

FATALITIES DUE TO WORKING WITH TRACTORS, AUSTRALIA 2003–04 TO 2006–07



MAY 2011



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SAFE WORK AUSTRALIA

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WITH TRACTORS, AUSTRALIA
2003–04 to 2006–07**

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Summary of Findings

Over the period 1 July 2003 to 30 June 2007, 65 workers were killed due to working with tractors. These workers were primarily engaged in the agriculture sector.

A similar study undertaken by the National Occupational Health and Safety Commission (NOHSC) over the period from 1 January 1989 to 31 December 1992 found 102 workers died while using tractors, 89 in the agriculture sector. Despite the fall in the number of agriculture workers, comparison of the two studies indicates a fall in the number of tractor-related deaths.

The major reduction area is in the number of workers killed due to the tractor roll overs which have decreased from 40 deaths in the 1989–92 period to 17 in the 2004–07 period. This is most likely linked to the introduction of legislation that required all tractors built after 1981 to be fitted with a roll over protection structure.

Over the 2004–07 period, the major cause of tractor deaths was due to being run over, 25 workers lost their life when they alighted from their tractor without it being adequately braked.

While safety alerts and advices on the safe use of tractors have been issued by work health and safety authorities, older farmers in particular are still engaging in unsafe work practices. This study found that 40% of workers killed while using a tractor were aged 65 years or over. This age group accounts for just 13% of workers. Reaction times become longer as we age and older workers need to be more aware of their limitations in moving around their vehicle.

Self-employed workers in the agriculture sector are particularly at risk of a tractor-related death with 42 of the 62 deaths in this sector occurring to self-employed workers. This study also showed that half of the self-employed workers who died in a tractor-related incidents were aged 65 years or over.

This study found 1 bystander death associated with the use of a tractor. This is a striking reduction from the 23 bystander deaths identified in the previous study. The main area of improvement appears to be that workers have learnt that tractors are not built to carry passengers and they have stopped doing it.

1. Introduction

In December 1998, the National Occupational Health and Safety Commission (now known as Safe Work Australia) published the results of an extensive study of work-related fatalities that occurred between 1 January 1989 and 31 December 1992 (hereafter referred to as the 1989–92 study). The 1989–92 study identified 102 workers, 2 volunteers, 17 people on farms undertaking domestic duties and 23 bystanders who died as a result of using tractors. Researchers had access to all paper documents relating to these fatalities and hence extensive analysis of the circumstances was possible.

Safe Work Australia has just completed a similar study which looked at all work-related fatalities which occurred over the four years from 1 July 2003 to 30 June 2007 (hereafter referred to as the 2004–07 study). This study was undertaken using the on-line National Coronial Information System (NCIS). The same level of analysis was not possible due to some documents not being available electronically. In some cases information from the media was used to supplement the information in the NCIS. This latest study identified 65 workers who were killed due to working with tractors. This equates to 16 worker deaths per year due to working with tractors, a decline on the 26 worker deaths per year identified in the 1989–92 study. The 2004–07 study did not look at deaths associated with non-working activities.

The 1989–92 study found that 93 of the 102 tractor-related deaths occurred on an agricultural property whereas the 2004–07 study found that all but 3 of the 65 tractor deaths were workers in the Agricultural, forestry & fishing industry. Of the remaining 3, 2 deaths occurred to workers in the Construction industry, clearing land using a slasher attached to a tractor and the third was a mechanic working in the Retail trade sector who was killed when the tractor fell on him during repairs. These numbers suggest that the non-agricultural sector has made the greatest improvement in preventing tractor-related deaths. However, this improvement may simply reflect a shift away from the use of tractors towards other types of machinery.

This report will look at the types of incidents that resulted in a fatality.

2. Tractor deaths by age

The 1989–92 study reported an increase in the number of deaths as age increased. This pattern was not so obvious in the 2004–07 study. Figure 1 shows that workers in the 65 years or over age group still account for the highest number of deaths and the actual number of deaths has not changed between the two studies with 25 deaths recorded in the 1989–92 study and 26 deaths recorded in the 2004–07 study.

While this oldest group accounted for 25% of all tractor-related deaths in 1989–92, it accounted for 40% in 2004–07. The latest study shows that only 16 of the deaths (25%) occurred to workers aged less than 45 years. This is less than half the number in the previous study (37 deaths – 36%). It is not known if these changes are related to changed usage patterns of tractors or changes in safety behaviour. New tractors have a greater range of safety features but since tractors are generally not registered it is difficult to determine how many tractors are in use and their age.

