REDUCING RISK OF INJURY ASSOCIATED WITH FARM MOTORCYCLES ON FARMS IN AUSTRALIA

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Executive Summary

'Reducing the Risk of Injury Associated with Farm Motorcycles on Farms in Australia' research project was initiated after the Australian Agricultural Health Unit identified farm motorcycles as a major cause of on-farm injury.

The project was funded by the National Occupational Health and Safety Commission (formerly Worksafe Australia).

The research program was directed primarily to reducing the risk of injury to farm motorcycle riders through the identification of preventable injury factors, the development of a competency based ATV and 2-wheel motorcycle training course and recommendations for a more suitable on-farm motorcycle helmet.

Farm motorcycle rider survey forms were sent to farm families in New South Wales, Victoria and Western Australia. Farm motorcycle injury surveys were completed by injured riders in nominated New South Wales, Victorian and South Australian rural hospitals. The study was assisted by data collected from the National Injury Surveillance Unit (NISU), Victorian Injury Surveillance Unit (VISS), Victorian Emergency Minimum Dataset (VEMD) and preliminary results from the National Occupational Health and Safety Commission (NOHSC) work-related fatality database.

The results of this study confirm that farm motorcycles are an integral part of Australian farms with the majority of riders using them three days a week or more, particularly for mustering and personal transport. Respondent/riders represented a wide range of ages for both males and females, although there were more males represented then females. Over 97% of respondent/riders indicated that they had never completed a formal rider training course, and less than half of these indicated that they would be interested in attending one. It was reported that the wearing of personal protective clothing was poor, with over 60% of respondent/riders indicating that they never wear a helmet. The results of this study also confirm poor maintenance of brakes, suspension, chain and tyres that are critical to motorcycle safety.

Of the respondent/riders, there were 505 riders injured on 2-wheel motorcycles compared to 47 injured riders on ATVs in the previous 2 years. Young males tended to have a higher percentage of injuries compared to any other group. Injuries resulting from ATVs tended to be of a more serious nature - fractures and sprains, compared to 2-wheel motorcycle injuries - cuts and lacerations. ATV injured riders commonly suffered upper body injuries whereas 2-wheel motorcycle riders commonly suffered lower leg injuries. Riding across a paddock and hitting a stationary object were the major causes for both ATV and 2-wheel motorcycle accidents, although rolling the ATV was also prominent. It is interesting to note that the majority of accidents occurred at speeds less than 30 km/h.

Injury to the head represented only a small fraction of the overall injuries sustained, but severe head injury accounted for nearly half of the deaths. Fatal head injuries involved skull fractures, and the majority were lacerations or bruising to the frontal sections of the brain.

There were 24 recorded farm motorcycle fatalities between 1989-1992, of which 22 of the deceased were males. There were 5 deaths attributed to ATVs and the remaining 19 attributed to 2-wheel motorcycles. Fatal ATV injuries were observed to occur to the upper body regions, whereas fatal 2-wheel motorcycle injuries were observed to occur to the head.

Recommendations for reducing the risk of injury to farm motorcycle riders can be found in the body of the report.

Recommendations

The following recommendations have been derived from the total body of the research project.

Recommendation 1

In the development of injury databases more information regarding farm motorcycle injury and fatalities is required to better inform injury programs. There is a need to address the method of data collection to ensure uniformity in the data collected, standardise definitions and differentiate between 2-wheel motorcycles and ATVs and the different mechanisms of injury associated with each, although there are often similarities.

Recommendation 2

The health and safety risks associated with the use of motorcycles on farms should be included in education and promotion programs to help farmers, farm managers and farm workers to manage occupational health and safety risks.

Recommendation 3

Competency based ATV and 2-wheel farm motorcycle training courses should be developed with the aim of improving both rider knowledge and rider skills. The courses need to cater for both young and older riders, as well as both male and female riders. The importance of rider, motorcycle and environmental factors and their interactions should be emphasised as well as safe use of the motorcycle in the performance of such tasks as mustering and chemical application.

Recommendation 4

The importance of wearing protective clothing, especially a helmet, and maintaining the motorcycle should be emphasised to farm motorcycle riders. An education program is required to inform riders on the different types of helmets available.

Recommendation 5

Information regarding the carrying of passengers and recommended age of riders for both ATVs and 2-wheel motorcycles should be made available to all riders or their guardians. Guardians should also be made aware that there are community motorcycle clubs which cater for junior riders, providing education, supervision and controlled riding conditions.

Recommendation 6

Farm motorcycles, both 2-wheel motorcycles and ATVs, are manufactured in a variety of sizes and models. There is a need for an education program to make riders aware of the importance of selecting the correct machine for a specific task.

Recommendation 7

Head injury information should be referred to an expert panel to determine a suitable standard for an on-farm motorcycle helmet. If possible a common standard for equestrian and motorcycle use on farms should be pursued.

Recommendation 8

At present it is recommended that ROPS should not be fitted to ATVs in the light of current research information. Research information regarding the benefits and risks of the fitment of ROPS to ATVs should be referred to an expert panel to prepare advice for Australian suppliers, farmers and farm managers.

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Objectives

The specific objectives of the project were:

- The identification of preventable factors for injury associated with farm motorcycle usage in a range of farming enterprises in Australia

- Development and evaluation of a suitable farm motorcycle rider and motorcycle maintenance training program

- Identification of design modifications, in association with the motorcycle industry, required for improved safety for both 2-wheel motorcycles and All Terrain Vehicles (ATVs)

- Recommendations for a more suitable helmet standard for farm motorcycle use

1 Background

1.1 Australian Agriculture

Agriculture is an occupation that encompasses the art, science and industry of managing the growth of plants and animals for human use. Australian agriculture is an industry that is diverse in both products and production techniques, depending on engineering, technology, biological and physical sciences.

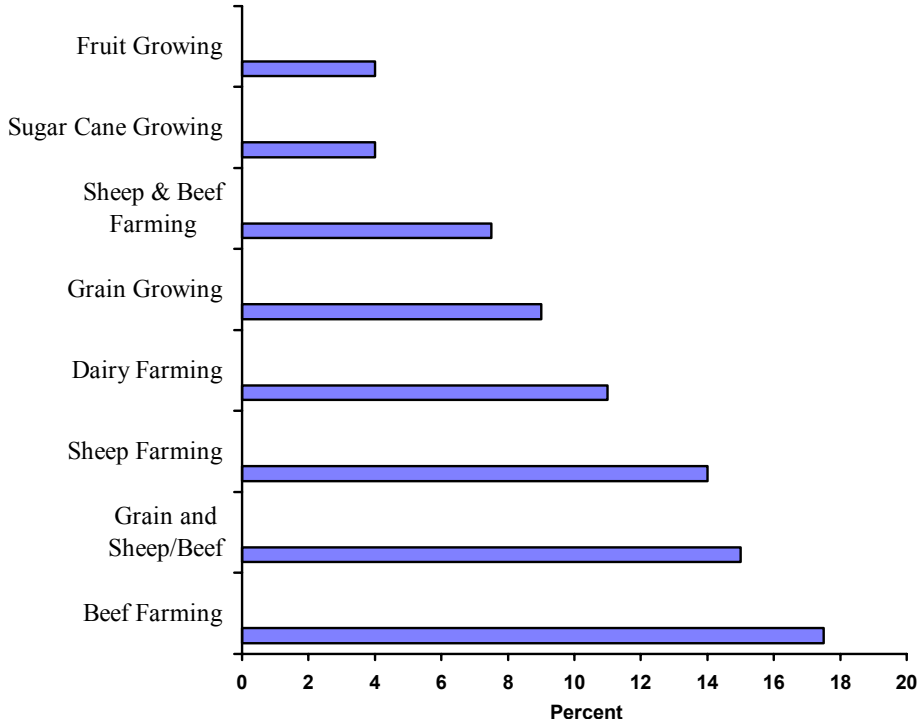
The estimated number of farms in Australia was 150 389 in 1994 (ABS Agstats, 1994). Table 1 shows a breakdown of farm numbers by State, New South Wales having the largest number of farms and the Australian Capital Territory having the least number of farms. (The definition of a farm was any establishment with an Estimated Value of Agricultural Output (EVAO) greater than $5 000).

Table 1 Numbers of Australian Farming Units

Year	Number Farming Units								
	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	Total
1994	42 817	37 330	34 268	16 345	14 555	4 663	316	95	150 389

Source: Australian Bureau of Statistics 1993-94.

Figure 1 Percentages of Agricultural Enterprises by Industry Australia, as at March 1993



Source: ABS Characteristics of Australian Farm No. 71

The Australian agricultural industry produces a wide variety of products that can be categorised by industry. Figure 1 demonstrates the percentage of establishments by the major industry groups. Beef / sheep / grain farming are the predominate industries. It should be noted that industries, such as the cotton industry, are not represented in the figure.

Table 2 Numbers of Farm Workforce by Industry, 1981-1991

Industry	1981	1986	1991	% of Farm Work Force
Cereal, grains, sheep, cattle & pigs	258 019	255 716	239 629	65%
Fruit			239 629	9.5%
Vegetables	14 947	36 049	37 227	9.0%
Poultry	10 919	10 596	9 903	2.7%
Other	47 237	44 393	50 367	11.5%
Services to Agriculture	19 338	18 635		4.8%
Total	**386 509**	**391 398**		

Source ABS Labour Force unpublished data / NFF Discussion Paper Vol 9, Nov 1995

The number of people employed on farms in Australia is represented in Table 2. The farm workforce is divided into respective industries, the cereal grains, sheep, cattle and pig industries having one of the largest workforce populations. The fruit industry also has a high workforce population due to the labour intensive nature of the industry.

Table 3 Number of Agricultural Establishments and Farm Employment in Australia

Years	Agricultural Establishments	Employers & Self Employed	Wages & Salary Earners	Unpaid Family Helpers	Total
		'000	'000	'000	'000
1980	175 760	243.9	124.9	13.6	382.4
1990 - 1991	124 975	228.2	140.1	29.3	397.1
1991 - 1992	120 558	220.5	129.9	23.3	373.7
1992 - 1993	120 655	220.0	118.3	24.5	362.8
1993 - 1994	150 389	220.9	129.5	24.7	375.1

Source: Australian Commodity Statistics Bulletin 1995.

1990-1991 Estimated Value of Agricultural Operations (EVAO) was $20 000 and from 1991-1992, the EVAO threshold was raised to $22 500. A 1980 comparison includes agricultural establishments based upon an EVAO of $2 500 or more.

The contribution of employer and self employed labour, wage and salary earners labour and unpaid family labour to the farm workforce is represented in Table 3. Around 60% of the farm workforce is comprised of employer or self employed labour, with an increasing trend towards using unpaid family labour.

As Australian agriculture enters its next phase there will be a requirement to further develop existing skills and adopt new management techniques and production tools. To improve farm business, finance, management and marketing skills is only part of the equation. Farmers will also need to develop skills that will make their farms a safer workplace.

2 Farm Motorcycles - A Definition

Motorcycles that are used on Australian Farms can be generally classified into three groups.

2.1 Agbikes

In rural Australia the term "agbike" refers to a type of 2-wheeled motorcycle that has been especially designed for use in agriculture. These motorcycles usually range in size from 100 cc to 200 cc, have specially fitted racks for carrying, hand guards for rider protection, knobby tyres and a low range gearbox which is orientated for farm work (Figure 2).

