CANADIAN AGRICULTURAL INJURY REPORTING

Agriculture-Related Fatalities in Canada
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ACKNOWLEDGEMENTS

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CHAPTER 1: INTRODUCTION

1.1 GENERAL INTRODUCTION

The Canadian Agricultural Injury Reporting (CAIR), formerly known as the Canadian Agriculture Injury Surveillance Program (CAISP) was established in 1995 in response to the need for better information about fatal and hospitalized agriculture-related injuries in Canada. CAIR is a national program with collaborators in each of the ten provinces of Canada. *Agriculture-Related Fatalities in Canada* examines Canadian agriculture-related fatality data for the 10 year period between 2003 to 2012. This report includes trends over a 23 year time period (1990 to 2012) as well as an in-depth analysis of mechanisms of injury over a 10 year time period from 2003 to 2012. The reported agriculture-related fatality data is for persons who were part of the Canadian farm population, those temporary foreign workers under the seasonal agriculture workers program from Citizenship & Immigration Canada, or those who were at risk for agriculture-related injuries in Canada from 2003 to 2012. From 2003 to 2012, there were 843 agriculture-related fatalities in Canada, an average of 84 per year. Over the 10-year surveillance period, the average fatality rate per 100,000 farm population, per year was 11.5 fatalities.

Following this introduction, there is a description of the methods used in CAIR. Agriculture-related fatalities in Canada are then reviewed in two overview chapters.

1.2 HISTORY OF AGRICULTURE-RELATED INJURY SURVEILLANCE IN CANADA

Agriculture-related injuries have been recognized as an important rural health issue since the 1960s, when the problem was first recognized in the medical literature. At that time, some provincial groups began to monitor agriculture-related injuries, but only recently have substantial national resources been committed to the study of agriculture-related injuries.

When compared with other Canadian industrial sectors, agriculture is a dangerous occupation. Agriculture ranks as the fourth most hazardous industry in Canada with respect to rates of fatal injury. In terms of absolute numbers of fatalities, there is no more dangerous occupation.\(^1\)

Economic costs associated with agriculture-related injuries are also substantial. In 2004, agriculture-related injuries in Canada cost $465 million dollars. Unintentional injuries accounted for the majority of costs, 80% of all agriculture related injury costs ($374 million).\(^2\)

Until the establishment of CAIR, Canadian data on agriculture-related injuries were limited. This surveillance program has filled an important void in providing national evidence of agriculture-related injury occurrence that can be used in developing and targeting effective injury-prevention strategies. CAIR data has been used by various groups internationally, including Australia, Brazil, Hong Kong, India, Ireland, Netherlands, New Zealand, the United Kingdom and the United States. CAIR has been referenced in a variety of inventories and compendiums including guides to occupational and environmental health.
and safety, casebooks and inventories published by the Public Health Agency of Canada. In terms of policy, CAIR has been used as a reference source for agriculture-related injuries at international, national, provincial, and regional levels. Information gathered indicated that the program’s data has contributed to informing, influencing and enacting policy development at both federal and provincial levels. Evidence of strategic planning influences at provincial and organizational levels is also apparent, and contributions can be linked to: child safety guidelines, child labour laws, occupational health and safety guidelines, engineering standards, injury reduction, and health promotion strategies. At an international level, the Government of Canada has cited CAIR reports in its 2003 submission to the United Nations Convention on the Rights of the Child and identified CAIR as playing an important role in influencing children’s rights in Canada. CAIR has also been identified as a tool for awareness raising, skill building, and knowledge development through conference presentations, teleconferences, lectures, course materials, social marketing campaigns, and resource materials. From a research perspective, 132 articles in 56 journals reaching a very wide range of disciplines were related to CAIR.

1.3 CANADIAN AGRICULTURAL INJURY REPORTING

The Canadian Agricultural Injury Reporting (CAIR) is a national program that is funded by the Canadian Agricultural Safety Association (CASA). CAIR is a collaborative program involving various organizations from across Canada. It is coordinated from a national office at the Injury Prevention Centre, University of Alberta, in Edmonton, Alberta. The people and organizations that contribute to CAIR include researchers, government agencies and the agricultural industry.

The main purpose of CAIR is to collect and analyze information on agriculture-related injuries from across Canada. CAIR established national standards for the collection of fatality and hospitalizations. Although a very rich data source, in 2002, CAIR ceased the collection of hospital admission data on a national basis due to budget cuts. The collection of hospital admissions data requires the review of hospital records in order

5 Ontario Ministry of Labour, 2006; Workers Compensation Board of Prince Edward Island, 2006.
6 Canadian Standards Association. Available at: http://www.csa.com/
to extract the circumstances around the injury producing event. Due to the sheer number of hospital admissions annually, the costs proved to be prohibitive.

**CAIR’s vision:** *A pillar of agricultural safety providing a comprehensive national system of surveillance for fatal and non-fatal agricultural injuries.*

**CAIR’s mission:** *To provide Canada with national and provincial leadership in the prevention of agricultural injuries as a world leader in gathering information, conducting research and translating knowledge into products and services.*

CAIR strives to ensure that fatality injury data are collected, compiled, and analyzed in a standard manner by all provinces and that the information is interpreted and communicated in ways that are helpful to those in the agricultural industry.

CAIR’s primary audience is individuals within the agricultural industry who need to make informed decisions about safety programs and policy. CAIR’s reports represent one approach to making these data accessible to this audience.

Other dissemination formats include articles in scientific journals, presentations at national conferences and information on casa-acsa.ca.