Figure 1: Worker fatalities due to tractors: number by age of worker

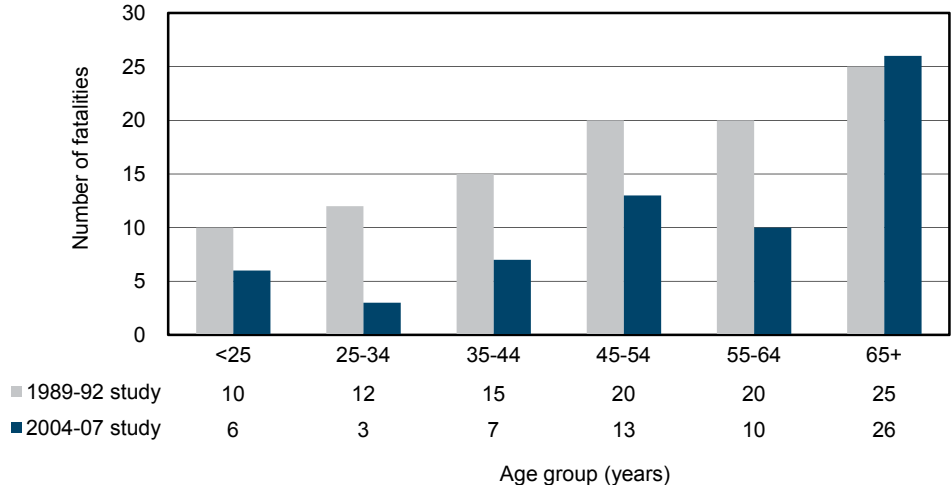
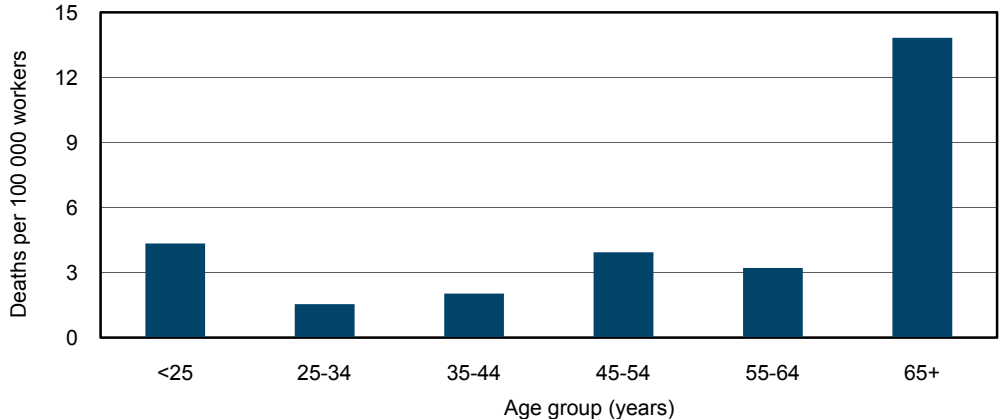


Figure 2 shows that for the 2004–07 period, fatality rates by age for the Agriculture, forestry & fishing industry are similar for all age groups except the 65 years and over group which is three to four times the other age groups. These figures assume a constant ratio of tractor use by age.

Figure 2: Agriculture, forestry & fishing worker fatalities due to tractors: fatality rate by age of worker, 2004-07