Figure 2 Agricultural Motorcycle (Agbike)

2.2 Trail Bikes

The term 'agbike' is also commonly used when describing a trail bike that is used for an agricultural purpose. Trail bikes, unlike the true 'agbike,' are more performance orientated, range in size from 50 cc to 600 cc, stand taller, have a higher ratio gearbox and generally superior brakes and suspension fitted to them. They are usually fitted with higher mudguards, semi or knobby tyres, can be registered for on highway use and are generally more expensive (Figure 3).

Figure 3 Trail Bike

2.3 All Terrain Vehicles (ATVs)

ATVs are specially designed motorised vehicles that operate on four low pressure, high flotation tyres. These vehicles are designed for off-road use in a variety of terrains. ATVs are manufactured in a variety of sizes and differ in their ability to carry loads. They have a seat which is designed for a single operator, handlebars for steering control and may be either 2 or 4 wheel drive. Different riding skills are required for safe operation of ATVs then are required for 2-wheeled farm motorcycles (Figure 4).

Figure 4 All Terrain Vehicle (ATV)

In addition, ATVs may be fitted with special attachments. Generally these fittings are manufactured by independent companies, not the motorcycle companies. The more common fittings purchased are:

- motorcycle mounted spot sprayers (saddlepack sprayers) motorcycle mounted boom sprayers
- trailer mounted boom sprayers (Figure 6)
- motorcycle mounted seeders and fertilisers
- trailer mounted seeders and fertilisers
- motorcycle front mounted slashers
- trailer mounted slashers
- rear hitch trailers
- on farm modifications eg shovel holders, mounts for 2 way radios

Manufacturers do not encourage the fitment of attachments that may raise the motorcycles centre of gravity. Furthermore, manufacturers advise that riders under the age of 16 should not operate ATVs and passengers should not be carried.

2.4 Farm Motorcycles and Their Use

In Australian agriculture farm motorcycles are used for a variety of operations, in both light and dark conditions. Both 2-wheeled motorcycles and ATVs are commonly used in activities such as:

- personal transport around the farm
- mustering of livestock (Figure 7)
- supervision of working field crews
- inspection of crops, pastures, fences and livestock
- timber marking
- inspection of irrigation fields, pipes and channels
- recreation

ATVs, in addition, may be associated with the following activities:

- substitute for the farm utility (ute) and tractor
- towing and/or carrying of goods (Figure 5 and 8)
- spraying of crops and pastures
- seeding, fertilising and applying chemicals
- mowing grass
- small scale earthmoving
- shifting irrigation pipes
- markers for aerial operators
- recreation

Figure 5 Carrying a Load

Figure 7 Mustering

Figure 8 Towing a Trailer

2.5 Number of Farm Motorcycles on Australian Farms

The majority of Australian farms have at least one farm motorcycle in operation. Table 4 demonstrates that 2-wheeled farm motorcycles are the most popular irrespective of farm size. A trend appears showing that, in general, the larger farms have a greater proportion of 4-wheeled motorcycles (ATVs).

Table 4. Number of Farm Motorcycles Used on Farms by Farm Size NSW, 1994 and Field Day Attenders at Major Field Days in New South Wales, 1994

Farm Size (ha)	Number of Respondents	Average No. of Farm Motorcycles on Farm			
		2 Wheeled	3 Wheeled	4 Wheeled	Total
0 - 99	155	0.49	0.03	0.10	0.62
100 - 499	143	1.20	0.07	0.43	1.70
500 - 999	97	1.38	0.03	0.57	1.98
1 000 - 1 999	102	1.36	0.05	0.55	1.96
2 000 - 2 999	38	1.87	0.11	0.53	2.51
3 000 - 3 999	12	2.25	0	1.25	3.50
4 000 - 4 999	12	1.83	0.08	1.33	3.24
5 000 - 9 999	18	2.17	0	0.94	3.11
0 000 - 25 000	7	2.43	0	1.14	3.57
Total	**584**	**14.98**	**0.37**	**6.84**	**22.19**

Source: NSW Farm Safety Project 1994.

The National Sales Figures from Honda, Yamaha, Kawasaki and Suzuki (Table 5) suggest an increase in the sales of both 2-wheeled motorcycles and ATVs. It is difficult to estimate the number of motorcycles that are used on Australian Farms as there is no registration or licensing system which enables an accurate record to be kept. National sales figures give an approximate count of the new 2-wheeled 'agbikes' and ATVs entering agriculture, but do not give any indication of the number of trail bikes that are sold into agricultural establishments or the number of older motorcycles that are still in use.

Table 5 Number of 2-Wheeled Motorcycles and ATVs Sold into Agriculture

Motorcycle Type	1995	1996
2-wheeled motorcycles	3 241	3 249
ATVs	8 226	9 546

Source: Newland (1997).

3 Farm Motorcycles and Injury

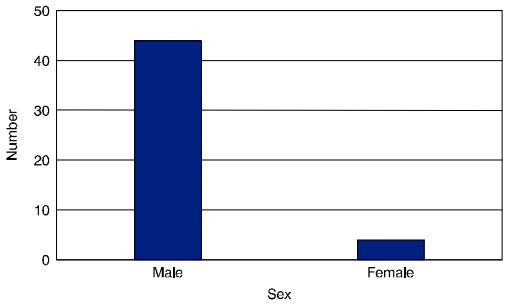
The farm motorcycle, or the "agbike," has assumed the role of both horse and farm utility (ute) on many Australian Farms. It is generally thought of as the workhorse and has become an integral part of Australian Farms. As these machines are worked tirelessly there often

appears to be little thought given to the risks and dangers that can be associated with farm motorcycle operation.

Farm motorcycles, including ATVs, are associated with 8-11% of on-farm injuries presenting to rural hospital Emergency Departments in Australia (Muiswinkel 1994). During 1991 to 1992 there were 236 admissions to New South Wales rural hospitals relating to on-farm motorcycle accidents.

Emergency Department data and hospital separations (admissions) data both show that males more frequently present with an injury while riding a farm motorcycle then female farm motorcycle riders (Figure 9).

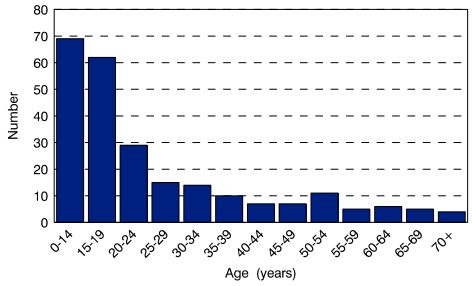
Figure 9 Sex Profile of Injured Farm Motorcycle Riders



Hospital Admissions
Source: New South Hospitals Separations 1991-92.

The number of farm motorcycle injuries is closely correlated with the age of the motorcycle rider. Figure 10 shows that farm motorcycle riders in the age group between 0 years and 24 years more frequently sustain an injury and are admitted to hospital than any other age group. Once over 24 years of age a pattern is formed showing that older riders are less frequently injured and admitted to hospital with a motorcycle injury. Whether this represents a difference in exposure or risk is not known at this point.

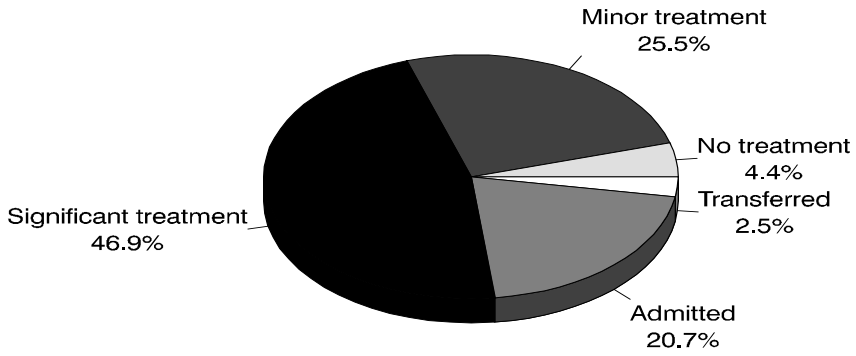
Figure 10 Age Profile of Injured Farm Motorcycle Riders



Hospital Admissions
Source: New South Hospitals Separations 1991-92.

A series of 1 492 persons presenting with on-farm motorcycle injuries to Emergency departments in eight states during 1988-92 show that 46.9% of injured farm motorcycle riders required significant treatment, 25.5% required minor treatment and 20.7% were admitted to a ward (Figure 11).

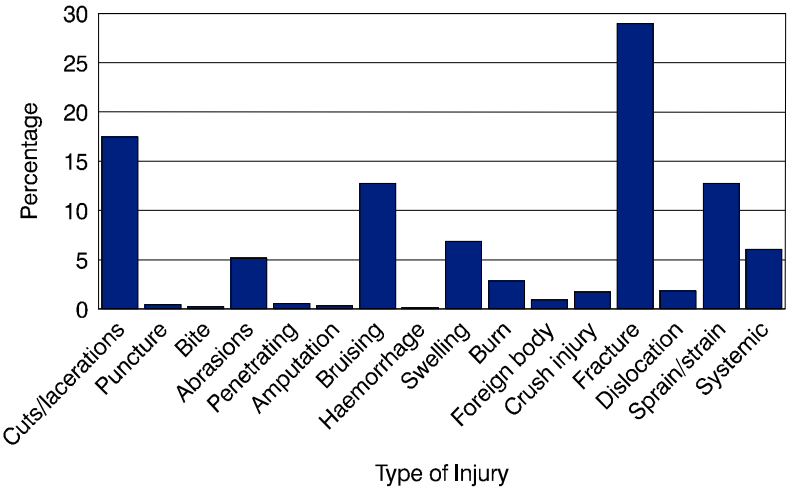
Figure 11 Type of Treatment Given to Injured Farm Motorcycle Riders



Emergency Department Presentations
Source: NISU 1992.

The injured farm motorcycle riders were commonly treated for fractures, cuts/lacerations, bruising and sprain/strains (Figure 12).

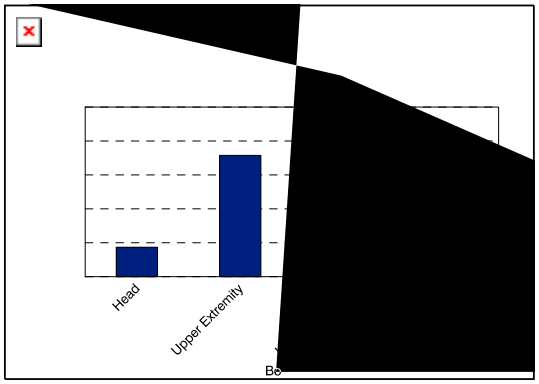
Figure 12 Types of Injuries Sustained by Farm Motorcycle Riders



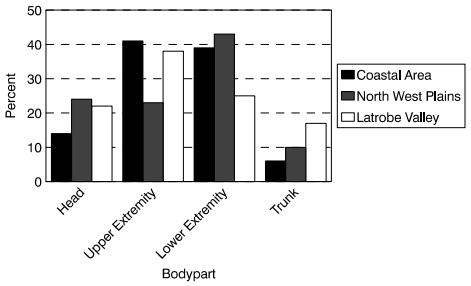
Emergency Department Presentations
Source NISU (1992)

The body parts which are most commonly injured in farm motorcycle accidents are the lower and upper extremities (Figure 13). Head injuries are also common, although the prevalence and severity will be determined by the use of a motorcycle helmet. Both sources of data show a similar trend, although the percentage of body parts injured throughout the geographical regions differ which may be a direct result of the motorcycle riding environment and the tasks in which the motorcycle is being used.