### 1.4 The Uses of CAIR Data

CAIR has developed a surveillance system for Canada that describes the occurrence and patterns of agriculture-related injuries at a higher level of detail than was available previously. At both national and provincial levels, CAIR has provided evidence that has assisted in the development of priorities for health and safety programs as well as strategies for the targeting of these initiatives. CAIR data have also facilitated the post-implementation assessment of injury-prevention programs.

Agriculture-related safety specialists and others require objective evidence so that they can promote awareness of agriculture-related injury issues and advocate the allocation of additional resources to injury prevention and research programs. CAIR information has been used repeatedly to assist in advocacy efforts. This has contributed to the development of informed safety policy in the agricultural industry and to the funding of safety programs at international, national, and provincial levels.

CAIR has provided baseline evidence to support several applied research projects such as the Saskatchewan Farm Injury Cohort Study funded by the Canadian Institutes of Health Research (2005-2010). These projects include focused investigations aimed at the prevention of agriculture-related injuries in children and the elderly, studies of agriculture-related machinery injuries and their causes, and studies examining the economic burden of agriculture-related injuries.
1.5 THE CHALLENGES OF INJURY CONTROL IN AGRICULTURE

In other industries, victims of occupational injuries are usually workers aged 18 to 65. Agriculture is unique in that children and the elderly sustain significant numbers of severe work-related injuries. This is partly because farms and ranches are not just work sites, but also places where people of all ages live and participate in recreational activities. Also, unlike other industries, it is common for farmers and ranchers to work full time and to operate tractors and other heavy machinery well into their 70s and 80s.

The prevention of injuries in agricultural work settings is challenging because of the unique nature of the agricultural work environment. Also, in most jurisdictions, agriculture is not a heavily regulated industry in terms of occupational health and safety standards. Unlike other industrial workplaces, many Canadian agricultural workplaces have not benefited from modern industrial hygiene and safety practices. The composition of the agricultural workforce, farming practices, and safety practices is geographically diverse. This diversity adds to the difficulty of establishment and enforcement of safety standards. There has traditionally been reliance on voluntary, rather than regulatory safety standards, but the effectiveness of voluntary safety standards has not been well evaluated.

CHAPTER 2: METHODS

2.1 IDENTIFICATION OF AGRICULTURE-RELATED FATALITIES

A review of CAIR’s data collection and analysis methods is detailed in this report. The process used in the identification of agriculture-related fatalities varies by province. This is a general description of the process:

1. Potential sources of agriculture-related fatality data are identified. These are kept by a variety of agencies that vary by province. Examples of these agencies include: offices of the provincial coroner or chief medical examiner, occupational health agencies, departments of vital statistics, ministries of transportation and provincial agriculture-related safety associations.

2. A comprehensive list of all potential agriculture-related fatalities is assembled within each province. These lists draw upon each available source of fatality data.

3. Once cases are identified, detailed case reports are sought for review and data abstraction. The main sources of information are coroners’ investigation reports, occupational safety and health agency investigation reports, and RCMP/provincial police reports.

4. Data abstraction and entry are completed on each eligible fatality. This is done in a consistent manner using a standard data abstraction form (Appendix C). Data abstraction is completed on-site at provincial chief coroners’ or medical examiners’ offices. Data are then sent to the national site for verification, coding and analysis.
2.2 KEY DEFINITIONS

Agriculture-related Fatalities:
CAIR defines an agriculture-related fatality as:

1. Any unintentional injury resulting in fatality that occurs during activities related to the operation of a farm or ranch in Canada and/or

2. Any unintentional injury resulting in fatality that involves any hazard of a farm or ranch environment in Canada (excluding fatal non work-related injuries that take place in the farm residence). This includes fatalities that occur away from agricultural work locations if agriculture-related work is being done; e.g., transporting workers, livestock, supplies, or harvested crops on public highways; farm animals roaming on public highways. Fatalities where victims are killed because a third party is engaged in agriculture-related work are also included.

Population of Fatalities: All persons who live, work on, or visit a Canadian farm or ranch (as defined below), as well as all persons who are fatally injured in other locations (such as public highways) as a result of agriculture-related activity and all temporary foreign workers under the seasonal agriculture workers program from Citizenship & Immigration Canada. See Appendix D: Agriculture Populations.

Farm: In the Census of Agriculture, Statistics Canada defined a farm as “any farm, ranch or other agricultural holding that produces at least one of the following agricultural products intended for sale: crops, livestock, poultry, animal products, greenhouse or nursery products, mushrooms, sod, honey, or maple syrup products.” (Canada Census of Agriculture, 1996, Statistics Canada.)

Farm Population: The population covered by the Agriculture–National Household Survey Linkage database and the estimates derived from it also changed in two ways in 2011:

• The definition of the farming population changed. In the years prior to 2011, only operators and their families who resided on the farm at any time in the previous 12 months were included in the farming population. In 2011, the on-farm restriction was removed. Operators and their families not residing on a farm are also included.

• Residents of collective dwellings were not eligible to receive the National Household Survey and, thus, are not represented in the Agriculture–National Household Survey Linkage database.

The farm populations used to calculate rates presented in this report are based on the 2011 definitions and numbers from previous census periods were re-tabulated accounting for the current definition.
2.3 CONFIDENTIALITY OF CAIR DATA

Data are maintained in an electronic database that is managed centrally by the National Coordinator under the supervision of the Program Director. The provincial collaborators retain the complete data set for their own provinces.