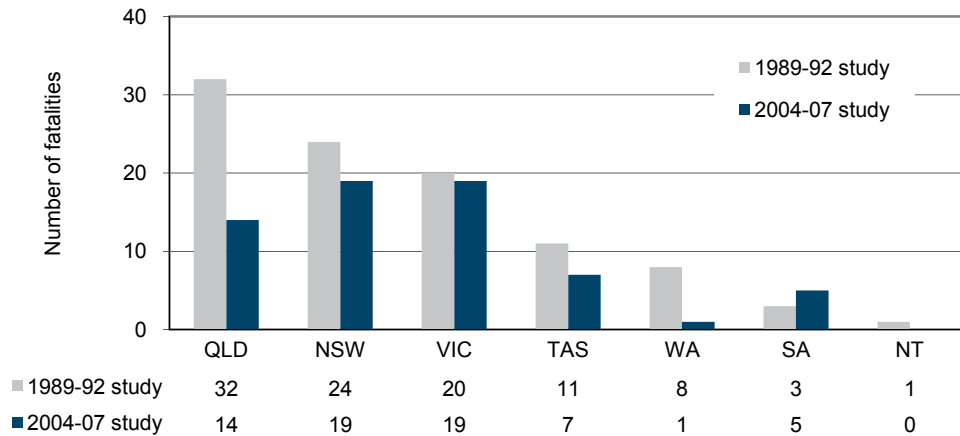


3. Tractor deaths by state of death

Out of the 102 tractor deaths identified in the 1989–92 study 99 were coded to the state/territory of death. Figure 3 shows a comparison of the two studies by state/territory of death. These data show that Queensland recorded a substantial drop in the number of tractor-related deaths between the two studies, down from 32 in the 1989–92 study to 14 in the 2004–07 study. Western Australia also recorded a large drop, falling from 8 to 1. In contrast, New South Wales and Victoria recorded similar numbers in both studies, 24 and 20 respectively in the 1989–92 study and 19 in the 2004–07 study. South Australia was the only state to record an increase with 3 tractor-related deaths identified in the first study and 5 in the second.

It is not known whether tractor usage has changed over this time period due to differences in farming practices across the states and territories.

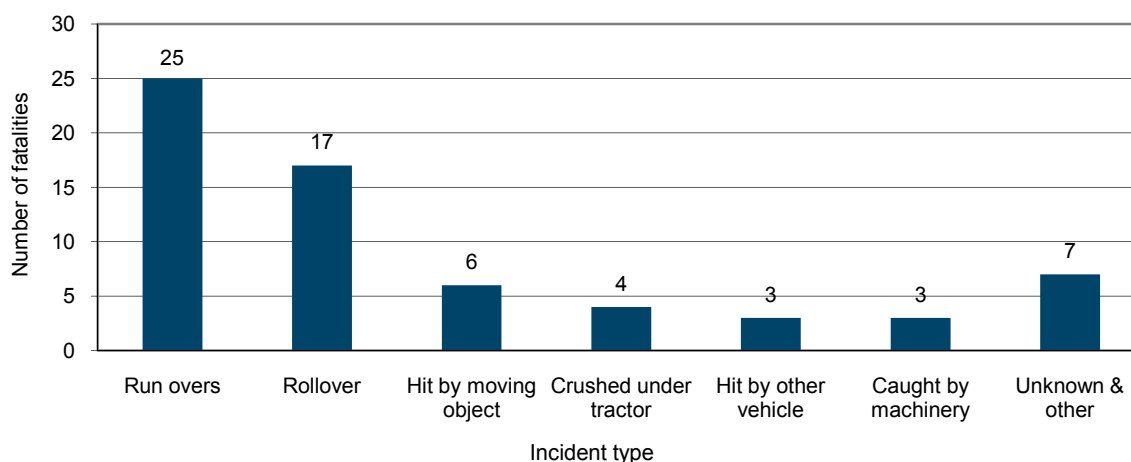
Figure 3: Worker fatalities due to tractors: number by state of death



4. Incident types

The circumstances of the deaths can be grouped into similar types of incidents. Figure 4 shows that 38% (25 workers) were killed due to being run over by their own tractor and a further 26% (17 workers) were due to a tractor roll over. The 1989–92 study identified that 40% (40 workers) were killed due to roll overs. It is not possible to make other comparisons because the two studies used different classifications.

Figure 4: Worker fatalities due to tractors: number by incident type, 2003–04 to 2006–07



4.1 Run overs

Of the 25 run over deaths that were identified in 2004–07, 9 occurred in Victoria, 5 in New South Wales, 4 each in Queensland and Tasmania, 2 in South Australia and 1 in Western Australia. More than half (13 of the 25 deaths) of the workers killed were aged 65 years or over. These incidents happened in a number of ways:

