

Purdue University

Agricultural Safety and Health Program

2021 Indiana Farm Fatality Summary with Historical Overview¹

Compiled by the Purdue University Agricultural Safety and Health Program

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Abstract

Purdue University's Agricultural Safety and Health Program has been monitoring farm-related fatalities in Indiana for nearly 60 years. The earliest identified summary of cases, published in 1966, examined 76 fatalities reported during 1963.² Purdue's fatality database, though acknowledged as not being comprehensive of all farm-related deaths, provides a unique historical perspective to explore trends that have occurred over several decades. During that time, the total number of farms and the number of people directly involved in production agriculture have declined considerably, while production technology and farming practices have transformed dramatically. During the 1940's and early 1950's the leading identifiable cause of death was livestock, primarily horses and bulls. These animal-related injuries and deaths have largely been replaced, at a much lower frequency, with tractors and machinery. The annual number of farm-related fatalities continues to show a general downward trend that parallels the decline in the number of farm operations. The reduction in the number of farm operations has likely contributed more to the reduction in farm-related fatalities than any other single factor³, even as Indiana farmers have become more productive than ever. While the total number of farm-related deaths has gradually declined the fatality rate per number of workers remains one of the highest of all Indiana occupations.

Publication of this annual summary is intended to make the public aware that our food comes at a cost of lives, health, and well-being that is not necessarily reflected in the prices we pay at the grocery store or farmer's market.

¹ Appreciation is extended to Executive Director Stacy Wart, BLS Coordinator Joseph Black, and Survey Assistants Richard Clark and Rhapsody Owens with the Indiana Department of Labor Quality Metrics & Statistics Division for contributing to this report.

² Mitchell, Bailey W. (1966) Indiana Farm Accident Report 1963-1965. Purdue University, West Lafayette, IN.

³ Data from USDA National Agricultural Statistics Service

https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=INDIANA

https://www.nass.usda.gov/Statistics_by_State/Indiana/Publications/Annual_Statistical_Bulletin/index.php

The 20 documented fatalities in 2021 are a decrease from the 25 cases identified in 2020 and the fewest in the past eight years, reflecting the continuing historical trend of a declining number of annual fatalities. One victim was a child (age 1) and eight individuals age 60 and older were documented to have died in farm-related incidents in 2021. Incidents involving those 60 and older now account for 49% of all documented cases over the past five years, including 40% in 2021. Tractors are the most common agent in farm-related fatalities, representing as many as 52% of all documented cases in the past ten years, with 6 reported cases (30%) in 2021. Over the past 50 years, tractor overturns have accounted for the single largest cause of farm-related deaths, even considering that Rollover Protection Structures (ROPS) have been standard equipment on new tractors since 1985. Only one female fatality was documented in 2021, with males comprising the overwhelming majority of farm-related fatalities (95%). The average age of all victims was 53.6, younger than the current average age of Indiana farmers of 55.5.⁴ Amish/Old Order communities in the state still account for a disproportionate share of farm-related deaths. Findings suggest that over the last decade the diversity of agents involved in farm-related fatalities has been increasing. Hazards identified as needing special attention include the use of older, non-ROPS equipped tractors and self-propelled mowers on steep grades; working in wood lots and tree felling on farms; ATV and UTV operation on farms; working with livestock, including horses and bulls; and extra riders on equipment. Results of this summary are used to guide the allocation of injury prevention resources.

Methods of Data Collection

The 2021 Indiana Farm Fatality summary was compiled by Purdue's Agricultural Safety and Health Program from a variety of sources, including published news reports, web searches, voluntary reporting from Extension educators and others, and voluntary feedback from witnesses, family, or responders. No additional cases were identified from sources outside of the state, including federal government sources such as the Census of Fatal Occupational Injuries or Bureau of Labor Statistics. Data were compared with findings by the Indiana Department of Labor and adjusted to reflect differences due to data interpretation, data collection sources, and occupational classification. There is no claim made that the presented data are comprehensive but rather represent the best assessment currently available.⁵

The actual frequency of farm-related fatalities and injuries continues to be under-reported, and is difficult to separate from other classifications of workers. In Indiana, there is no requirement to report farm-related injuries or fatalities to a central location, as is mandated for most other industry classifications under the provisions of the Occupational Safety and Health Administration (OSHA). Currently, there are no known efforts being made nationally to enhance the quality of Indiana farm-related fatality and injury statistics beyond the level of reporting found in these annual summaries. The Bureau of Labor and Statistics maintains records on fatalities in farming for all states, but that dataset combines farming, fishing, forestry, and hunting fatalities, while often excluding incidents on smaller farm operations, children involved in farm-related activities, or unpaid family workers.