Access to the national dataset is strictly limited to CAIR collaborators for the following activities:

1. CAIR provincial collaborators assigned the task of producing special technical reports for Canada.

2. CAIR collaborators who have permission from the CAIR group to conduct special analyses for the purpose of producing scientific reports for submission to peer-reviewed journals.

3. The National Coordinator and Program Directors for the purpose of maintaining the database and producing periodic comprehensive reports for Canada.

4. To support agriculture-related injury prevention initiatives by others through analyses presented as tabular data.

2.4 ANALYSIS

The analysis presented in this report is descriptive and not interpretive to imply cause and effect. It has three main objectives:

1. to illustrate the magnitude of the agriculture-related fatality problem in Canada,
2. to compare trends in the causes and occurrence of fatal agriculture-related injuries among genders and age groups and
3. to identify emerging patterns of injuries.

The statistics used include simple counts and frequencies as well as cross-tabulations. To allow for comparison across the provinces and years, age-standardized rates were calculated using the direct method. This method controls for potential sources of bias resulting from variations in age distributions of populations. Formal hypothesis-testing methods and tests of statistical significance were not employed in comparisons.

Rates of fatal agriculture-related injuries are presented in this report. The numerators used in calculating these rates are the numbers of agriculture-related fatalities for particular age categories and mechanisms of injury. These include fatal injuries to farm residents, hired agriculture-related workers, contractors, persons traveling on public highways and a small number of visitors to farms. Denominators for these rate calculations are taken from the 1996, 2001 and 2006 Canada Census of Agriculture and extrapolated for the years in which the census was not performed. In addition to the Canada Census of Agriculture population, temporary foreign workers under the seasonal agriculture workers program from Citizenship & Immigration Canada were included. For the year(s) for provinces who did not submit fatality data, the populations for those years were not included in the denominator.*, **
Some caution is warranted in the interpretation of the rates because it is not possible to obtain complete data on the full population at risk, or to determine relative amounts of exposure to agriculture-related work and associated hazards. Also, the Canada Census of Agriculture includes all farm and ranch residents, some of whom have relatively little exposure to agriculture-related work hazards, but excludes visitors to farms or ranches and agricultural workers who are not resident on farms or ranches. The accuracy of agriculture census information may vary among provinces, but is the best source of denominator information available at this time.

The change in trending of the age-standardized rates over time is expressed in average annual percent between time periods. The sum of the average percentage change will give the overall change. The trending was done with the Joinpoint Regression Program. To ensure the data in this report are illustrated in an effective and useful manner, data fields with small numbers are often not included in graphs. In these cases, a note is included below the graph.

Joinpoint, Version 3.3.1. April 2008; Statistical Research and Applications Branch, National Cancer Institute.


2.5 DATA LIMITATIONS

The data is collected in accordance to section 2.1 Identification of Agriculture-Related Fatalities. However, there are limitations to this data collection if the injury has not been identified as having occurred on the farm or involving agricultural machinery or agricultural activities these incidents are not captured.

Data abstraction is completed on-site at provincial chief coroners’ or medical examiners’ offices. The quality of the data is reflective of the detailed documentation available in the records at the provincial chief coroners’ or medical examiners’ offices. Data is collected in a consistent manner using a standard data abstraction form (Appendix C). Data are then sent to the national site for verification, coding and analysis.

There is also limitation identifying migrant workers. The numbers of migrant workers included in the denominator for calculating rates only accounted for those workers who participated in the seasonal agricultural workers program from Citizenship & Immigration Canada.

* The number of fatalities in previous reports differ from those in the current report. This is due to the removal of “extrapolated Quebec” fatalities with actual fatalities counts.

**Prince Edward Island fatality data for 2007 to 2008 have not been made available to CAIR.
FARM POPULATIONS

Over the period from 1990-2012 there has been a decrease in the Canadian farm population of 42%. This equates to 469,582 fewer people on farms. In 1990 there were 1,118,053 people counted in the agriculture census and based on linear extrapolation using the 1996, 2001, 2006 and 2011 Canada Census of Agriculture the agriculture population in 2008 the count dropped to 633,858. (see Appendix D). See key definitions (Chapter 2.2) for the changes to inclusion on the Agriculture-National Household survey.

FARM POPULATION BY AGE GROUP

Over the time period from 1990-2012 the age group which experienced the largest percentage decline in farm population was those between the ages of 30 to 39 years with a decline of 72%. This was followed by children 5 to 9 years of age with a decline of 63%, children 1 to 4 years of age with a decline of 61%, and children 10 to 14 years with a decline of 60%.

There were increases in the older farm population, with the largest increase experienced by those 80 years of age and older with a 58% increase, followed by those 70 to 79 years of age with an increase of 14% and then those 50 to 59 years of age with an increase of 4%.
CHAPTER 3: AGRICULTURE-RELATED FATALITIES IN CANADA 1990-2012 OVERVIEW

3.1 FATAL AGRICULTURE-RELATED INJURIES BY CALENDAR YEAR, 1990-2012 (2,324 FATALITIES)

From 1990 to 2012, there were 2,324 agriculture-related fatalities in Canada. An average of 101 fatalities each year. During the first 12 years of the surveillance period (1990-2001) there was an average of 116 fatalities each year. During the last 11 years (2002-2012) the average number of fatalities dropped to 85 each year.

Note: The number of fatalities in previous reports differ from those in the current report. This is due to the removal of “extrapolated Quebec” fatalities with actual fatality counts. In addition, 2007-2008 are incomplete for the province of PEI.