- 6 workers attempted to start their tractor whilst standing outside of the tractor between the front and rear wheels. In all these cases the tractor had been left in gear which meant once the tractor started, it moved and dragged the worker under a wheel. In 2 of these cases, the tractor was being jump-started and in 1 a screwdriver was being used. This indicates a poor state of maintenance. The previous study also found 6 deaths that occurred in similar circumstances.
- 4 workers had parked the tractor but had not engaged the brake sufficiently and the tractor moved once the worker had stepped off. In 2 of the cases, the worker had tried to re-enter the vehicle to stop it moving further. In the other 2 cases, the tractor crushed the worker between the tractor and a fixed object (tree, fence). The documents on the NCIS did not indicate that the brakes were faulty in any of these cases but 1 did mention that the tractor had been parked on an incline and the weight of a grader attachment meant the brake could not have held the vehicle. All 4 of these workers were aged 65 years and over. The previous report highlighted issues associated with older workers not being able to exert the full force needed to put the brake on properly and the decrease in agility and reflexes making it more difficult for older workers to mount a moving tractor. These issues still exist.

- 7 workers had temporarily alighted to undertake an activity around the vehicle but did not apply the brake adequately. In all 7 cases a run over occurred due to the changing weight as the driver alighted allowing the tractor to move. In 4 of these incidents farmers were undertaking activities involving the picking up or moving of hay bales while 3 involved the linking of attachments.
- 2 workers were thrown from their tractors while riding over uneven terrain and were then run over by the tractor.
- 2 deaths involved a passenger on a trailer being towed by a tractor: 1 worker was killed after alighting from the trailer and the tractor was reversed over him; the other worker was killed when the trailer became separated from the tractor while going up a steep incline; the worker was thrown or jumped from the trailer and then run over by it.
- In the remaining 4 incidents there was not enough information in the NCIS to determine how the incident occurred other than that the death was due to being run over by a tractor.

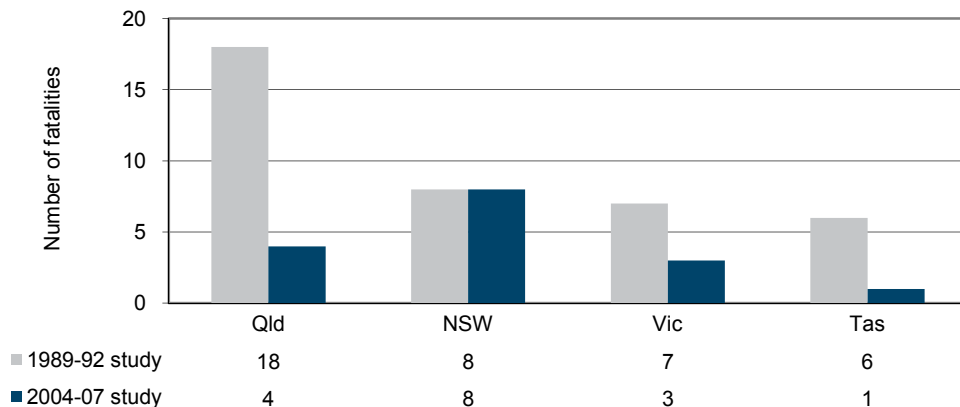
In 8 of the 25 cases discussed, it was clear that the worker was standing between the tyres when the tractor started moving. In most cases this resulted in the worker being dragged under the rear tyres. There were 2 cases where the worker was standing in front of the tractor when it moved and 7 where the worker was standing behind the tractor when it rolled backwards over them. In the remaining cases there was not sufficient information to determine the direction of the tractor at the time of the incident.

4.2 Rollovers

Figure 4 shows that rollovers accounted for 17 deaths of workers in the 2004–07 period. These fatalities occurred when the tractor rolled down an embankment or incline or struck a tree and then rolled over. This is considerably lower than the 40 rollover deaths identified in the 1989-1992 study. This improvement is most likely linked to the mandatory fitting of rollover protection on tractors. Information on the requirements for Rollover Protective Structures (ROPS) can be found in the Safety equipment section of this report.

The requirement to fit protective structures was implemented on different dates in each state. Figure 5 shows that a major reduction in deaths due to rollovers was observed in all States except New South Wales which recorded no change in the number of deaths between the two studies. Note that comparisons are only shown in Figure 5 for the four states with the highest number of rollover fatalities.

Figure 5: Worker fatalities due to tractor roll overs: number by state of death



Use of safety equipment

From information in the NCIS it was possible to determine that 6 of the 17 workers who died due to a tractor rollover did not have ROPS fitted to their tractor and that this contributed to their death. In 1 of the 6 cases there was specific mention that the ROPS had been removed.