Several other Midwestern states no longer have the capacity to document and report on these incidents beyond the limited data available from the Census of Fatal Occupational Injuries, which has historically underreported farm-related fatalities. Some key agricultural states have eliminated or diminished their land grant university-based farm safety efforts and, due to prohibitions in federal appropriation language, federal and state OSHAs have generally maintained a hands-off approach to most agricultural production sites.

⁴ Data from Indiana State Department of Agriculture <https://www.in.gov/isda/3555.htm>

⁵ Differences may be found in reporting of prior years due to the addition of previously unidentified cases to the database.

The most recent data from the Indiana Department of Labor documented 21 fatalities in 2020 and classified agriculture as the state’s third most hazardous industry.⁶ There were slight differences in reporting of fatalities between Purdue and the Indiana Department of Labor due to variances in how workers and events are classified. For example, the Purdue summary has traditionally excluded most motor vehicle crashes which do not involve transport of agricultural equipment or crops, or that could not be specifically linked to farm work-related activities. Children involved in farm work have also been historically included in the Purdue report, whereas they may not be in the Department of Labor summary due to their classification as non-employees. As noted by the annual Census of Fatal Occupational Injuries, deaths on Indiana farms have long represented a disproportionate share of the state’s workplace fatalities.

Description of 2021 Farm-related Fatalities

Description, dates, and locations of the 20 fatalities documented as agricultural workplace incidents are provided in Table 1. Again, it should be noted that the list may not be comprehensive due to the lack of consistent reporting requirements, Indiana residents transported to and dying at medical facilities in neighboring states, and victims dying after the injury event due to related medical complications. The list does not include fatalities to farmers due to motor vehicle crashes involving farm vehicles (unless determined to occur when conducting farm work tasks), conditions such as heart attacks or heat stress that were not directly attributed to work activities, or medical complications from workplace health hazards such as chronic pesticide exposure. Little or no accessible data exists on the impact these agents, including agricultural chemicals, have on Indiana farmers and farm workers.

Table 1. Description of Documented 2021 Farm-Related Fatalities

Date	County	Age	Sex	Description
1/7	Harrison	76	M	Tractor-related
1/11	Elkhart	52	M	Hay bales rolled off trailer crushing farmer
1/11	Jasper	N/A	M	Dairy farm worker entangled in manure pump
1/14	Crawford	67	M	Pinned beneath a wheel of tractor
1/27	Decatur	34	M	PTO entanglement
2/19	Randolph	51	M	Overcome by fumes inside a tank
2/26	Morgan	74	M	Tree limb fell on victim
4/13	Allen	64	M	Tree limb fell on victim
4/16	Henry	76	F	Grain entrapment
4/19	LaGrange	1	M	Struck by pickup towing a trailer of calves
5/23	Randolph	60	M	Lawnmower overturned
5/29	Randolph	53	M	Runover by mule-drawn wagon
7/17	Harrison	80	M	On-farm incident
8/2	Dearborn	N/A	N/A	Tractor incident
8/27	Cass	27	M	Overcome by fumes in tank containing chicken byproducts
9/11	Marion	32	M	Grain entrapment
10/9	Spencer	40	M	Tractor overturn
11/9	Clinton	51	M	Semi-tractor with grain trailer and motor vehicle collision
11/9	Clinton	73	M	Semi-tractor with grain trailer and motor vehicle collision
11/11	Howard	61	M	Farm tractor incident

⁶ https://www.in.gov/dol/files/CFOI_2020.pdf

Summary of Findings

Twenty (20) farm-related fatalities were documented in Indiana during 2021, 32.7% fewer than the average number of fatalities documented annually since 1970 (29.7). As shown in Figure 1, the lowest number of documented cases since 1971 was 8 in 2006. The highest numbers documented in that period were 54 in 1981, 49 in 1990 and 44 in 2016. Though the total average number of annual fatalities over the last five decades has continued downward, spikes in 2016, 2017, and 2018 slowed that encouraging trend.

Though the frequency of these events has been rather erratic over the years there has been an overall decline in the average annual number of fatal incidents as previously noted. It should be recognized that during early years incidents were less likely to be documented due to limited access to records such as online sources, making the decline even more noteworthy.