3.2 FATAL AGRICULTURE-RELATED INJURY RATES BY YEARS (AGE-STND), 1990-2012

Over the 23 year period the overall agriculture fatality rate decreased an average of 1.1% annually.

Note: 2007-2008 are incomplete for the province of PEI and the rates have been adjusted accordingly.
When comparing the fatality rates by population group, each age group experienced a decrease in the fatality rate. Older adults (60+ years) consistently had higher fatality rates than children and adults. The fatality rates for children and adults are very similar.

Adults (15-59 years) experienced a statistically significant decrease in the fatality rate with an average of 1.1% annually. Older adults (60+ years) experienced an average annual decrease in the fatality rate of 1.1%, and children (0-14 years) had an average decrease of 0.8% annually.

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### 3.3 Fatal Agriculture-Related Injury Comparison by Age Group, 1990-2012

<table>
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<th>Older Adults (60+ yrs)</th>
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<tr>
<td>2012</td>
<td>4.7</td>
<td>4.2</td>
<td>22.2</td>
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</tbody>
</table>

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From this point forward, the report will focus on the most current 10 years of data available, 2003-2012.
CHAPTER 4: AGRICULTURE-RELATED FATALITIES IN CANADA 2003-2012 OVERVIEW

4.1 FATAL AGRICULTURE-RELATED INJURIES BY MONTH, 2003-2012

Of the 843 agriculture-related fatalities in Canada 66% occurred from May to October with 570 fatalities.

The highest proportion of fatalities took place in July and September each with 12%. Another 11% of the fatalities occurred in the months of August and October.

Relatively few fatal agriculture-related injuries occurred in the winter months of December to March. There were 9 fatalities in which the month was not documented.

4.2 FATAL AGRICULTURE-RELATED INJURIES BY AGE GROUP AND GENDER, 2003-2012

The vast majority, 91% of the persons who died in agriculture-related injury events were male.

The ratio of males to females was highest for the 60+ age group (16.5:1), and lowest for the 1 to 14 year age group (3.9:1).

<table>
<thead>
<tr>
<th>Sex</th>
<th>0-14 yrs</th>
<th>15-59 yrs</th>
<th>60+ yrs</th>
<th>Total</th>
<th>%</th>
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<tbody>
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<td>352</td>
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<tr>
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<td>386</td>
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<td>Percent</td>
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<td></td>
<td>100</td>
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</tbody>
</table>
Overall, the top 3 mechanisms of agriculture-related fatalities were: machine runovers 18%, machine rollovers 17% and being pinned or struck by a machine component 9%.

Seasonally, machine rollovers were the leading causes during the 2 most active seasons, summer and fall. It was the second leading cause in the spring.

The per cent is based on all injury fatalities within each season.
The overall agriculture fatality rate was 11.9 per 100,000 farm population.

The age groups with the highest number of fatalities, those 60 to 69 years of age (159 fatalities) and those 50 to 59 years of age (158 fatalities) did not have the highest rate, 19.0 fatalities per 100,000 farm population and 12.1 fatalities per 100,000 population respectively.

The age group with the highest fatality rate was experienced by those 80 years of age and older with a rate of 56.4 fatalities per 100,000 farm population with 68 fatalities.

There were 4 fatalities in which age was not documented.
92% (773 fatalities) of the agriculture-related fatalities in Canada were work-related. The few fatalities that were non-work-related (8%) were due to hazards of the farm environment.

Most adults who died were engaged in agriculture-related work, whereas the majority of children who were killed in work-related injury events were not working themselves. Overall, 86% of those killed in agriculture-related injury events were actually engaged in agriculture-related work.

There were 9 fatalities in which it could not be determined if the deceased was working or not working.

4.6 Fatal Agriculture-Related Injuries by Major Cause, 2003-2012

70% (589 fatalities) of agriculture-related fatalities were machine-related. The leading machine-related mechanisms of fatal injury were machine rollovers, machine runovers and machine entanglements. (Figure 4.8).

There were 255 agriculture-related fatalities that were non-machine-related (30%) included being struck by an animal or an object, drownings (mainly in children), falls from height, and exposure to toxic substances. (Figure 4.8).

Note: there was one fatality in which there was insufficient documentation to determine if the injury was machine or non-machine-related and therefore the fatality was counted once in each category.
When analyzing the top 5 machine-related mechanisms of injuries over time, fatality rates due to rollovers experienced a decrease on average of 3.6% annually, fatality rates due to entanglements increased an average of 6.2% annually, fatality rates from being pinned/struck by a machinery component decreased an average of 7.8% annually, motor vehicle collision fatality rates increased an average of 2.8% annually and runover fatality rates decreased by an average of 2.3% annually.
Almost half of all agriculture-related fatalities in Canada (44%) were due to three machine-related causes: machine runovers, machine rollovers and being pinned or struck by a machine component (total of 369 fatalities). Machine runovers and machine rollovers accounted for 18% and 17% of fatalities respectively. Being pinned or struck by a machine component (9%), animal-related fatalities accounted for (8%), machine entanglements and traffic collisions each with 7%, struck by a falling or propelling object (often a bale) accounted for 4%, and being struck by a non-machine object, asphyxiation from grain or soil and fall from height each accounted for 4%.