In 6 other cases it was specifically mentioned that no seatbelt was worn though it was not possible to determine if the tractor was fitted with one. In only 1 of these cases was it also mentioned that ROPS was fitted. The coroner concluded in this instance that the death was preventable if the tractor had been fitted with a seatbelt and worn as the cabin remained intact but the driver was thrown from the tractor.

In a further 2 deaths the tractor had ROPS, but while the workers remained securely within the cabin during the rollover, they were killed when the cabin was penetrated by a tree branch.

There was no mention of ROPS or seatbelts in the remaining 3 cases.

Cause of rollover

Information on the cause of the rollover was available for 13 of the 17 incidents.

- 5 involved the tractor being used on a steep slope. In 3 of the incidents the tractor was towing a slasher or trailer, though it is not clear what impact this extra weight had on the rollover.
- 4 involved the tractor being used along a ridge or dam wall and then rolling down the embankment.
- 2 involved the tractor being used to pull out or push over trees and then rolling when the tree came clear.
- 1 involved a tractor being towed by a 4WD on a public road. The towing speed exceeded the tractor's capability and the worker was thrown from the tractor as it rolled.
- 1 involved the tractor rolling off a tray truck when it was being loaded.
- 1 involved the tractor being used to pull another tractor out of a bogged position. The manner in which the hitching was done caused the bogged tractor to roll, crushing the driver. Indications are that farmers have become aware of the dangers associated with hitching attachments to tractors above the axle level. From the information available it would appear that 2 deaths in the current study could be attributed to 'high-hitching', while the previous study indicated there were 13 deaths where this was the main contributing factor.

4.3 Hit by moving objects

Six fatalities were the result of being hit by a moving object whilst working with the tractor.

- 1 occurred when the tractor was pulling down a tree that then knocked another tree onto the worker.
- 1 occurred when a tractor-driven rear-mounted wood saw bench broke loose allowing the saw blade to come in contact with the worker.
- 1 involved the moving of a concrete water trough which fell from the tractor bucket onto the worker.

- 1 involved the worker being crushed by the bucket attachment of the tractor when the hydraulic lift failed.
- In a non-farming incident, a qualified tractor mechanic was killed when he was hit by a falling tractor motor when the gantry that was supporting it failed.
- 1 fatality occurred when a worker was hit by parts of a tractor tyre when it exploded during inflation.

4.4 Crushed under tractor

Four workers were killed when they were trapped under their tractor or one of its attachments (silage wagon, fertiliser spreader, slasher). All of these deaths were related to repair or maintenance work. In 3 of the incidents the worker did not use stands to secure the attachment against movement. In the fourth incident, blocks were used, but the attachment fell off them.

4.5 Hit by other vehicle

There were 3 incidents where the tractor was hit by another vehicle. All of these deaths occurred on public roads: 1 worker was hit by a car and 2 workers were hit by trains as they drove across the train lines without looking.

4.6 Caught in machinery

There were 3 incidents where the worker was dragged into a moving part on the tractor, 2 involved the power take-off (PTO) shaft and the third a rotary tiller. In 2 of these cases, it was mentioned that the worker's clothing caught in the moving part and dragged the worker into the machinery. The previous fatality study also found 3 incidents where clothing was caught in machinery resulting in the worker's death.

4.7 Other incidents

There were 7 deaths that occurred in other circumstances.

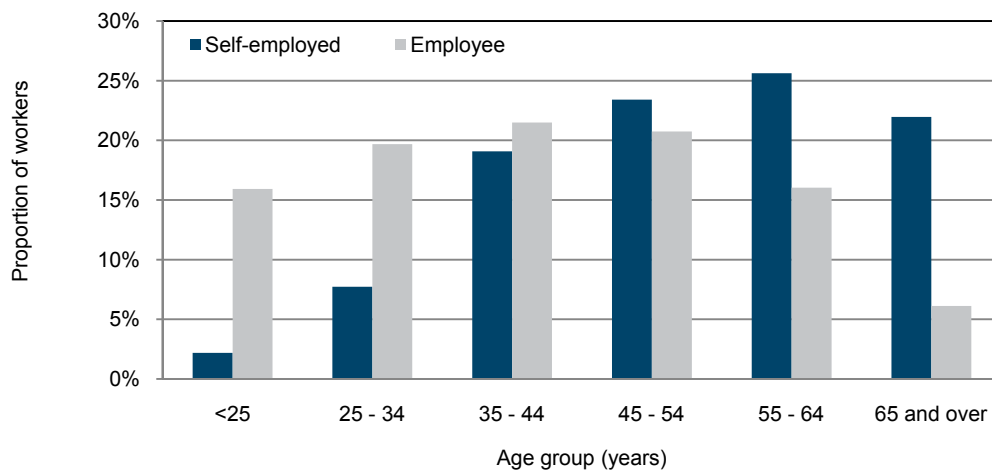
- 2 workers died when the tractor was driven into a tree.
- 1 worker died when using a tractor with an attachment on a dam wall. The combined weight of the equipment was too much for the dam wall and it gave way. The vehicle slid down the embankment into the dam with the worker trapped inside and he subsequently drowned.
- No details are available for the remaining 4 deaths.