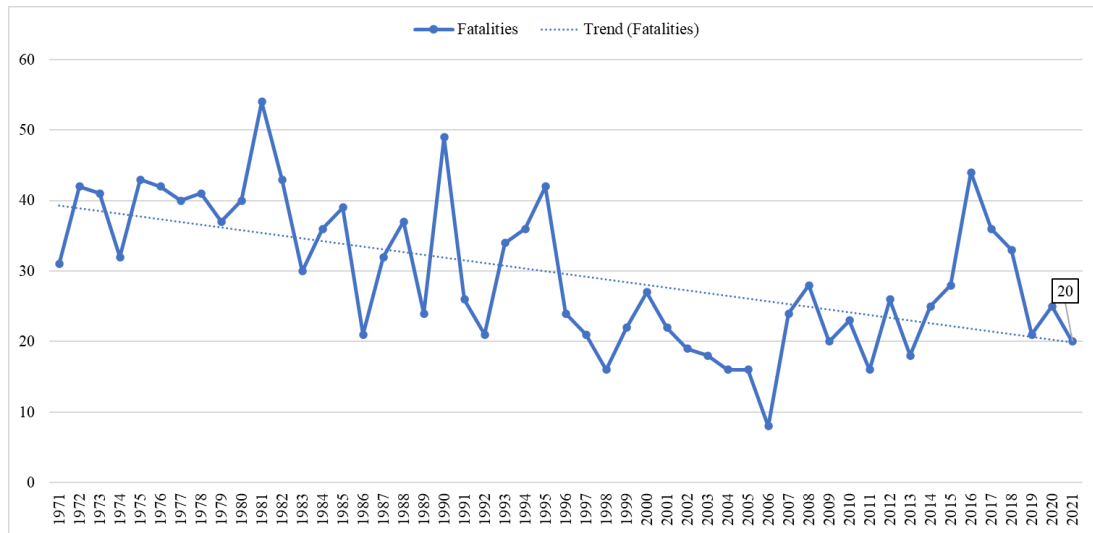


Figure 1. Farm-related fatalities: 1970-2021

No specific factor has been identified that contributed to the reoccurring spikes (or declines) in frequency. Other than incidents involving tractors and farm machinery, agents of injury have varied widely. This lack of consistency makes targeting limited prevention resources difficult, except for tractor-related incidents. The continued occurrence of tractor-related incidents, such as overturns and runovers, indicates that a greater focus on the value of Rollover Protection Structures (ROPS) - especially on tractors used for mowing - could prove beneficial.

The age of the victims in 2021 ranged from 1 to 80 and averaged 53.6, which is slightly lower than the average age of Indiana farmers, currently at 55.5. A true comparison cannot, however, be made since the pool of farmers included to determine the average age does not include children under the age of 18. The volume of work, or exposure to farm-related hazards, that children and youth account for is unknown. However, in some families, especially within the Amish community, the amount may be significant. Historically, farmers over the age of 60, including many who work only part time, have accounted for a disproportionate number of farm-related injuries. Spikes in frequencies of fatalities among older farmers over the past 10 years makes this population a special concern.