Figure 13 Body Parts Injured



Emergency Department Presentations
Source NISU (1992
(n=1492)

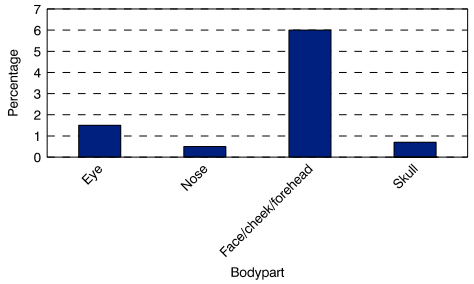


Emergency Department Presentations
Muiswinkel (1994)
(n=181)

Figure 14 shows a breakdown of the body parts injured with respect to the head, upper extremity, lower extremity and trunk regions of the body. The lower leg, knee, shoulder and ankle are the most commonly injured body parts.

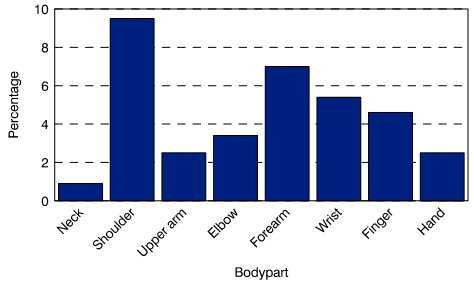
Figure 14 Body Parts Injured

Head Injuries (n=131)



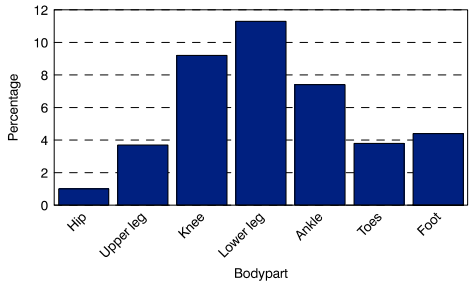
Emergency Department Presentations
Source: NISU (1992)

Upper Extremity (n= 533)



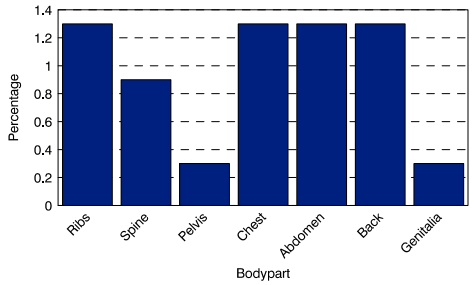
Emergency Department Presentations
Source: NISU (1992)

Lower Extremity (n= 608)



Emergency Department Presentations
Source NISU (1992

Trunk Injuries (n= 103)



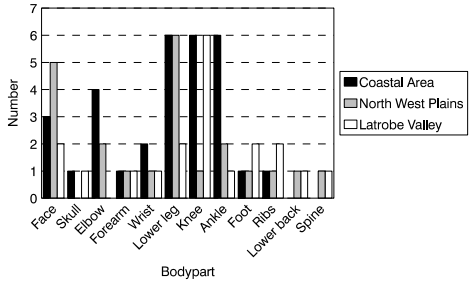
Emergency Department Presentations
Source NISU (1992)

When studying body parts injured for both 2-wheel motorcycle and ATV accidents a trend of similarities and differences appears (Figure 15). Both 2-wheel motorcycle and ATV accidents result in a large number of lower leg injuries. In addition 2-wheel motorcycle accidents tend to result in knee and ankle injuries whereas ATV accidents tend to result in wrist injuries.

When studying body parts injured, particularly the head, it was observed that injured 2-wheel motorcycle riders received a high number of cuts / lacerations to the head, whereas ATV injured riders received both bruising and concussion (Figure 15b). It was also interesting to note that 2-wheel motorcycle riders had a higher number of upper extremity injuries that were admitted to hospital compared to ATV riders who had a higher number of head injuries that were admitted to hospital.

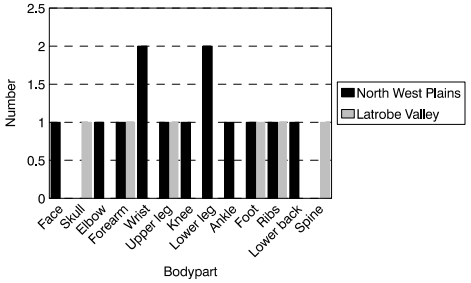
Figure 15a Body Parts Injured on 2-wheel Motorcycles and ATVs

2-wheel Motorcycles



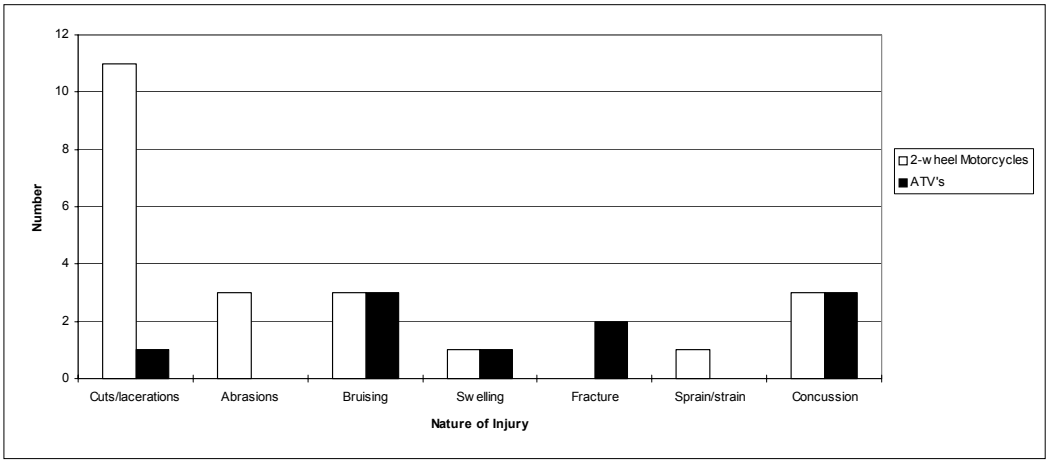
Emergency Department Presentations Muiswinkel (1994)

ATVs



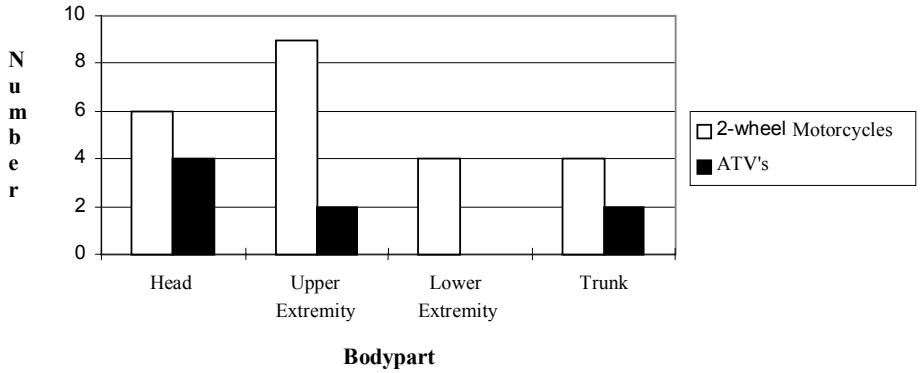
Emergency Department Presentations Muiswinkel (1994)

Figure 15b The Nature of Head Injuries Sustained on Both 2-wheel Motorcycles and ATVs



Emergency Department Presentations Muiswinkel (1994).

Figure 15c A Comparison Between the Number of Head Injuries and Other Body Region Injuries Admitted to Hospital



Emergency Department Presentations Muiswinkel (1994)

To improve safety and safety awareness of those individuals who use farm motorcycles it is necessary to develop an understanding of the interactions between rider, motorcycle and the environment. These interactions can lead to the identification of modifiable farm motorcycle safety factors, which in turn lead to practical improved safety applications.

3.1 Head Injury on Motorcycles

There is inadequate information about the nature and scale of the head injury problem to provide farmers, farm managers and farm workers with practical advice on helmet use. This study aimed to elicit the frequency, severity and mechanism of head injuries associated with riding 2-wheel motorcycles and ATVs.

4 Method

4.1 The Surveys

The project entailed the distribution of three (3) surveys to a sample of the farming community and injured farm motorcycle riders. The surveys used were developed by the Australian Agricultural Health Unit and reviewed by members of the Project Steering Committee.

4.1.1 The Farm Motorcycle Rider Survey

The aim of the Farm Motorcycle Rider Survey (Appendix 1) was to define use of farm motorcycles and the population exposed to the risk of injury. The survey was piloted at Broken Hill Agfair and New England Wool Expo Field Days where 65 surveys were

completed, and then distributed at the Inverell, Coonabarabran, Mudgee, Nyngan and Ag-Quip Field Days where a total of 150 surveys were completed. This survey was distributed to a sample of the farming community via New South Wales Field Days (Figure 16) and mail outs. Surveys were also sent to members from the NSW Cane Growers Association (200), NSW Dairy Farmers (200), Cotton Growers Association (400), Fruit Growers Association (80), Western Australian Farmers Federation (1 000) and Victorian Farmers Federation (1 000) in order to ensure sampling in all major commodity groups. The Farm Motorcycle Rider Survey was distributed to the farming community between 3 May 1996 and 12 September 1997. The mode of distribution at field days was by both site stand and roving person.

Figure 16 New South Wales Field Days

4.1.2 The Women on Farms Survey

The aim of the Women on Farms Survey (Appendix 2) was to define the population exposed to the risk of injury. This survey was distributed to rural women using 'The Country Web,' a newsletter for rural women and their families. The survey was distributed between 30 September 1996 and 12 September 1997.

4.1.3 The Farm Motorcycle Injury Survey

The aim of the Farm Motorcycle Injury Survey (Appendix 3) was to define the factors associated with farm motorcycle injury and mechanisms of injury. After a pilot period at both Moree and Narrabri District Hospitals where 15 surveys were completed, the survey was placed in the Emergency Departments of Armidale, Barham, Kerang, Port Lincoln, Colac, Murtoa and Mansfield Hospitals (Figure 17). The Farm Motorcycle Injury Survey was placed into the Emergency Departments on 3 May 1996 and withdrawn on the 12 September 1997.

Figure 17 Hospitals Targeted for the Farm Motorcycle Injury Survey

4.2 Head Injury Data Collection

In addition to data collected from the surveys head injury data was provided by the National Injury Surveillance Unit (NISU), Victorian Injury Surveillance System (VISS) and the Victorian Emergency Minimum Dataset (VEMD).

4.3 Farm Motorcycle Fatality Data

Farm motorcycle fatality data was provided by the Victorian Workcover Authority, National Occupational Health and Safety Commission (Worksafe Australia) and NSW Coroners Reports.

4.4 Data Entry and Storage

The data was entered into Epi Info, (version 5) which is a word processing, database and statistics system. The data is stored in a computer database at the Australian Agricultural Health Unit.

4.5 Statistical Analysis

Data were analysed and tabulated using frequency and table calculations from Epi Info.

5. Results

The below table gives an indication of the survey response rate for each of the organisations or grower associations. The NSW Dairy Association, Western Australian Farmers Federation and Victorian Farmers Federation had the best response rates.