5. Tractor deaths by employment status

This section focuses on the 62 tractor-related deaths in the Agriculture, forestry & fishing industry. Over the 2004–07 period, half of the workers in the Agriculture, forestry & fishing industry were self-employed while the rest were predominantly employees. Analysis of the fatalities for these groups shows that of the 62 tractor-related fatalities in this industry, 18 involved employees and 42 self-employed workers. There were also 2 deaths involving contributing family workers who make up 2% of the employment profile in this industry.

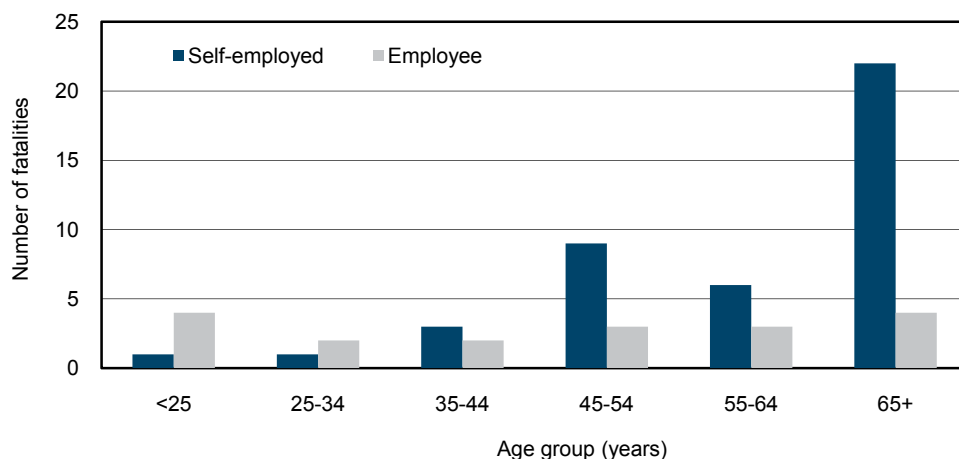
Figure 6 shows the age profile for employees and self-employed workers is very different, with self-employed workers concentrated in the older age groups. Nearly half of the self-employed workers were aged 55 years and over while for employees the proportion was less than one-quarter.

Figure 6: Workers in the Agriculture, forestry & fishing industry: proportion of workers by employment status and age, 2004–07



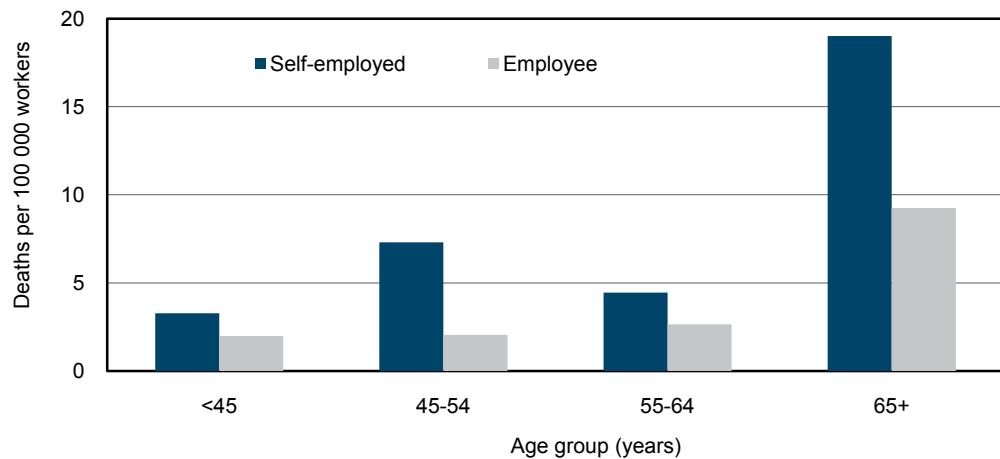
Due to this older age profile of self-employed workers, it is not surprising that Figure 7 shows that 37 of the 42 tractor-related deaths which occurred to self-employed workers, occurred to workers aged 45 years and over. What is more a concern is that 22 of the 42 (52%) self-employed workers killed in tractor incidents were in the 65 years and over age group. Employees recorded similar numbers of deaths in all age groups.