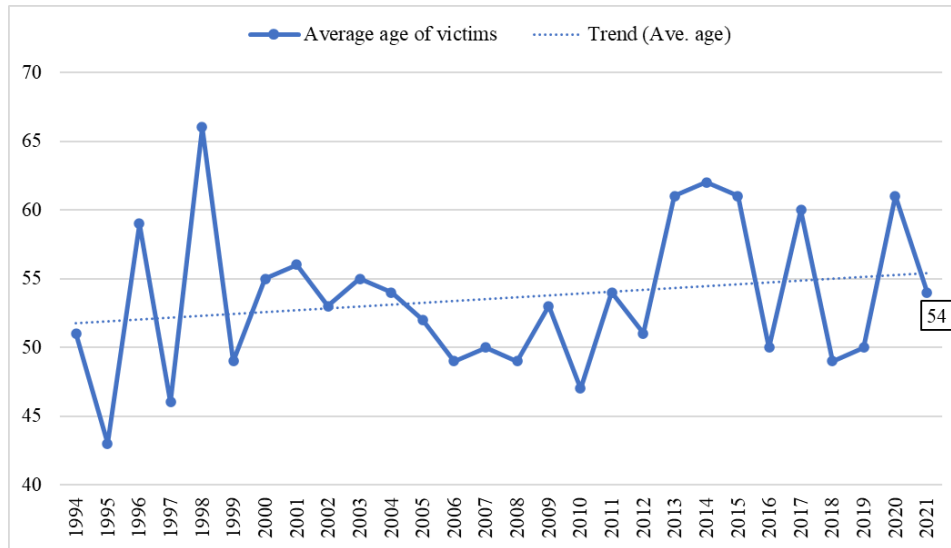


Figure 2. Average age of farm-related fatalities 1994-2021

One fatality involving children and youth, under the age of 21, was documented in 2021. The historical data show an overall decline in the frequency of farm-related fatalities involving children and youth, who have historically accounted for a disproportionate share of total farm deaths. In some early years nearly one third of fatalities were children and youth. Few, if any, farm safety topics have been more highly stressed in Indiana over the past 40 years than child and youth safety.

The overall historical decline in the number of children being reported as dying in agricultural workplaces, as shown in Figure 3, is extremely encouraging. It is believed that the changing attitudes of parents and the general public towards children and youth performing some types of especially hazardous farm work has had a significant influence on the continuing downward trend in fatalities involving this group. There may also be greater compliance with child safety related regulations, including the Hazardous Occupations Order for Agriculture. The introduction of larger, more complex and expensive equipment has also made many producers less comfortable employing young or inexperienced workers to operate it. As with the declining average overall number of annual fatalities, the reduction in the number of farm operations and likewise the number of children who live on farms also likely contributes to the lowering frequency of youth fatalities.

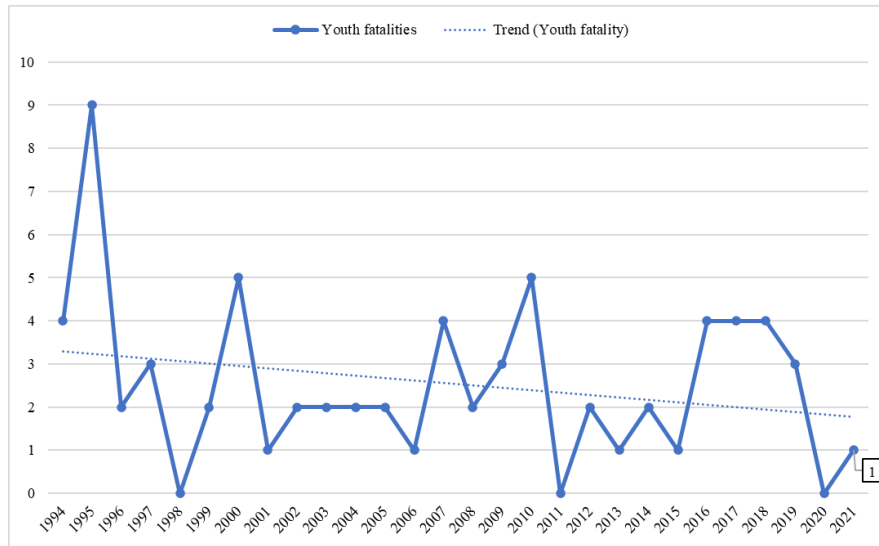


Figure 3. Number of youth farm-related fatalities: 1994-2021

Table 2 summarizes documented incidents during the period 1994 to 2021 involving youth and those 60 and older. During those 28 years, there were no fewer than 674 fatalities, of which 73 cases were under the age of 18 and 396 were age 60 and older. Again, these two groups have historically represented a disproportional share of the total deaths, accounting for nearly 59% of the total. In 2021, these two age groups accounted for 54% of documented fatalities.

Table 2. Analysis of "youth" and "over 60" fatalities as percent of total farm-related fatalities

Year	Deaths	Youth Deaths as % of Total	Deaths	Over 60 Deaths as % of Total	Deaths of Both Youth & Over 60	Percent of Both Youth and Over 60 Deaths	Average Age of Victim	Total Farm-Related Fatalities
	Ages		Age					
	1-17		60+					
2021	1	5%	8	40%	9	54%	54	20
2020	2	8%	13	52%	15	60%	61	25
2019	3	14%	11	52%	14	66%	50	21
2018	4	12%	16	48%	20	61%	49	33
2017	4	9%	18	50%	22	61%	60	36
2016	4	11%	15	33%	19	42%	50	44
2015	1	4%	16	57%	17	61%	61	28
2014	2	8%	17	38%	19	76%	62	25
2013	1	6%	10	56%	11	61%	61	18
2012	2	8%	9	35%	11	42%	51	26
2011	0	0%	8	50%	8	50%	54	16
2010	5	22%	9	39%	14	61%	47	23
2009	3	15%	12	60%	15	75%	53	20
2008	2	7%	11	39%	13	46%	49	28
1994-2007	39	17%	150	42%	189	58%	53	311
Total	73	11%	323	48%	396	59%	54	674