There were an additional 20 machine-related and non-machine-related mechanisms of injury categories with 152 fatalities (18%) that were not included in the above graph.
4.9 Fatal Agriculture-Related Runovers, 2003-2012

There were 149 agriculture-related runover fatalities from 2003 to 2012. Alighted operator runovers (unmanned machine) were the most frequent type of fatal runover (50%). In this kind of injury event, the victim is runover by a vehicle he/she had left running or unblocked on a slope. Bystander runovers caused the second largest percentage of runover fatalities (21%), followed by fallen operator runovers (17%), passenger/extra rider runovers (11%). There was 1 fatality in which the decedent was not identified as an operator, passenger or bystander.

4.10 Fatal Agriculture Bystander Runovers by Age Group, 2003-2012

Of the 31 bystanders runover, one-third (33%) were children between 1 and 9 years of age. Children between 1 and 4 years of age had the highest number of bystander runover fatalities (9 fatalities) and the highest age-specific rate of 2.7 fatalities per 100,000 farm population.
4.11 Fatal Agriculture-Related Runovers by Top 5 Machine Types, 2003-2012

Of the 149 agriculture-related runover fatalities, 62% involved the use of a tractor, and another 14% involved a motor vehicle. There were an additional 9 machine types for a total of 13 fatalities (9%) which were not included in the above graph.

4.12 Fatal Agriculture-Related Machine Rollovers by Rollover Type, 2003-2012

Of the 143 rollover fatalities, 56% (80 fatalities) were sideways in direction. Another 22% (32 fatalities) of the rollovers were backwards and in 22% (31 fatalities) the direction of rollover could not be determined.

The majority of the rollover fatalities involved a tractor (69%), and another 16% involved an off-road vehicle.
In 36% of fatal sideways machine rollovers, circumstance text descriptions attributed the rollover to the machine or vehicle travelling too close to the edge of a ditch or other steep slope bordering a road or field. In 28% of the cases, the rollover was said to be due to the machine or vehicle travelling on a steep incline.

There were an additional 5 cause categories with a total of 16 fatalities (20%) which were not included in the above graph.
In fatal sideways machine rollovers, injury circumstance text descriptions showed that the decedents’ most common activities prior to the rollover were driving on highways (transportation) and farm roads (38%) and field work accounted for another 16%.

There were an additional 6 categories with a total of 19 fatalities (24%) which were not included in the above graph.
4.15 Fatally Pinned or Struck by Machine and Non-Machine Injuries by Object Type, 2003-2012

From 2003 to 2012, 162 people were killed by being struck, caught/pinned by machinery or a non-machinery object. In 16% of all struck by object fatalities, the victim was killed by a heavy machine (not under power). In another 14% the fatalities, victims were struck by a large bale either being lifted with a piece of machinery or rolling off a stack.

There were an additional 9 object categories with a total of 24 fatalities (15%) which were not included in the above graph.

4.16 Fatal Agriculture-Related Animal Injuries by Type of Animal, 2003-2012

There were 65 animal-related fatalities in Canada from 2003 to 2012 (8% of all agriculture-related fatalities). More than half (54%, 35 fatalities) involved horses/stallions/cotts. Of the fatalities associated with horses 59% (22 fatalities) were involved in some form of agriculture work. Example: checking on cattle, tending to the horse. Another 38% (14 fatalities) were non-work-related. Example: recreational horse-riding. They are included in the CAIR fatality database because horses are considered to be a hazard of the farm environment. Cows/bulls/steers/calves were involved in 45% (29 fatalities).
Of the 61 fatalities due to entanglement, 51% cited loose clothing or hair as the cause. In 20% (12 fatalities) of the cases, the deceased was performing another activity near the machine. In 18% (11 fatalities) of entanglements the victim had been cleaning or repairing a machine without shutting it off. In 13% of the fatal entanglements the deceased was trying to remove a blockage prior to shutting the machine off.

There were 14 fatalities in which the activity prior to death could not be determined or was not documented. There were an additional 3 identified categories with a total of 4 fatalities (3%) which were not included in the above graph.
4.18 Fatal Agriculture-Related Drownings by Drowning Location, 2003-2012

Of the 25 non-machine related drowning fatalities from 2003 to 2012, 44% occurred in dugouts, 16% in lakes or ponds, another 16% in manure pits or sewage lagoons. More than half, 56% (14 fatalities) of the decedents were children, less than ten years old.

There were 6 machine-related drownings. There were 3 additional drowning locations with a total of 3 fatalities (12%) which were not included in the above graph.

4.19 Fatal Agriculture-Related Non-Machine Falls from Height, by Fall Location, 2003-2012

42% of the 31 fatal non-machine falls from height that occurred from 2003 to 2012 involved ladders or scaffolding. Barn lofts and rafters were the location of occurrence for another 13% of fatal falls.

There were 3 additional fall locations with a total of 5 fatalities (15%) which were not included in the above graph.
4.20 FATAL AGRICULTURE-RELATED TOXIC SUBSTANCE INJURIES BY TYPE OF SUBSTANCE, 2003-2012

Of the 11 non-machine-related toxic substance exposure fatalities, 55% (6 fatalities) were attributed to hydrogen sulfide poisoning. Another 45% (5 fatalities) were caused by inhalation of silo gases. Hydrogen sulfide exposure occurs when workers enter a poorly ventilated area containing manure or sewage. Storage areas for hog manure are especially prone to hydrogen sulfide accumulation. Of the 10 incidents involving non-machine toxic-related fatalities, 1 incident involved multiple fatalities when would-be rescuers entered dangerous confined spaces without the proper equipment.