Figure 7: Worker fatalities due to tractors in the Agriculture, forestry & fishing industry: number by employment status and age, 2004–07



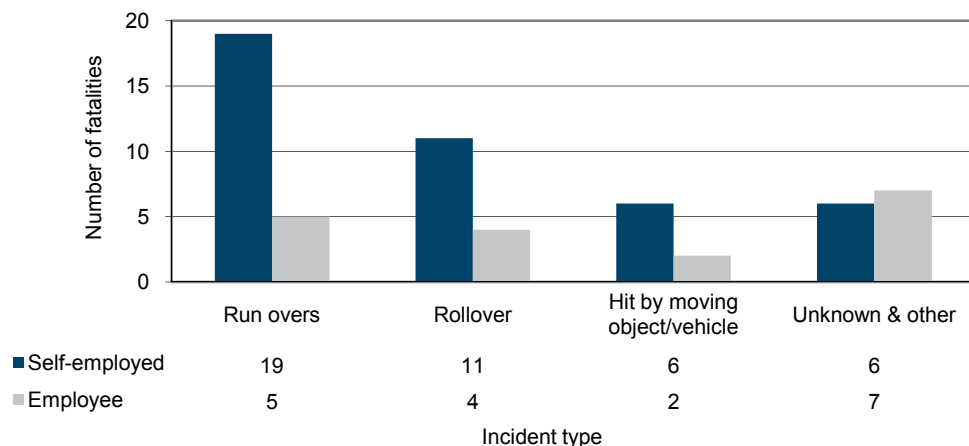
Since there are almost equal proportions of self-employed workers and employees in the Agriculture, forestry & fishing industry, the fatalities rate data indicate that self-employed workers are more than twice as likely as employees to suffer a fatal injury while working with a tractor (assuming that both employment groups use tractors equally). For the 2004–07 period employees in the Agriculture, forestry & fishing industry recorded 2.6 deaths per 100 000 workers while self-employed workers recorded 8 deaths per 100 000 workers. Figure 8 shows that fatality rates for self-employed workers were higher for all age groups with the highest rates for both self-employed and employee occurring in the 65 years and over age group.

Figure 8: Worker fatalities due to tractors in the Agriculture, forestry & fishing industry: fatality rate by employment status and age, 2004–07



The ROPS legislation particularly enforces protection for employees who are using tractors. Conversely, if the tractor is used by a self-employed worker who has no employees there is no requirement to fit ROPS. Against this background, it is not surprising that self-employed workers recorded nearly three times the number of rollover deaths: 11 self-employed worker fatalities compared with 4 employee fatalities (Figure 9). The coroners' data shows that in one of the employee deaths no ROPS was fitted to the tractor. The employer was subsequently charged with a number of offences related to not providing a safe working environment for the employee. In 4 of the 11 self-employed deaths it was specifically mentioned that no ROPS were fitted.

Figure 9: Worker fatalities due to tractors in the Agriculture, forestry & fishing industry: number by incident type and employment status, 2004–07



The other area where there were large differences between employee and self-employed worker deaths was in the category of run overs. Self-employed workers recorded nearly four times the number of employees killed while working around an inadequately braked tractor: 5 employees compared with 19 self-employed workers.