Table 6 Survey Response Rate

Organisation	No. Surveys Completed	No. Surveys Sent	Response Rate (%)
NSW Field Days	247	253	97.6
NSW Dairy Assoc	112	200	56.0
NSW Sugar Cane Growers	20	200	10.0
Cotton Growers Assoc	48	400	12.0
NSW Fruit Growers	13	80	16.3
WA Farmers Federation	479	1 000	47.9
Victorian Farmers Federation	275	1 000	27.5

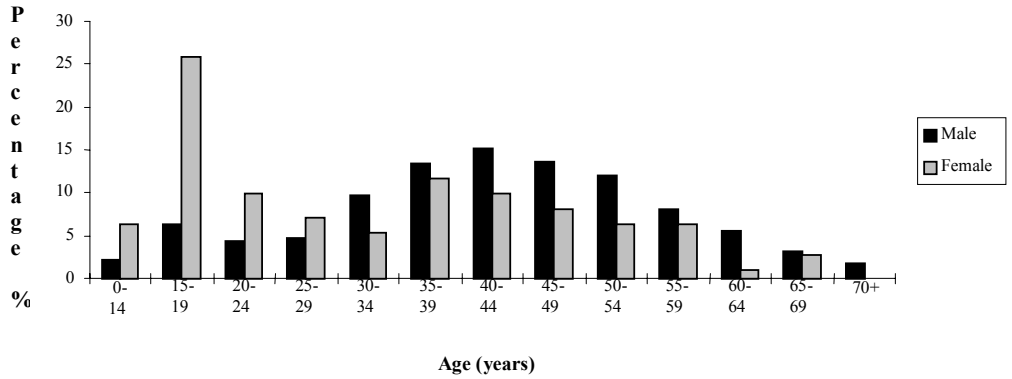
* no more than 6 people who were approached at field days to participate in the farm motorcycle rider survey declined to do so

5.1 The Farm Motorcycle Rider Survey

5.1.1. Rider Profile

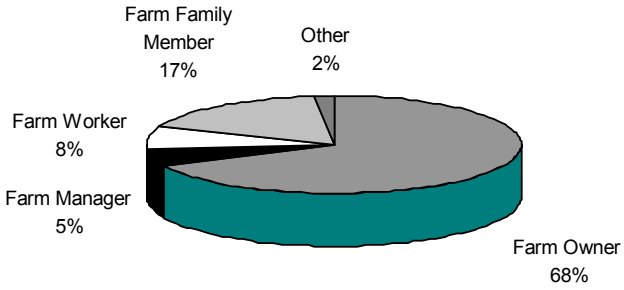
The age distribution of the male survey respondent/riders increased, peaking at 40-44 years, and then decreasing, the exception being the 15-19 year olds. The age distribution for the female survey respondent/riders was similar over all age groups, with a higher number being present in the 15-19 year olds.

Figure 18a: Age and Sex Profile of Farm Motorcycle Riders (n=1194)



The largest proportion of survey respondent/riders were classified as being Farm Owners (68%), followed by Farm Family Members (17%). Farm Workers (8%), Farm Managers (5%) and Other (2%) made up the remaining proportions. The classification of 'Other' included occupations such as agriculture teachers, TAFE teachers, research and extension officers.

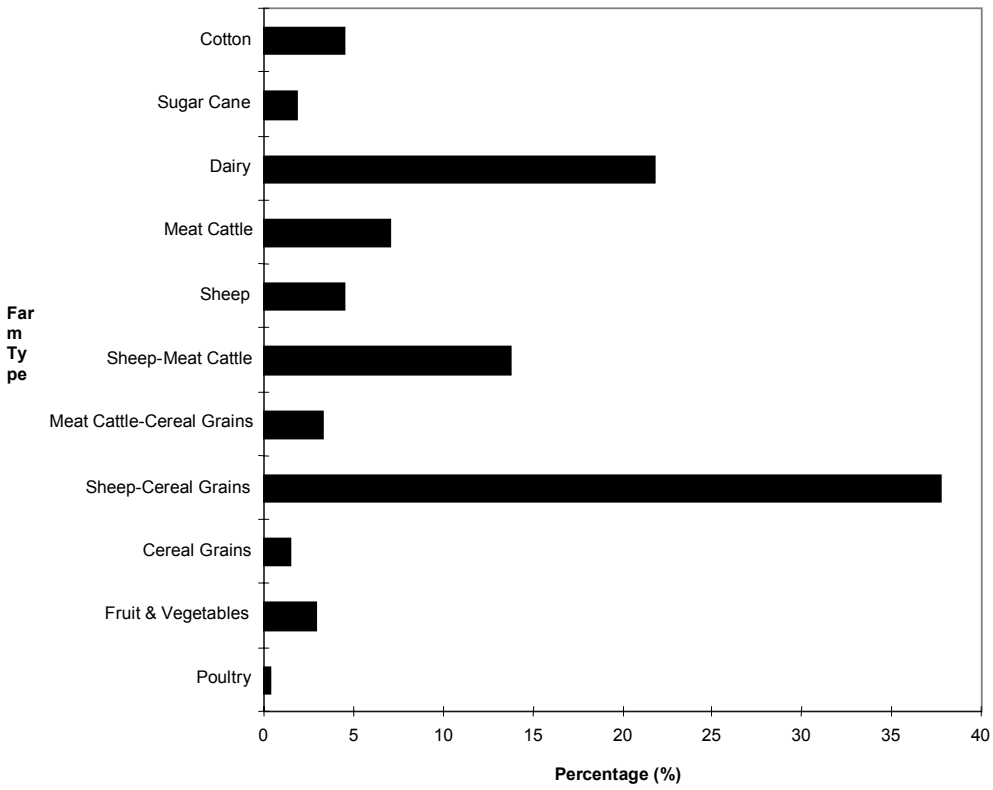
Figure 18b: Respondents Occupational Status (n=1194)



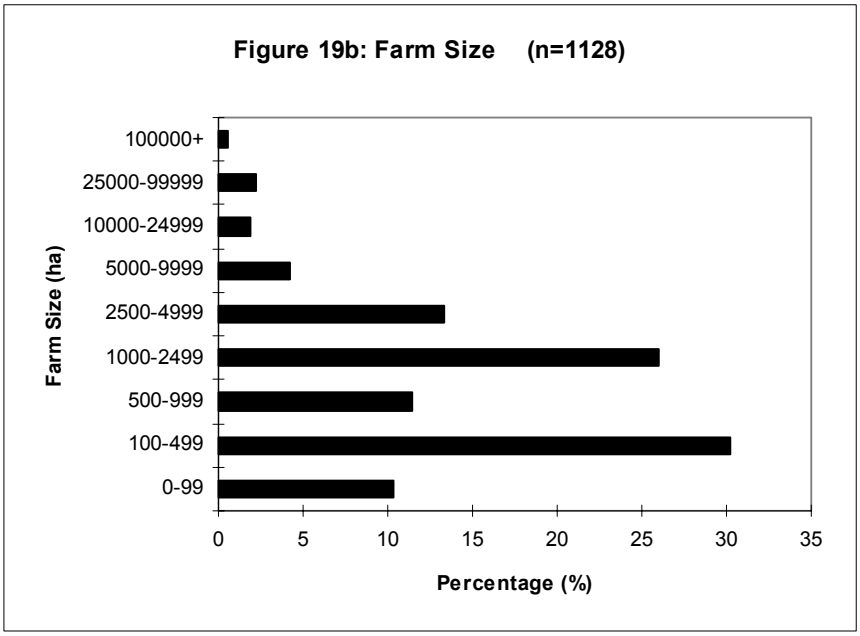
5.1.2 Farm Profile

The enterprise mix of sheep-cereal grains represented 37.7% of the total farm types represented in this study. Dairy was the next largest enterprise type with a 21.8% representation, followed by sheep-meat cattle (13.8%).

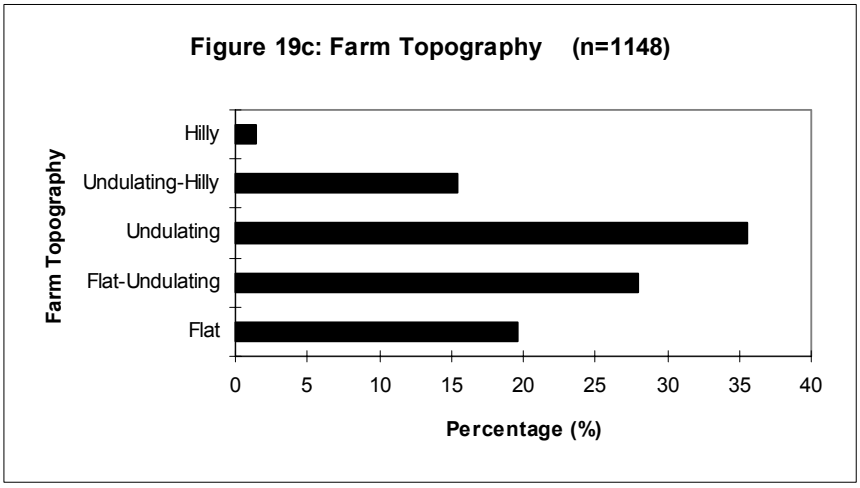
Figure 19a: Farm Type (n=1165)



The majority of farms fell into the size categories of 100-499 ha (30.2%) and 1 000-2 499 ha (26%). Over 5 000 ha in size a decreasing trend of farm numbers began to appear.

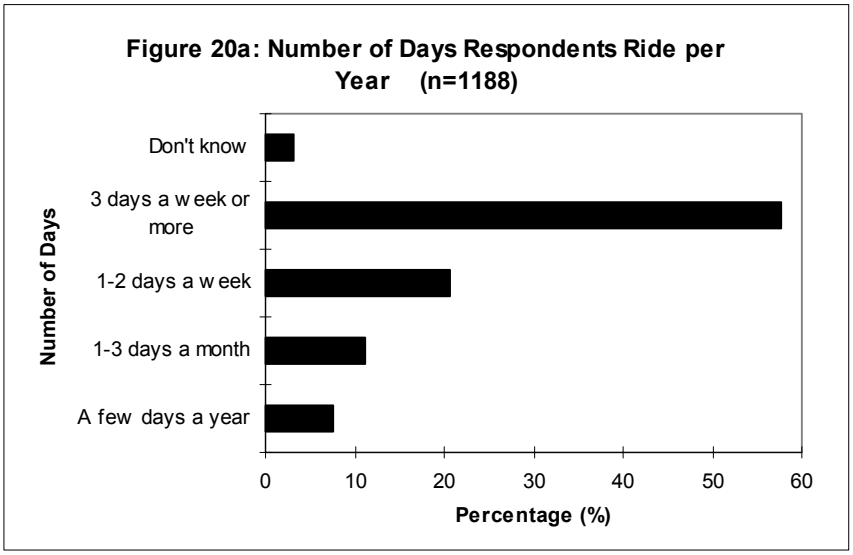


Farm topography was divided into 5 categories, with 35.5% of respondent/riders indicating that their farm was undulating.



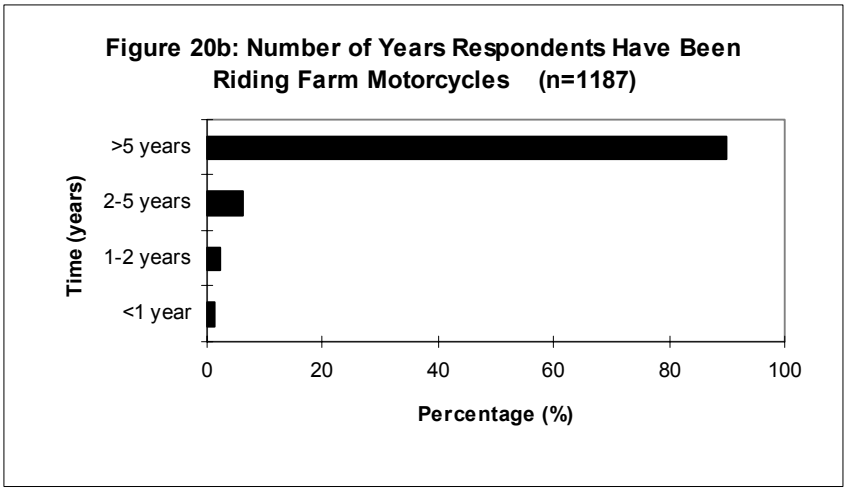
5.1.3 Rider Experience

57.7% of respondent/riders use their motorcycles 3 days a week or more to perform a specific farm task.