There were an additional 2 machine-related fatalities due to carbon monoxide. Carbon monoxide inhalation is most frequently associated with running engines indoors in winter with insufficient ventilation.

Due to the small number of fatalities a graph is not presented.

4.21 FATAL MACHINE-RELATED AGRICULTURE-RELATED INJURIES BY TOP 10 MACHINE TYPES, 2003-2012

There were 589 machine-related agriculture-related fatalities in Canada from 2003 to 2012. Machine types most frequently involved in agriculture-related fatalities were tractors (46%), followed by motor vehicles (13%), off-road vehicles (6%).

There were an additional 13 machine types with a total of 50 fatalities (8%) which were not included in the above graph. There were 29 fatalities (5%) in which the machine type was not identified. Tractors were associated with 32% of all agriculture-related fatalities in Canada.
Of the 782 fatalities where the relationship between the victim and the farm operator was known, 55% of the persons killed in agriculture-related injury events were farm owner/operator. A further 13% of the victims were children of farm owner/operator (of any age) and 11% were hired workers.

Of the “other relative of operator” the majority of them were identified as being the father of the operator.

There were 50 fatalities (6%) in which the victim was a roadway user (i.e. driver/passenger of a vehicle struck by agricultural machinery). There were an additional 6 relationship categories with a total of 34 fatalities (4%) which were not included in the graph above. There were 61 fatalities (7%) in which the relationship of the decedent was unknown.
Of the 780 agriculture-related fatalities in which a location was identified, the most common locations were fields with 190 fatalities (24%), farm yard with 144 fatalities (18%), road/highway with 107 fatalities (14%), barns with 63 fatalities (8%) and woodlot or orchard with 49 fatalities (6%).

There were 63 fatalities in which the location was unknown (8%). There were 10 other locations with a total of 227 fatalities (29%) which were not included in the above graph.

* = Includes adjacent dry ditches
APPENDIX A: DECISION RULES

INCLUSION OF FATALITIES AND INJURIES IN THE CAIR FATALITY DATABASE

Alcohol involvement
Fatal injuries where the victim was under the influence of alcohol were included in the database if they involved agriculture-related work or an agriculture-related hazard.

Fatalities on highways
Fatal injuries on public highways that involved agricultural vehicles, agricultural machinery or farm animals were included in the database.

Medical conditions
Fatalities attributed to pre-existing medical conditions (e.g. previous seizure or heart attack) were excluded from the fatality database. Fatalities where an agriculture-related injury (such as a fall from a machine) was immediately preceded by a significant medical event such as a stroke, seizure or heart attack, were also excluded. Fatalities from a heart attack where the victim was engaged in strenuous agriculture-related work at the time of or immediately before the heart attack are included in the fatality database as “overexertion”.

Secondary complications
Fatalities that occurred in hospital from secondary complications of agriculture-related injuries (e.g., embolism, respiratory distress) were included in the fatality database. Note: New Brunswick does not identify these cases as farm-related if the fatality occurred more than two weeks after the agriculture-related injury.

Off-road vehicles
Fatalities involving off-road vehicles such as ATVs, dirt bikes and dune buggies were included in the fatality database if they occurred on a farm or ranch and/or involved agriculture-related work.

Children at play
Fatalities of children who were playing in the agricultural workplace were included. For example, cases where a person engaged in agriculture-related work was unable to supervise a child whom he/she had taken to the agricultural work place; cases where a child was killed as a direct result of someone engaged in an agriculture-related work activity; cases where a child was killed due to a hazard of the farm or ranch environment such as a riding horses, tending to farm animals, drowning in dugouts/sloughs or manure pit, etc.
APPENDIX B: GLOSSARY

GENERAL TERMS

Agriculture-related fatalities
CAIR defines an agriculture-related fatality as
1) Any unintentional injury resulting in fatality
that occurs during activities related to the
operation of a farm or ranch in Canada and/or
2) Any unintentional injury resulting in fatality
that involves any hazard of a farm or ranch
environment in Canada (excluding fatal non-
work-related injuries that take place in the farm
residence). This includes fatalities that occur away
from agricultural work locations if agriculture-
related work is being done; e.g. transporting
workers, livestock, supplies or harvested crops
on public highways; farm animals roaming on
public highways. Fatalities where victims are killed
because a third party is engaged in agriculture-
related work are also included.

Denominator data
Data used as denominator values in rate
calculations. If presented as a fraction, the lower
half of an injury rate refers to the population
exposed over a given period of time.

Farm
Any farm or other agricultural holding that
produces at least one of the following agricultural
products intended for sale: crops, livestock,
poultry, animal products, greenhouse or nursery
products, mushrooms, sod, honey, or maple
syrup products. (Census of Agriculture,
Statistics Canada.)

Injury
Damage to a person caused by an acute transfer of
energy (mechanical, thermal, electrical, chemical,
or radiation) or by the sudden absence of heat
or oxygen.

Numerator data
Data used as numerator values in rate calculations.
If presented as a fraction, the top half of an injury
rate refers to the number of cases (events) for a
particular mechanism of injury and/or age group.

Non-work hazards
Non-work hazards of the farm environment would
include things that one wouldn’t typically find in a
“non-farm” residence. This would include; various
locations such as dugouts/sloughs, orchards, wood
lots, manure pits, various farm machinery such as
tractors, combines, ploughs. It would also include
various outbuildings such as barns, quonsets,
chicken coops, and various activities of tending
to animals, improper storage of equipment and
riding of horses.

