</td>
<td>5 (8%)</td>
<td>66</td>
</tr>
<tr>
<td>Other</td>
<td>79 (92%)</td>
<td>7 (8%)</td>
<td>86</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>12</td>
<td>152</td>
</tr>
</tbody>
</table>

* Internal percentages are associated with data rows (ROPS were readily available for 92% of tractors without ROPS sold by dealers).
tractors on dealer's lots were a rare sight. During this study 43% of the tractors sold without ROPS were sold through the dealerships.

Implications and Recommendations

Kelsey and Jenkins (1991) found that a policy mandating ROPS use on all tractors would not only be a significant financial burden for the producers, but that enforcement could be the largest expense of such a policy. While it is unlikely that retrofit policies would ever impact currently owned non-ROPS-equipped tractors or the private sale of agricultural tractors from farmer to farmer, retrofit policies for equipment dealers should not be quickly discounted as having little impact on the number of tractors without ROPS being used on U.S. farms. A dealer retrofit policy in this study would have reduced the number of tractors sold without ROPS in Central Iowa by 40 to 43%. As long as tractor rollovers are the leading cause of agricultural work-related fatalities, reducing the number of tractors changing ownership without ROPS by 40% could have a significant impact on reducing farm fatalities. Additionally, the findings by Kelsey et al. (1996) which suggests that many farmers would not accept a ROPS retrofit even if it was free, indicate that a dealer retrofit may be a more feasible way of getting ROPS on older non-ROPS-equipped tractors. However, the price of the retrofit (even at cost) would likely be passed on to the farmer which may cause an increase in older tractors being sold outside of the equipment dealers. The necessity of retrofitting and thus increasing the price of older tractors would probably make them more difficult to sell. This in turn, would probably reduce the likelihood of dealers taking them as trade-ins which may cause farmers to keep older non-ROPS-equipped tractors in service longer. Both of these scenarios would decrease the effectiveness and impact of dealer conducted retrofit programs in accomplishing the ultimate goal—reducing the number of non-ROPS-equipped tractors being used on American farms.

To fully evaluate the potential impact and effectiveness of a ROPS retrofit program additional studies need to be conducted. Similar studies in other geographic regions are needed to be able to draw conclusions that would be representative of national patterns of the sales of tractors without ROPS. These studies should also be considered at different times of the year. Through conversations with equipment dealers in Central Iowa, the pattern and number of new and used tractors sold through the dealerships are not governed by time of year, but rather dictated internally by incentives and promotions from the manufacturers. However, it is not yet known whether a pattern exists for sales outside of the dealerships.

The data collection methods used in this study were very time consuming and labor intensive. New data collection methods should be explored to facilitate the needed regional studies. Finally, if a ROPS retrofit policy is going to be considered, significant work needs to be done to develop a feasible implementation plan that incorporates the needs and concerns of the potential shareholders (manufacturers, dealers, farmers) while still accomplishing the goal of reducing the number of non-ROPS-equipped tractors in use.

References


The 4th International Symposium: “Rural Health and Safety in a Changing World” was held 18-22 October 1998 in Saskatoon, Saskatchewan, Canada. Organized by the Centre for Agricultural Medicine, University of Saskatchewan and partners, the Symposium sought to provide the opportunity for discussion of science and advancement of ideas on a diversity of topics designed to capture the full extent of agricultural safety and rural health issues. Four companion conferences completed the spectrum: The Conference on Industrial Hygiene (organized with the Institute for Rural and Environmental Health, University of Iowa); the First International Conference on Rural Nursing (organized with the College of Nursing, University of Saskatchewan); the Conference on the Health and Safety Needs of Rural Children (organized with the National Farm Medicine Center, Marshfield Medical Clinic); and the Fourth Annual Meeting of the Canadian Coalition Agricultural Safety and Rural Health. All of the NIOSH Agricultural Health Centers in the United States participated.

With some 445 participants from 20 countries, the Canadian, American, and world picture on health and safety in agriculture and rural health emerged. The results clearly demonstrated that the remarkable gains being made in research programming and outreach capability in the agricultural industries were the springboard for a new vision of health and safety in rural areas. The presentations provided striking evidence that the lessons learned from agriculture could be applied broadly across rural areas, and that other primary industries in rural areas shared many of the issues that confront a safe workplace and healthy lifestyle in agriculture. With the commonality of distance, culture and often scarce health-care resources, the discussions clearly identified the universal issues in rural health and safety.

In this edition, and those to follow, a selection of peer-reviewed articles arising from the Symposium are presented. These articles provide the flavor and substance of the Symposium. A complete set of abstracts from the Symposium will be available on the website of the Centre for Agricultural Medicine at http://www.usask.ca/medicine/agmedicine.

We would like to express our most sincere thanks and debt of gratitude to the agencies that provided the financial support necessary to undertake a symposium of this scope and magnitude. These were in order of contribution: the National Institute for Occupational Safety and Health; industry partners through the Founding Chairs Program of the Centre for Agricultural Medicine; Agriculture and Agri-Food Canada through the Canadian Agricultural Safety Program; the National Cancer Institute; the Saskatchewan Workers’ Compensation Board; the National Farm Medicine Center, Marshfield Clinic, Wis.; the Great Plains Center for Agricultural Health, University of Iowa; the Northeast Center for Agricultural and Occupational Health, Cooperstown, N.Y.; Western Co-operative Fertilizers Ltd., Westco, Calgary; Levitt Safety Ltd.; 3M Canada; and Flexi-Coil Ltd., Saskatoon. We recognize with appreciation the outstanding efforts of Dr. Karen Semchuk, M.s. Sueli de Freitas, M.s. Donna Leddingham, M.s. Vera Ljubovic, M.s. Ruth Day, and M.s. Donna Zaleschuk on organizing the Symposium.

We thank all those who made the Symposium possible by coming to Saskatoon to share their science, their views, their energy, and their humor. Our previous emphasis was on health and safety for farmers, their families, and others in a variety
of industries related to agriculture. We think that in the future, rural people, researchers, and policymakers will enhance their vision from that starting point to a future vision of “Rural Health and Safety in a Changing World”.

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