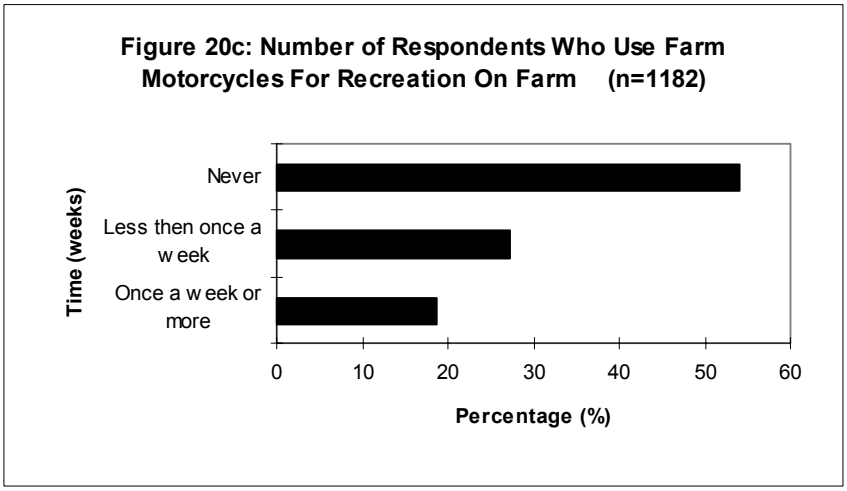


Even though the age distribution of riders in this survey under represents young riders, the rider usage as measured by days ridden is similar to the Women on Farms Survey (see figure 27a).

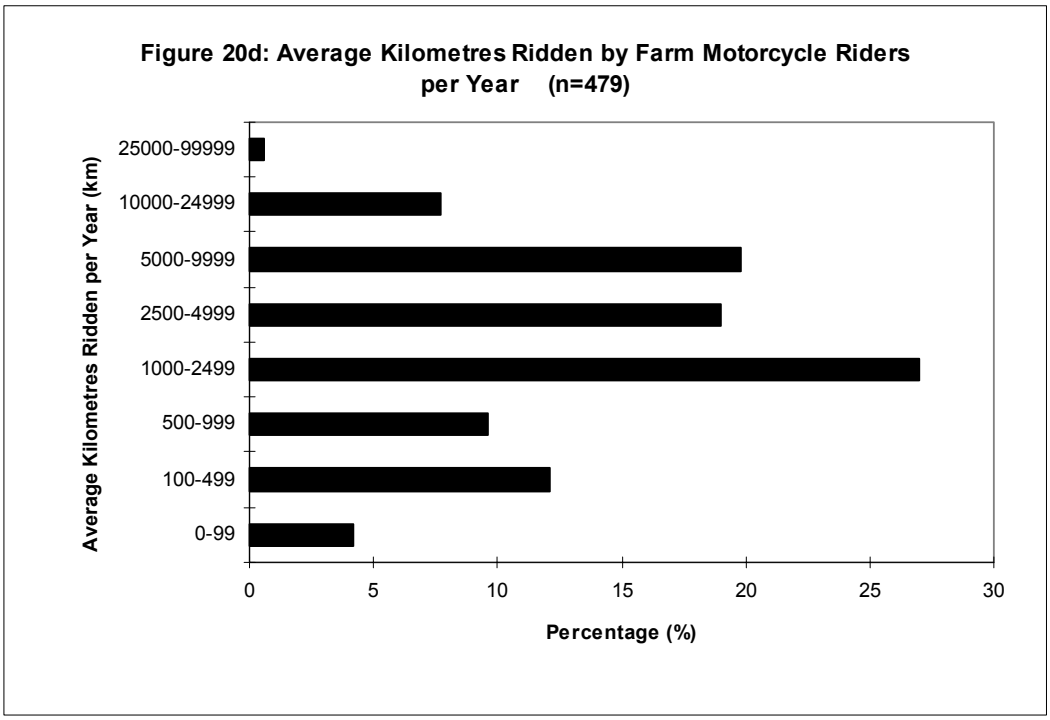
90% of respondent/riders indicated that they had been operating a farm motorcycle for greater than 5 years. This was an expected result after considering that 16.6% of respondent/riders started riding between the ages of 0-19 years and 53.4% started riding between the ages of 20-29 years.



It was expected that the use of farm motorcycles once a week or more for recreational riding would be greater then the observed figure of 18.7%. In fact, 54.1% of respondent/riders indicated that they never ride for recreational purposes. See also Figure 22e and 29b.



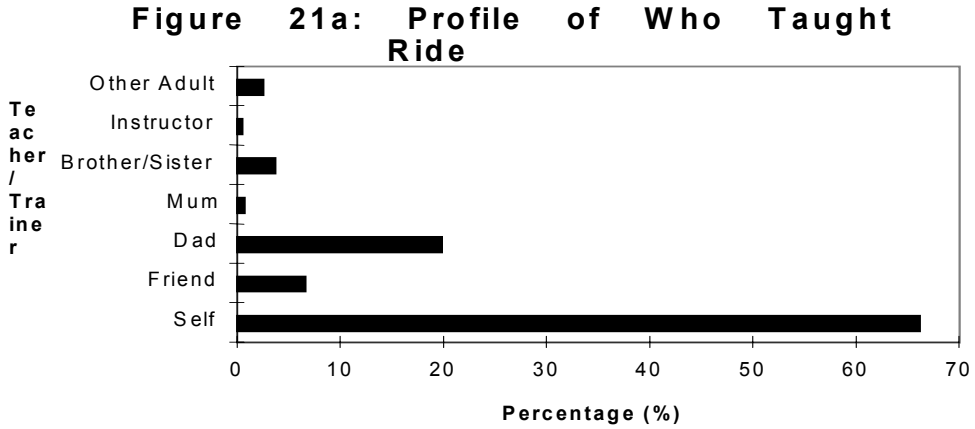
Over one quarter, or 26.9%, of respondent/riders indicated that they travelled between 1 000-2 499 kilometres per year on a farm motorcycle. The remaining three quarters of respondent/riders had varying responses ranging from 0-99 kilometres to 25 000-99 999 kilometres per year.



5.1.4 Rider Education and Training

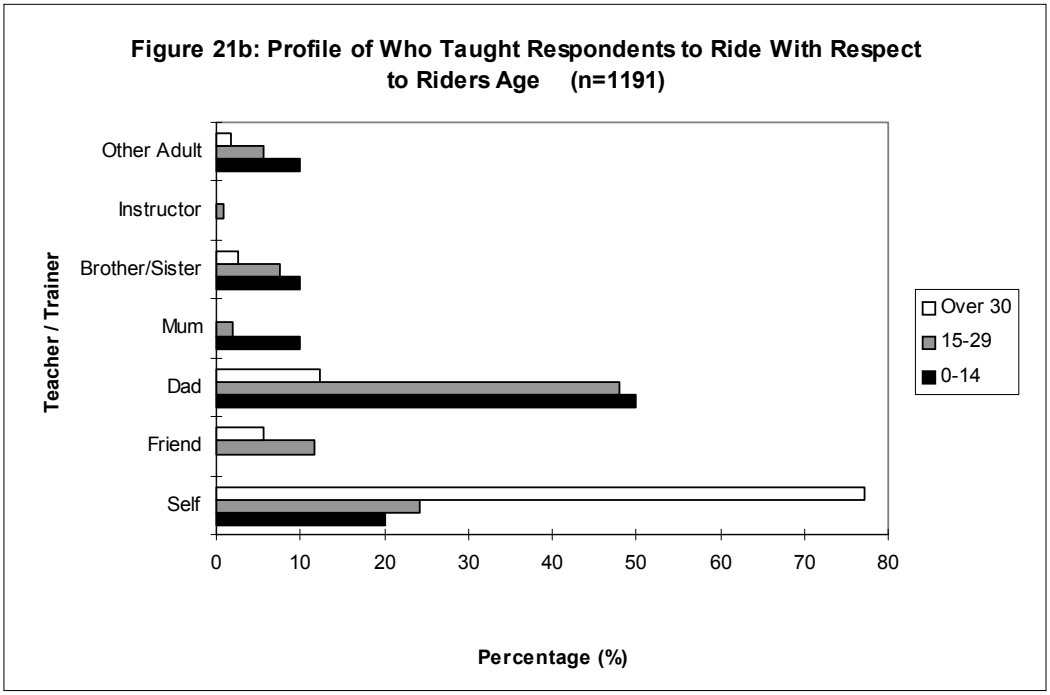
When asked if they had completed a training course 97.2% of respondent/riders responded 'no.' Of the respondent/riders who responded 'yes,' two thirds had completed a training course after 1989. The training courses attended by respondent/riders were held in various regions in Australia and coordinated by various institutions or companies (Appendix 4). The

lack of farm motorcycle training is further highlighted by the fact that 66.2% of respondent/riders are self taught, compared to 0.4% who are formally trained by qualified instructors.

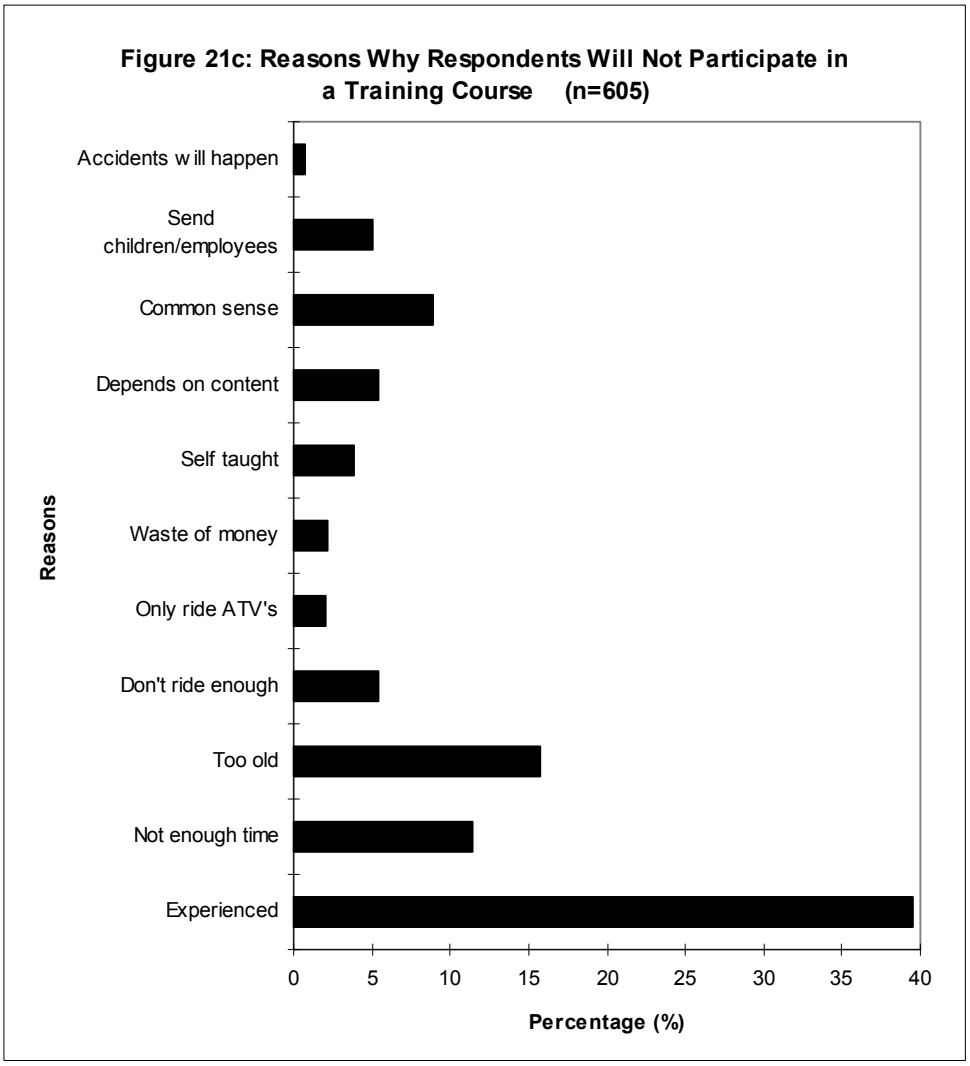


See Figure 28a for a description relating to all family members

Self taught respondent/riders were dominated by the age group over 30 years. Both the 0-14 years and 15-29 years age groups had a high percentage of respondent/riders who were taught to ride by their fathers.