Runovers
Machine-related agriculture-related injuries were
identified and coded by CAIR as “agriculture-
related runovers” if the victim was runover, struck,
or pinned by an upright vehicle or agricultural
machine that was under power or rolling on an
incline.
Alighted operator runover (subcategory of unmanned runover)
An operator is runover, pinned or struck by an unmanned machine under power or rolling on an incline, or by a machine or implement towed by it. Includes being runover while attempting to board a moving unmanned machine. Does not include cases where the decedent had been improperly starting the machine.

Bystander runover
A bystander is runover, pinned or struck by a manned machine, or by a machine or implement towed by it; includes being runover while attempting to board or alight from a moving manned machine.

Extra rider runover
A passenger falls from a machine and is then runover, pinned or struck by the machine, or by a machine or implement towed by it.

Improper start runover (subcategory of unmanned runover)
A person is runover by an unmanned machine subsequent to starting it by any means other than that specified by the machine’s manufacturer. Includes bypass and jump starting.

Operator runover
An operator falls from a machine and is then runover, pinned or struck by the machine, or by a machine or implement towed by it.

Unmanned runover
A person is runover, pinned or struck by an unmanned machine, or by a machine or implement towed by it. Includes being runover while attempting to board a moving unmanned machine.

Surveillance
The ongoing systematic collection, analysis, interpretation and dissemination of health data.

Unintentional injury
Unintentional injuries consist of that subset of injuries for which there is no evidence of predetermined intent. To further identify the activities or circumstances surrounding the leading causes of the fatalities, additional analysis was done based on the documentation in the circumstances text field of the abstract.

Activity prior to rollover
Included transportation of goods/livestock
- towing
- field work
- forestry
- working in the farm yard
- recreation, moving
- road maintenance
- extra rider
- unknown

Cause of rollover
- travelling too close to the edge
- travelling on an incline, cornering
- falling from a ramp
- carrying a heavy load in a bucket
- dragging logs/implements
- pulling stumps/trees
- towing
- collision with an object
- rough terrain
- tractor arms/bucket caught on ground
- pulling heavy machine/trailer
- unknown
Activity prior to entanglement
Maintenance/repairs/cleaning of equipment

Objects involved with injuries as a result of being pinned or struck by a machine or non-machine
• bale (large round)
• bale other
• tree, branch, log
• collapsing building or structure
• other heavy non-machine object example:
  • gate or door
• heavy machine (not under power)
• truck box
• bucket
• front end loader arms
• other heavy machine component
• knife or blade
• baling or barbed wire
• tool or part of tool (includes power tools)
• hook, tow rope or chain
• hitch or tongue
• jacks or hydraulic lifts
• other non-machine object
• unknown
• other machine-related object
APPENDIX C: ABSTRACTION FORM

CAIR’S AGRICULTURE-RELATED FATALITY DATA ABSTRACTION FORM

CAIR FATAL FARM INJURIES – DATA ABSTRACTION FORM

Coroner’s File #: ______ - ________

CAIR ID: ______ - ________ - ________

An Agricultural Fatality is: 1) Any unintentional injury resulting in death that occurred during activities related to the operation of a farm or ranch and/or 2) Any unintentional injury resulting in death that involved any hazard of a farm or ranch environment in Canada (excluding fatal non work-related injuries that took place in the farm residence). This includes deaths that occurred away from agricultural work locations if agricultural work was being done; e.g., transporting livestock, supplies, workers or harvested crops on public highways. Deaths where victims were killed because a third party was engaged in agricultural work are also included.

Age: _______

Birth Date: ____ / ____ / ____

Birth date missing (circle)? Yes No

Gender (circle): M F

Province: ____________

County/Regional Municipality: ________________

Region: ________________

Date of Injury: ____ / ____ / ____

Weekday of Injury (circle): S M T W T F S

Time of Injury __________ (24:00)

Date of Death: ____ / ____ / ____

Source of data for case identification (circle all that apply):

1 Coroner

2 Medical Examiner

3 Media

4 RCMP / police

5 Registrar General

6 Other

A. DESCRIPTION OF INJURY EVENT

Please include as many details as possible about the decedent’s activity, task and location at the time of the incident. For falls and drownings, please describe exact location. For struck or pinned by object injuries, please specify object or machine component. For entanglements, please state whether clothing was involved. For tractor rollovers, please indicate whether the tractor had ROPS. For machine injuries, please describe the machine in as much detail as possible.

If the injury was not machinery or vehicle related, complete Section B and then proceed to Section E.

If the injury was machinery or vehicle related, begin with Section C and continue.
### B. CAUSE OF INJURY NOT MACHINERY OR VEHICLE RELATED

1. Crushed or struck by animal. Specify animal: ________________________________
2. Other type of animal injury. Specify animal: ________________________________
3. Fall from animal. Specify animal: ________________________________
4. Struck by non-machine object
5. Struck against non-machine object
6. Caught inside, under or between non-machine objects
7. Fall from height. Give specific fall location: ________________________________
8. Fall on same level
9. Jumped to lower level
10. Overexertion
11. Drowning
12. Exposure to fire/explosion
13. Contact with temperature extremes
14. Contact with electric current
15. Contact with radiation, caustic, toxic or noxious substance by (circle): ______
   - Inhalation ___________
   - Ingestion ___________
   - Absorption ___________