During the past 28 years, tractors were involved in 293 or 44% of the total of all Indiana fatalities. The most frequent incidents involved tractor upsets or overturns followed by runovers. There is a trend towards fewer tractor-related fatalities, both in terms of total annual numbers and the percentage of total farm-related fatalities. The widespread use of ROPS or cab-equipped tractors is contributing to reduced fatalities, even in the event of tractor rollovers. While tractor-related incidents are declining, it appears that there may be a corresponding increase in the diversity of agents involved in farm-related fatalities. (Table 3).

Table 3. History of Indiana tractor-related fatalities

Year	Number of Tractor-Related Fatalities	Number of All Farm Fatalities	Percent of Tractor Related Fatalities in Total Fatalities
2021	6	20	30%
2020	9	25	36%
2019	8	21	38%
2018	12	33	36%
2017	13	36	36%
2016	16	44	36%
2015	11	28	39%
2014	13	25	52%
2013	6	18	33%
2012	12	26	46%
2011	6	16	38%
2010	11	23	48%
2009	11	20	55%
1994-2008	159	339	47%
Total	293	674	44%

With approximately 55,100 productive farms in Indiana, it was estimated that in 2021 one out of every 2,755 farms experienced a farm-related fatality.⁷ Using a population of 139,000 operators and hired workers on farms in Indiana, the death rate was approximately 14 per 100,000 farm workers, as compared to 18 per 100,000 in 2020.⁸ Indiana is often referred to as an agricultural state, although less than 1% of the workforce is employed in production agriculture. However, the agriculture industry has traditionally been responsible for one of the highest annual numbers of work-related fatalities in the state (Indiana Department of Labor, 2018). The estimated fatality rate of 14 per 100,000 Indiana farm workers in 2021 compares to an estimated national death rate of 3.5 per 100,000 for full-time workers in all industries and approximately 22.8 per 100,000 for those engaged in agricultural production nationwide.⁹

It is believed, however, that the Indiana and national agricultural farm-related fatality rates would be lower if unpaid family laborers were included in the population classified as being exposed to farm hazards on a regular basis. For example, older family members may still be regularly engaged in farm work but are not considered as employed labor, typically in order to meet Social Security eligibility requirements. As noted,

⁷ Estimated number of farms from the final report of the USDA/NASS 2021 State Agriculture Overview for Indiana.

https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=INDIANA

⁸ Estimated farm population of producers and hired workers on farms from the final report of the 2017 U.S. Census of Agriculture. This number does not include unpaid family labor such as retired family members and children.

⁹ Estimated death rates from the U.S. Bureau of Labor Statistics (2018). <https://stats.bls.gov/iif/oshcfoi1.htm>

those 60 and older accounted for 40% of the reported fatalities in 2021, implying that the agriculture workforce over the age of 60 is higher than most other occupations. Furthermore, the National Safety Council data and the Census of Fatal Occupational Injuries historically have not included children under 16 in their calculation of rates, while Purdue's Agricultural Safety and Health Program does if the child was involved with or exposed to farm-work activities.

Figure 4 shows the distribution of documented farm-related fatalities over the past 40 years when the county of location was known. Every county in the state has experienced multiple documented farm fatalities. The 10 counties with the highest number of documented cases are as follows:

- Elkhart-36
- LaGrange-32
- St. Joseph-24
- Dubois-24
- Greene-23
- Franklin-21
- Daviess-19
- Dearborn-19
- Harrison-19
- Randolph-19

Elkhart and LaGrange counties are home to the state's largest Amish/Old Order populations. These groups have historically accounted for a disproportionate share of farm-related fatalities. In one recent annual summary, Amish/Old Order farmers and family members accounted for approximately one-third of all documented fatalities. The continued use of horses as a primary power source, bulls for breeding, older machinery that does not meet safety standards, and the greater number of children engaged in farm work are significant contributors to higher frequencies of fatalities in this community.