When considering whether they thought rider education and training was important 59.9% of respondent/riders replied 'yes,' but when asked if they would attend only 20.9% replied 'yes.' The main reason for not attending was that they considered themselves to be experienced farm motorcycle riders.

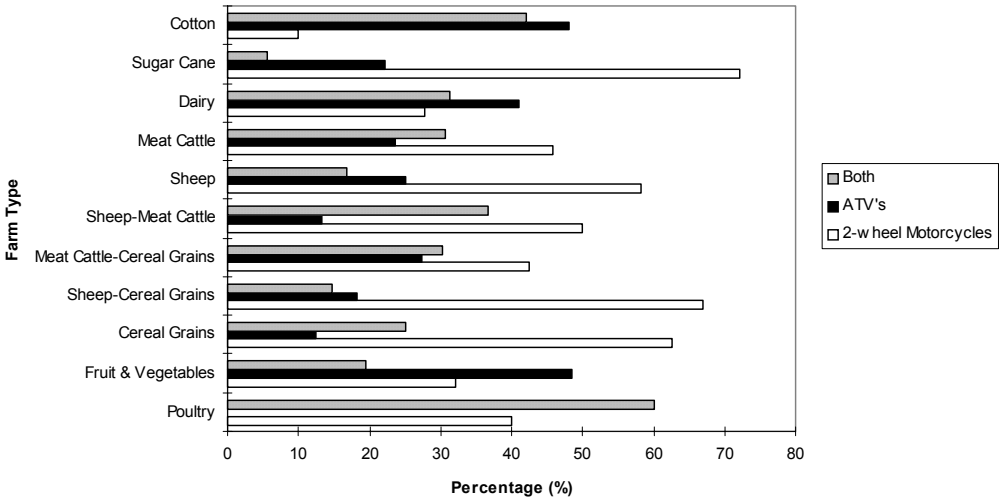


5.1.5 Farm Motorcycle Details

On Australian farms there can be 2-wheel motorcycles, ATVs or a combination of both. The results indicated that 49.9% of respondents owned 2-wheel motorcycles only, 25.5% owned ATVs only and 24.6% owned a combination of both.

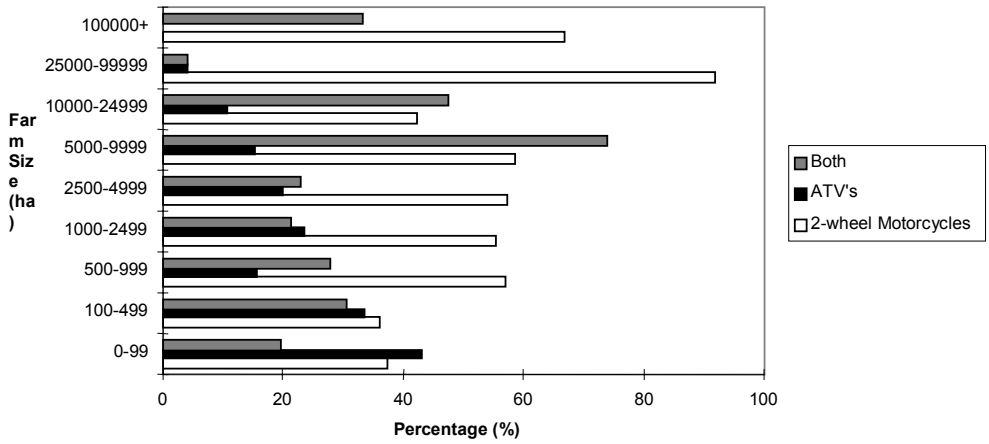
It was expected that the types of motorcycles owned would vary depending on farm type, farm size and farm topography. The cotton, dairy and fruit industries were dominated by ATVs, whereas the sugar cane, sheep and sheep-cereal grain industries were dominated by 2-wheel motorcycles. The meat cattle, sheep-meat cattle, meat cattle-cereal grain and cereal grain industries, although dominated by 2-wheel motorcycles, had a higher percentage of combined ATV and 2-wheel motorcycle ownership in comparison to ATV ownership.

Figure 22a: The Relationship Between Farm Type and the Percentage of Respondents Who Own 2-wheel Motorcycles (n=540), ATV's (n=279) or Both (n=268)



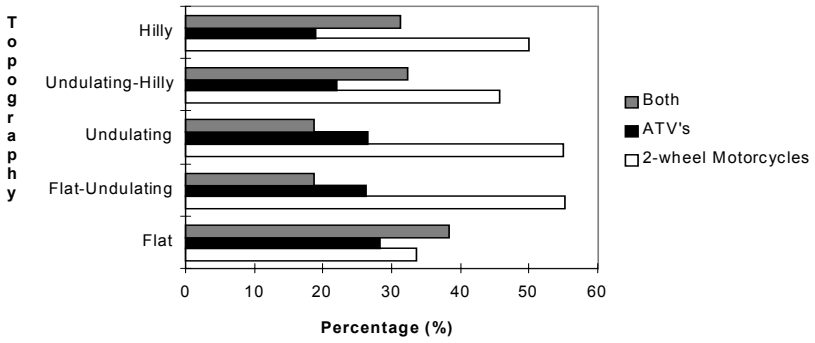
Farms with a size between 0-99 ha were dominated by ATV ownership, whereas larger farms were dominated by 2-wheel motorcycles. Farms with a size ranging between 5 000-9 999 ha and 10 000-24 999 ha had a higher percentage of combined ATV and 2-wheel motorcycle ownership.

Figure 22b: The Relationship Between Farm Size and the Percentage of Respondents Who Own 2-wheel Motorcycles (n=520), ATV's (n=273) or Both (n=266)

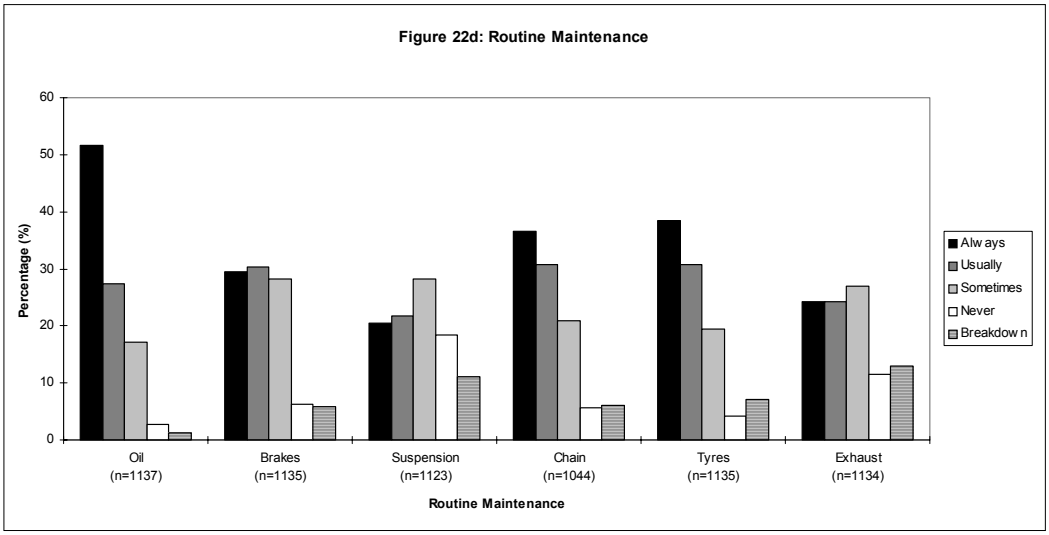


Farms with a flat topography were dominated by a combination ownership of ATVs and 2-wheel motorcycles, whereas farms with a topography ranging from undulating to hilly were dominated by 2-wheel motorcycles. Farms with undulating-hilly and hilly topographies, although dominated by 2-wheel motorcycles, had a higher percentage of combination ownership in comparison to ATV ownership. Hilly country often corresponds with livestock enterprises which may reflect the usage patterns of motorcycles.

Figure 22c: The Relationship between percentage of Respondents who own 2-wheel (n=531), ATVs (n=279) or both



When performing routine maintenance respondent/riders considered that always checking the oil (51.6%) was important. The routine check of tyres (38.4%), chain (36.6%), brakes (29.4%), exhaust (24.3%) and suspension (20.4%) were considered less important.



85.6% of respondent/riders indicated that they used their motorcycles primarily for mustering stock. An unexpected observation was that 56.8% indicated that they never used their motorcycles for recreation.