Specify agent: ________________________________

### C. CAUSE OF INJURY MACHINERY OR VEHICLE RELATED

1. Sideways rollover
2. Backwards rollover
3. Unspecified rollover
4. Entangled/caught in machinery
5. PINNED OR STRUCK BY MACHINE COMPONENT OR COLLAPSING MACHINE (specify)
   - Traffic collision on road or highway
   - Operator fell from moving machine, then runover, pinned, or struck by it
   - Operator fell from moving machine, then runover, pinned, or struck by it
   - Passenger fell from moving machine, then runover, pinned, or struck by it
   - Passenger fell from moving machine, then runover, pinned, or struck by it
   - Passenger fell from moving machine, then runover, pinned, or struck by it
   - Alighted operator/other person runover, pinned, or struck by it
   - Alighted passenger runover, pinned, or struck by moving machine
   - Bystander runover, pinned, or struck by moving machine
   - Machine-related contact with electrical current
   - Machine-related fire, explosion or burn
   - Machine collision off-road
   - Machine-related drowning
   - Struck by object falling or propelled from machine (specify)
   - Runover, pinned, or struck by moving machine - unspecified
   - Other machine related. Specify: ________________________________

### D. TYPE OF MACHINERY

(Circle appropriate number if the injury event was machinery or vehicle related)
1. Tractor
2. Auger. Specify whether freestanding, attached to machine, or unknown (circle)
3. Mower
4. Power take off, specify machine PTO attached to: ____________________________
   - Baler
   - Farm wagon/trailer
   - Combine
   - Power tool (not chainsaw)
   - Chainsaw
   - Welder
   - Harvester
   - Plough/disk
   - Hay elevator
   - Manure spreader
   - Bulldozer, bob cat, skid steer
   - Motor vehicle. Specify: ________________________________

### E. IMMEDIATE LOCATION OF INJURY

1. Field (includes dry ditches next to field)
2. Barn
3. Silo/grain bin, (circle)
4. Shed
5. Farmyard
6. Road/highway (includes dry ditches)
7. Driveway (includes dry ditches)
8. Farm house
9. Farm road (includes dry ditches)
10. Woods, orchard
11. Water source; includes water-filled ditch, dugout, manure lagoon, sewage pit, etc. Specify:
   - Coral/outdoor animal enclosure
   - Other unspecified ditch/embankment/dyke
12. Trench
13. Other location. Specify: ________________________________

### F. LOCATION OF DEATH

1. Found dead
2. Died en route
3. Died in hospital
4. Died in hospital, or unknown (circle)

### G. RELATIONSHIP OF INJURED PERSON TO FARM OWNER/OPERATOR

1. Operator
2. Spouse of farm operator
3. Child of farm operator
4. Other relative of farm operator. Specify:
   - Father of farm operator
   - Mother of farm operator
   - Uncle/aunt of farm operator
   - Cousin of farm operator
   - Stepfather/stepmother of farm operator
   - Grandparent of farm operator
   - Other relative of farm operator. Specify: ________________________________

### H. METHOD OF DISCOVERY

Who found the deceased? (i.e. relationship to deceased)
Was the injury event witnessed? (circle) Y N
(Indicate if the information is not available)

### I. NATURE OF INJURY BY BODY PART

e.g., NI1 crush injury. BP1 chest.
(List from most to least serious injury, where the most serious injury was the cause of death.)

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<th>Nature of injury 2:</th>
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<tbody>
<tr>
<td>Body part 1:</td>
<td>Body part 2:</td>
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### J. ALCOHOL INVOLVEMENT (effective 2012 date of death)

Was alcohol involved? Y N
If yes, was the deceased tested for alcohol? Y N
If yes, was the test positive for alcohol? Y N
If yes, what was the alcohol level? ________________________________
If yes, is this greater than the legal provincial level? Y N
## APPENDIX D: AGRICULTURE POPULATIONS

**CANADIAN FARM POPULATIONS BY AGE GROUP AND YEAR (INCLUDING TEMPORARY FOREIGN WORKERS)**

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DEFINITION CHANGE: The population covered by the Agriculture–National Household Survey Linkage database and the estimates derived from it also changed in two ways in 2011. First, the definition of the farming population changed. In the years prior to 2011, only operators and their families who resided on the farm at any time in the previous 12 months were included in the farming population. In 2011, the on-farm restriction was removed. Operators and their families not residing on a farm are also included. Second, residents of collective dwellings were not eligible to receive the National Household Survey and, thus, are not represented in the Agriculture–National Household Survey Linkage database. The new farm population definitions were applied to the 1996, 2001, and 2006 census data. Therefore, comparing rates presented in this report with previous reports is not advised.

Numbers from the 1996, 2001, 2006 and 2011 Canada Agriculture–National Household Survey were used to extrapolate the data for the years in which the census was not performed. In addition to the Canada Agriculture–National Household Survey populations, temporary foreign workers under the seasonal agriculture workers program from Citizenship & Immigration Canada were included.

Numbers from Citizenship & Immigration were randomly rounded categories up or down by a factor of five.

Populations do not include data for Yukon, Northwest Territories and Nunavut.
## Percentage Change in the Canadian Farm Population by Age Group (Including Temporary Foreign Workers)

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</table>

From 1990-2012 the overall Canadian agriculture population decreased by 42%. However, there has been an increase in the older population. Those 80 years and older experienced the largest per cent increase with 58%. Those 70 to 79 years of age experienced a 14% increase. The largest decrease in population was experienced by those 30 to 39 years of age with a 67% reduction.
APPENDIX E: CAIR COLLABORATORS

A special thank you to the CAIR collaborators (as of October 2016) for their hard work and dedication.

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