Impact of COVID Pandemic

The COVID-19 Pandemic continued to impact the nation through all of 2021. Attempts to return to “normal” became more successful, but for some there has become a need to adept a new “normal”. Based upon the data reviewed, there is no evidence that the pandemic had any measurable impact on the frequency or severity of agricultural workplace injuries. There were numerous reports of farmers and their family members becoming ill with COVID and losing work. Lost-time due to illness can cause significant economic impact and increase stress to farm families, especially during planting and harvesting. No data, however, could be found that documented the frequency of COVID within the farm population.

One of the most frequently identified concerns was the inability to recruit qualified labor, especially part-time workers. This may have resulted in retired or older farmers being hired to help with planting and harvesting. Another concern was the difficulty in obtaining appropriate respiratory protection, such as N-95 respirators, needed for completing tasks that caused exposure to excessive or toxic airborne dust. Cleaning grain bins, handling moldy hay, and working inside livestock confinement buildings without respiratory protection posed special problems. It may be appropriate for farmers exposed to these tasks to stockpile needed personal protective equipment (PPE).

Summary of Amish/Old Order Buggy-related Incidents

Indiana has the third largest Amish/old Order population in the U.S., and the demographic group is growing faster than the general population. This community relies heavily on horse drawn buggies and implements and continues to experience a growing number of buggy and motor vehicle collisions. Compared to motor vehicle incidents, these collisions result in a disproportionate number of fatalities. Table 4 describes 5 documented incidents that occurred in 2021, resulting in 20 injuries. The ages of victims ranged from 3 to 44 years, with victims under the age of 21 accounting for 66.7% of the cases where victim ages were reported in 2021. It is believed that other incidents go unreported.

Currently, Indiana state law requires red flashing lights on horse drawn vehicles used on roadways after dark. Most, but not all, Amish/Old Order communities have adapted the use of the SMV emblem. In some cases, the use of electric lights and SMV emblem are inconsistent with strongly held religious beliefs.

Table 4. Description of 2021 Amish buggy-related incidents

Date	County	Description	Injury
1/29	Adams	Buggy and motor vehicle collision	2
6/6	Elkhart	Buggy and motor vehicle collision	8
7/23	Elkhart	Buggy and motor vehicle collision	5
10/8	Adams	Buggy and motor vehicle collision	3
12/3	Kosciusko	Buggy and motor vehicle collision	2

From 2015 to 2021, 172 buggy-related accidents were documented in Indiana, resulting in 15 fatalities. Most of the incidents involved a collision between a motor vehicle and a buggy, and many resulted in multiple victims. It should be noted that this type of occurrence is under reported and access to incident reports may be difficult to obtain. There is a need to give more attention to incidents involving Amish/Old Order horse-drawn vehicles on public roadways, as well as farm work-related injuries among this population.

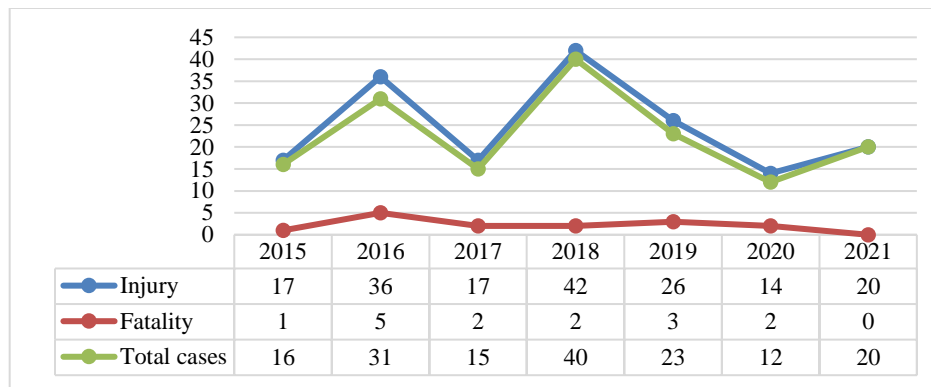


Figure 5. Amish buggy-related incidents, 2015-2021

Agricultural Waste-related Incidents

For several decades, Purdue University has been documenting and monitoring incidents involving agricultural wastes, including those involving confined spaces. Two such incidents were documented in Indiana during 2021. These incidents involved four individuals, of whom two received fatal injuries.