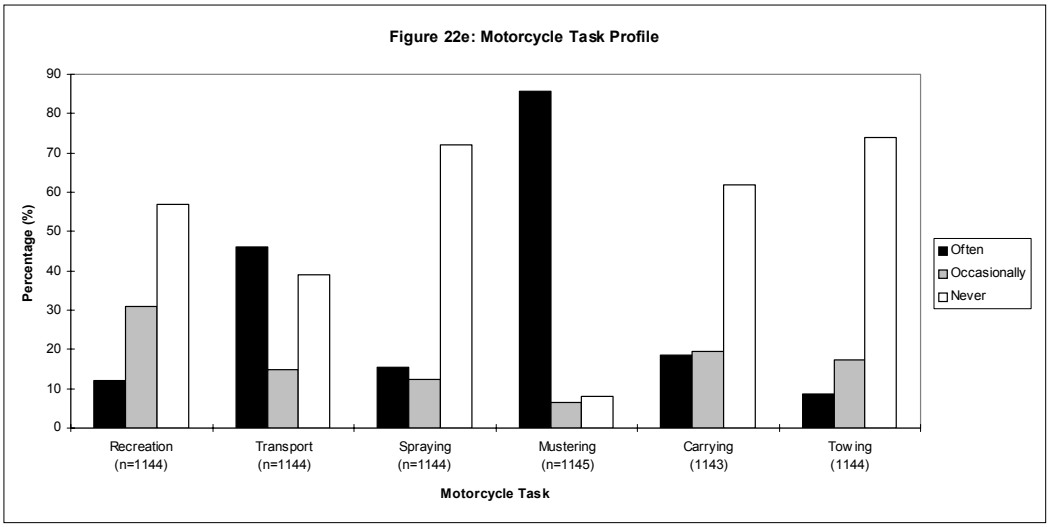


Table 7 The Average Speed of Farm Motorcycle Operation on Different Types of Farms Percentage of Riders Operating at Average Speeds

Farm Type	Average Speed (km/h)										
	n	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
Poultry	4	50.0	-	25.0	-	-	-	-	25.0	-	-
Fruit & Vegetables	30	26.7	40.0	16.7	10.0	3.3	3.3	-	-	-	-
Cereal Grains	17	5.9	35.3	17.6	17.6	5.9	5.9	-	5.9	-	5.9
Sheep-Cereal Grains	391	11.3	30.4	27.1	18.2	3.8	7.7	0.7	0.7	-	-
Cattle-Cereal Grains	32	15.6	34.4	9.4	28.1	3.1	6.3	3.1	-	-	-
Sheep-Meat Cattle	150	14.0	32.0	18.0	22.0	3.3	8.7	-	1.3	0.7	-
Sheep	45	17.8	37.8	20.0	11.1	6.7	-	2.2	-	4.4	-
Meat Cattle	72	15.3	37.5	12.5	16.7	4.2	9.7	-	2.8	1.4	-
Dairy	230	31.7	42.2	20.0	4.3	1.3	0.4	-	-	-	-
Sugar Cane	18	11.1	22.2	22.2	16.7	11.1	5.5	11.1	-	-	-
Cotton	50	4.0	32.0	20.0	16.0	10.0	12.0	2.0	4.0	-	-

Table 8 The Maximum Speed of Farm Motorcycle Operation on Different Types of Farms

Farm Type	Maximum Speed (km/h)											
	n	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	100+
Poultry	5	-	20.0	20.0	-	-	20.0	-	-	20.0	20.0	-
Fruit & Vegetables	29	6.9	17.2	17.2	20.7	-	24.1	3.4	6.9	-	3.4	-
Cereal Grains	17	-	-	17.6	11.8	-	23.5	5.9	23.5	-	11.8	5.9
Sheep-Cereal Grains	403	0.2	1.2	4.0	10.9	12.9	20.6	12.9	22.3	4.5	8.2	2.2
Meat Cattle-Cereal Grains	34	-	2.9	11.8	14.7	8.8	17.6	11.8	14.7	5.9	11.8	-
Sheep Cattle Meat	147	-	4.8	6.1	11.6	11.6	20.4	8.8	19.0	4.1	6.8	6.8
Sheep	48	-	13.0	13.0	21.7	8.7	10.9	4.3	6.5	2.2	13.0	6.5
Meat Cattle	73	1.4	5.5	11.0	16.4	5.5	21.9	4.1	17.8	-	12.3	4.1
Dairy	221	1.8	10.0	21.3	18.6	11.3	24.4	2.3	6.3	1.8	2.3	-
Sugar Cane	17	-	-	17.6	5.9	11.8	23.5	5.9	11.8	-	17.6	5.9
Cotton	51	-	2.0	11.8	21.6	9.8	13.7	7.8	21.6	-	7.8	3.9

The average speed of farm motorcycle operation varied slightly between different farm types. The poultry, fruit and vegetable and dairy industries had a higher percentage of respondent/riders operating between speeds of 0-10km/h. All industries had a high percentage of respondent/riders operating between the speeds of 11-20km/h. Similarly, maximum speed also varied slightly between industries. It was expected that the cotton industry would have a high percentage of respondent/riders operating at speeds in excess of 90km/h, but it is interesting to note that all industries, excepting fruit & vegetables and dairy, had percentages of respondent/riders operating in this speed zone.

Table 9 The Average Speed of Farm Motorcycle Operation on Different Topographies

Farm Topography	Average Speed (km/h)										
	n	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	100
Flat	198	20.0	33.8	22.7	11.1	4.5	4.5	1.0	2.0	-	-
Flat-Undulating	290	14.5	34.1	20.0	18.6	4.8	6.2	-	0.7	0.7	0.3
Undulating	369	17.3	34.1	22.5	13.3	3.5	6.2	0.8	1.6	0.5	-
Undulating-Hilly	158	15.2	33.5	24.1	17.1	3.2	5.1	1.3	0.6	-	-
Hilly	18	22.2	44.4	-	22.2	-	11.1	-	-	-	-

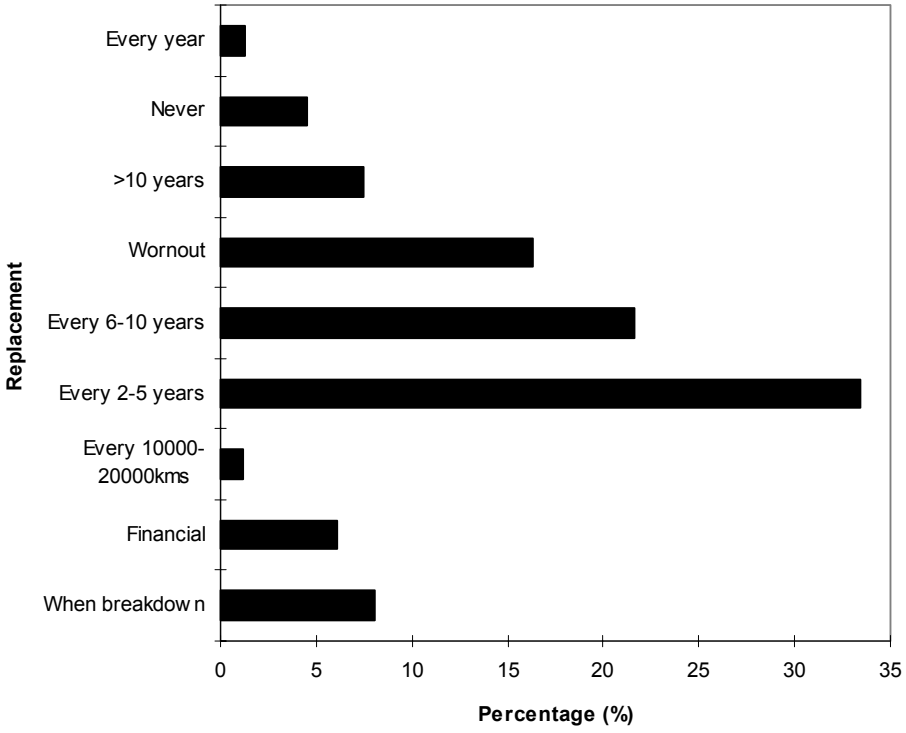
Table 10 The Maximum Speed of Farm Motorcycle Operation on Different Topographies

Farm Topography	Maximum Speed (km/h)											
	n	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	100+
Flat	200	-	6.0	12.5	20.5	11.0	19.5	5.5	13.5	3.0	6.5	2.0
Flat-Undulating	290	1.4	3.8	10.7	13.1	13.4	20.7	11.4	14.8	2.1	5.9	2.8
Undulating	370	0.5	5.9	8.6	11.4	9.7	22.4	8.1	17.6	3.5	9.2	3.0
Undulating-Hilly	162	1.2	3.7	11.7	14.8	8.6	17.3	6.8	20.4	3.7	9.9	1.9
Hilly	15	-	-	6.7	6.7	6.7	40.0	13.3	13.3	6.7	-	6.7

It was expected that higher average speeds and higher maximum speeds would be recorded on flat topography. This was not the case with higher average speeds being recorded on hilly ground. Higher maximum speeds were recorded on undulating to hilly ground, whereas lower maximum speeds were recorded on flat ground.

When considering the replacement of farm motorcycles it was expected that the financial position of the farm would have the greatest bearing on replacement. However, this was not the case as 33.4% of respondent/riders indicated that they replaced their motorcycles every 2-5 years, 21.6% every 6-10 years and 16.3% when the motorcycle is wornout.

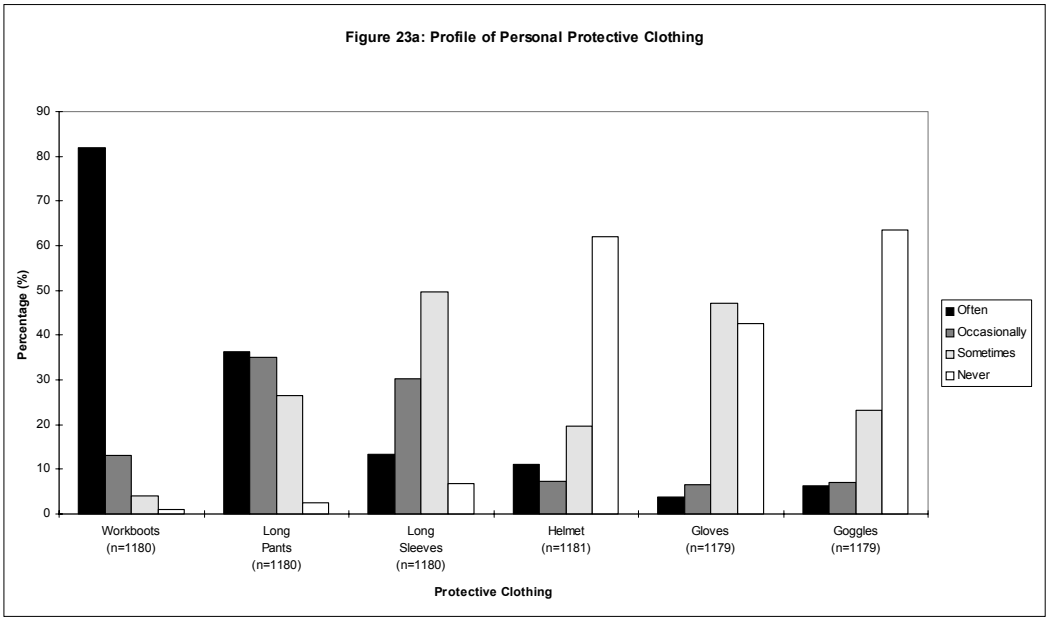
Figure 22f: The Time at Which Respondents Replace Their Farm Motorcycles (n=1009)



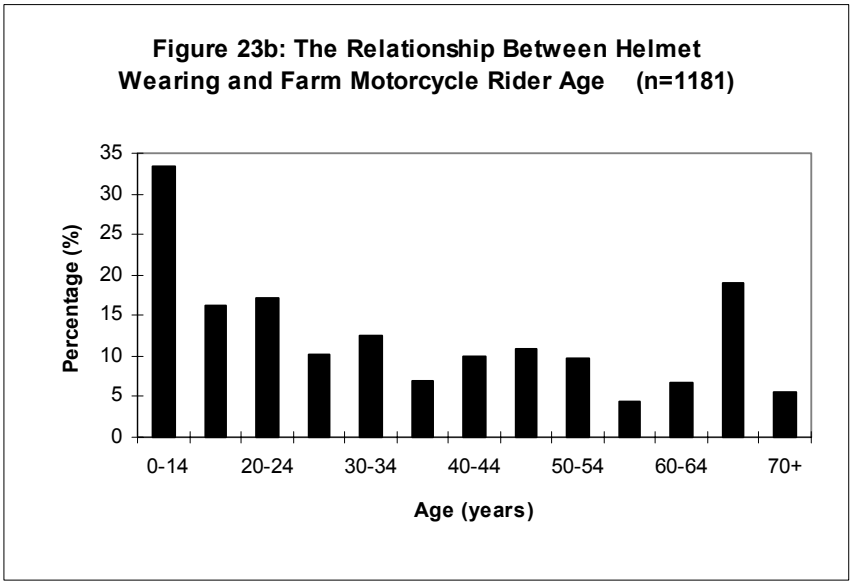
5.1.6 Protective Clothing and Equipment Profile

Personal protective clothing for farm motorcycle riders should optimally include workboots, long pants, long sleeve shirt, helmet, gloves and eye protection in the form of goggles or sunglasses.