6. Safety equipment on tractors

Rollover protective equipment

In 1994, NOHSC released its National Standard for Plant [NOHSC:1010(1994)]. The parts relating to tractors are:

- (4) An employer must ensure that a tractor to which the testing requirements of AS 1636 can be applied is, within 12 months after the commencement of this national standard, securely fitted with a roll-over protective structure except where the tractor is:
 - (a) manufactured, imported or originally purchased prior to 1981, and is not operated by an employee; or
 - (b) installed in a fixed position, and in manner which would no longer permit it to be used as powered mobile plant.
- (5) Where a tractor is used under a tree or in a place too low for a tractor to work while it is fitted with a roll-over protective structure, the structure may be lowered or removed for the period that the tractor is used in such a situation.
- (6) An employer must ensure that a tractor within the scope of Clause 37 (4) is not sold, leased or hired unless it is fitted, as appropriate, with suitable and adequate protective devices to minimise the risk of injury to the operator.
- (40) h (i) no person other than the operator is permitted to ride on an industrial lift truck or tractor unless the person is seated in a seat specifically designed for carrying a passenger, and the seat is fitted with appropriate seat restraints and is located within the zone of protection afforded by the required operator protective devices.

The AS 1636 covers tractors weighing 560 kilograms to 15 000 kilograms.

While this was the suggested standard it was implemented differently by each of the states and territories in Australia and at different times. While newly manufactured tractors had ROPS fitted, there were considerable numbers of older tractors still in use around Australia. Rebate schemes were offered to assist owners of tractors to upgrade safety. These schemes were readily accepted by employers but not so readily by self-employed farmers who worked on their private property and hence were exempt from the requirements to install ROPS. The high number of self-employed farmers killed in tractor rollovers indicates that many of them have not used the rebates to upgrade the safety of their tractors.

Apart from the obvious benefits of having protection in the event of a rollover, ROPS allows for the fitting of seatbelts which prevent the driver being thrown from the vehicle in the event of a rollover.

The analysis in this report suggests that 15 of the deaths that occurred in the four years of this study could have been prevented if all tractors were fitted with the appropriate ROPS and seatbelts (and the seatbelts were worn).

Access platforms

The Safe Tractor Access Platform (STAP) was designed so that a person could no longer stand between the front and back wheels of a tractor. This makes it much less likely that the operator will slip and fall under the tractor wheel if the tractor moves unexpectedly. It is currently a voluntary safety device. WorkSafe Victoria and FarmSafe Australia support the use of STAPs on the basis of relatively cheap installation costs and proven effectiveness in reducing run over incidents. The analysis in this report suggests that 8 of the deaths that occurred in the four years of this study could have been prevented if all tractors were fitted with a STAP.

Guarding

Machinery are manufactured with guards to protect workers from being caught in moving parts. On tractors, the power take-off shaft (PTO) powers attachments such as slashers and bailers. Workers have been known to take off the guarding as the PTO needs regular lubricating and the removal and subsequent replacement of the guard takes considerable time. However, it only takes clothing to become entangled in the PTO for the worker to receive life threatening injuries. Many safety alerts have been issued regarding the removal of guarding. The analysis in this report suggests that 3 of the deaths that occurred in the four years of this study could have been prevented if guards are maintained on all tractors.

7. Explanatory Notes

A death was regarded as a tractor-related death for the purposes of this report if a tractor had a significant involvement in the activity being carried out when the incident occurred.

The National Coronial Information System (NCIS) was interrogated for all work-related deaths which occurred between 1 July 2003 and 30 June 2007 and involved a tractor. A death was considered work-related where the activity being undertaken was associated with the income generated by the person or property. In the case of agricultural properties it can be difficult to draw a line between domestic and work-related activities. All available information in the NCIS, plus in some cases information from the media was used to determine work-relatedness. A death did not have to be coded as work-related in the NCIS to be included in this study. Open cases from the NCIS were also included where sufficient information was available to determine work-relatedness.

The previous study undertaken by the National Occupational Health and Safety Commission (NOHSC) included all cases that occurred from 1 January 1989 to 31 December 1992. The major results from this study can be found in Work-related traumatic fatalities in Australia, 1989 to 1992, Dec 1998 <http://www.safeworkaustralia.gov.au/AboutSafeWorkAustralia/WhatWeDo/Statistics/Pages/ReportsOnWorkRelatedTraumaticFatalitiesThatOccurredDuring1989To1992.aspx>

The current study uses data from a database maintained by Safe Work Australia. Annual reports are produced under the title Work-related Traumatic Injury Fatalities, Australia and can be found at <http://www.safeworkaustralia.gov.au/AboutSafeWorkAustralia/WhatWeDo/Statistics/Pages/WorkRelatedTraumaticInjuryFatalities.aspx>

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