Nationally, Purdue has identified 492 cases involving livestock waste storage, handling, and transport equipment and facilities since 1976. Of these cases, 291 (59%) were fatal. Eighty-five percent 85% of the victims were male, and the average age was 37, substantially younger than the average age of U.S. farmers. Incidents most frequently identified involved underground and underfloor manure storage facilities, above ground manure storage tanks, sump pits, ponds, lagoons, manure digesters, and manure transport vehicles such as portable tankers, applicators and spreaders. Multiple victims were documented in 53 of the incidents or approximately 12% of all agricultural waste injuries and fatalities were identified as secondary victims, including first responders.

The Changing Agricultural Workforce

The increasing number of small farms continues to be an important change occurring in rural communities. These audiences of part-time “hobby” or small highly diversified farmers have very different educational needs as compared to larger commercial operations. A review of fatality data over the last few years suggests that these smaller operations account for a disproportionate share of all documented fatalities, as compared with larger or full-time operations. A significant contributing factor is the use of older, less safe machinery on these smaller operations, especially older tractors without ROPS. In some cases, horses are being considered as a “greener” alternative to tractors, without recognition that horses were once the leading cause of farm-related fatalities.

Recent claims regarding the increasing numbers of women engaged as owner/operators of Indiana farms cannot be proven by any significant increase in the number of women dying or being injured as the result of being involved in farm work. Historically over 95% of all farm workplace fatalities have been male. Considering that an estimated 5,600¹⁰ principal farm operators in Indiana are female, it could be expected that there would be a larger number of fatalities or work-related injuries involving women, if all these women were actually engaged in production-related activities. Of the 207 total documented fatalities over the past six years only 17 (8.2%) were female. There were no documented female fatalities in 2019 and only 1 each in 2020 and 2021 respectively. However, there were four female fatalities in 2016, 5 in 2017, and 5 in 2018, each representing an unusually high number of incidents when compared with historical data.

¹⁰ https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=INDIANA

Incidents Involving Agricultural Confined Spaces

Since 1978, Purdue University has been documenting agricultural confined space incidents throughout the United States. Over 2,500 cases have been documented and entered into Purdue's Agricultural Confined Spaces Incident Database. For an annual summary of these incidents visit www.agconfinedspaces.org.

Indiana ranks number one historically in the number of documented grain entrapments. In 2021 there were two documented fatal entrapments. It is believed that Indiana's high national ranking for this type of fatality has more to do with the aggressive nature of Purdue's surveillance efforts in the state over the past 40 years rather than the actual number of incidents that occur in other states.

Farmer Suicides

There continues to be strong interest in addressing the problem of farmer suicides. Substantial investments have been made to raise awareness of the problem and increase resources available through rural mental health clinics, County Extension Offices, rural churches, and Secondary Agriculture Educators. For example, an instructional unit covering the impact of farm stress on youth has been developed for the "Gearing Up for Safety: Agricultural Production Safety for Youth" curriculum available at www.agsafetyforyouth.info. A new national suicide prevention toll free line (988) was implemented in July 2022, with trained professionals available to assist callers through difficult times. There remains, however, no reliable data to suggest that Indiana farmers are at a significant higher risk of suicide than the general population. Regardless, the increased attention being given to mental and behavioral health among rural populations during the recovery from COVID and challenging economic conditions is appropriate.

INPrepared.org

Two of the most significant contributors to the reduction in the frequency of Indiana's farm-related fatalities, beyond the introduction of safe technology, has been the increased capabilities of rural emergency first responders and rapid access to high quality emergency medical services. Injuries that were not survivable 20 or 30 years ago are being successfully addressed by better-trained first responders and rapid deployment of air transport medical services.

To further enhance the capacity of Indiana's farm and rural families to respond to typical emergencies, PUASHP has develop and promoted the www.INPrepared.org website. This tool is designed to enable users to be better prepared for respond to and recover from potentially harmful events.

Conclusion

Farm safety and health are not, nor will it ever be, topics that will make the front page of the paper, turn the heads of legislators, or generate an outpouring of public support. However, the no fewer than 1,525 Indiana farm families who have experienced the loss of a family member since 1970, including the 20 in 2021, know personally the effects these events last a lifetime.

If you are interested in learning more or supporting the work of Purdue's Agricultural Safety and Health Program, please feel free to call 765-494-1191 or visit www.farmsafety.org.

Other online resources that may be helpful include:

- www.agrability.org
- www.agconfinedspaces.org
- www.youtube.com/USagCenters
- www.agsafety4youth.info
- www.necasag.org
- www.inprepared.org