Enquiring about the use of personal protective clothing 62.1% of respondent/ riders indicated that they never wear a helmet when riding, compared to 81.9% who indicated that they always wear workboots. Eye protection is not worn in 63.5% of respondent/riders and gloves are sometimes worn in 47.2% of respondent/riders. Long pants are always worn by 36.2% of respondent/riders, whereas only 13.3% always wear long sleeve shirts.



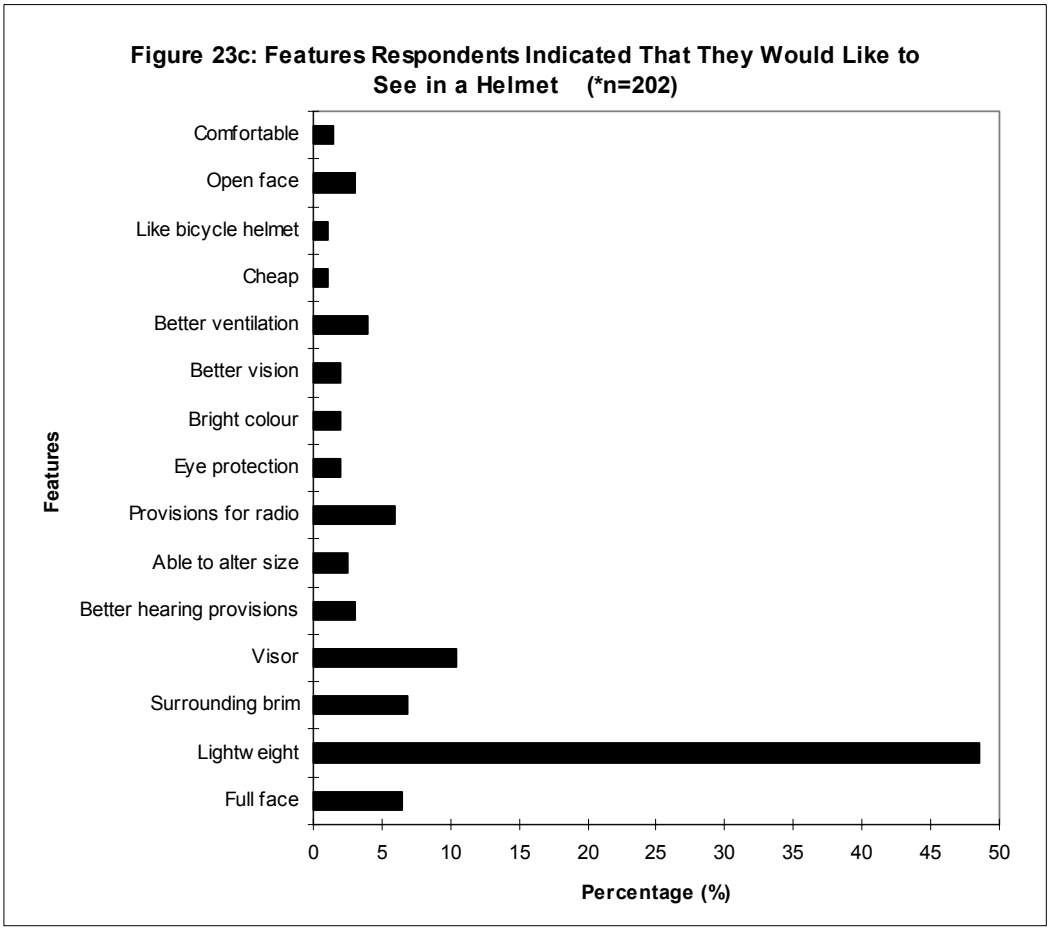
There appears to be a slight relationship between farm motorcycle rider age and the wearing of a helmet. The highest number of helmet wearers appears in the age group 0-14 years where 33.3% of respondent/riders indicated that they always wore a helmet. The next largest group of helmet wearers is found in the 65-69 years (18.9%), 20-24 years (17.2%) and 15-19 years (16.3%).



The difference in reporting personal protective clothing use by these respondent /riders and those in the Women on Farms survey should be noted (see Figure 30b).

In order to increase the number of farm motorcycle riders wearing helmets it was hypothesised by the research team that the helmets needed to be open faced, have improved ventilation, a surrounding brim and a quick release strap. These issues were viewed as marginally important by respondent/riders, being overshadowed by the issue of helmet weight. 48.5% of respondent/riders indicated that the helmets would need to be lighter before they would consider wearing one.

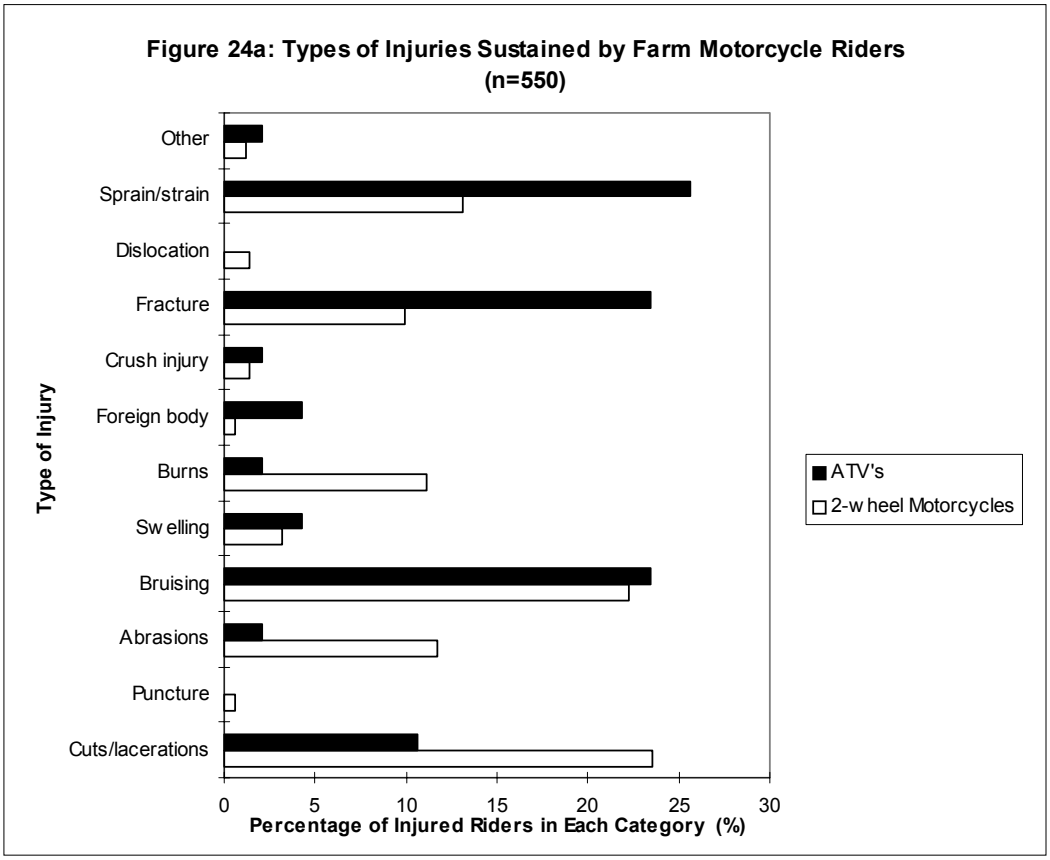
(* It should be noted that there were 202 suggestions given).



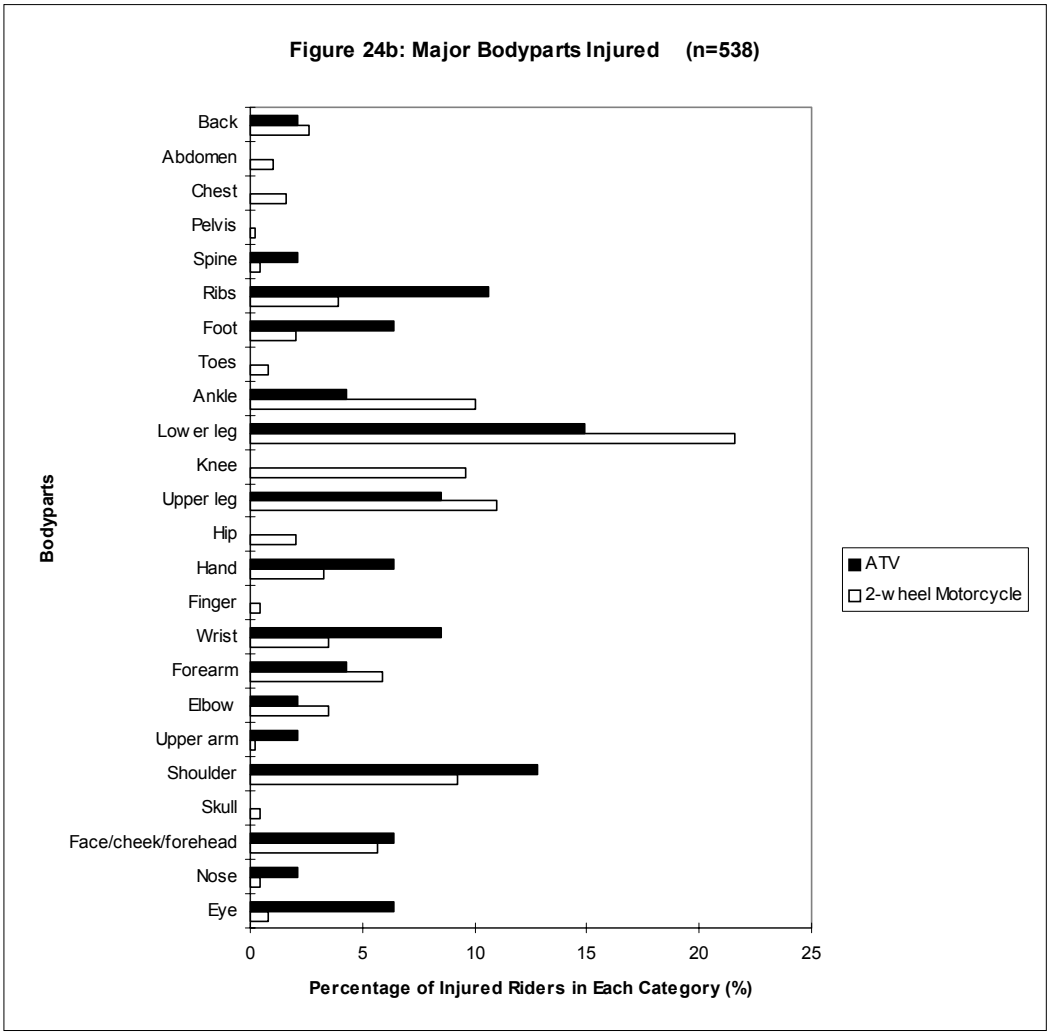
5.1.7 Farm Motorcycle Injury Details

Within the past 2 years 573 (48.0%) respondent/riders indicated that they had suffered an injury as a result of a farm motorcycle accident. From those injured, 91.5% had been injured while riding a 2-wheel motorcycle and 8.5% had been injured while riding an ATV.

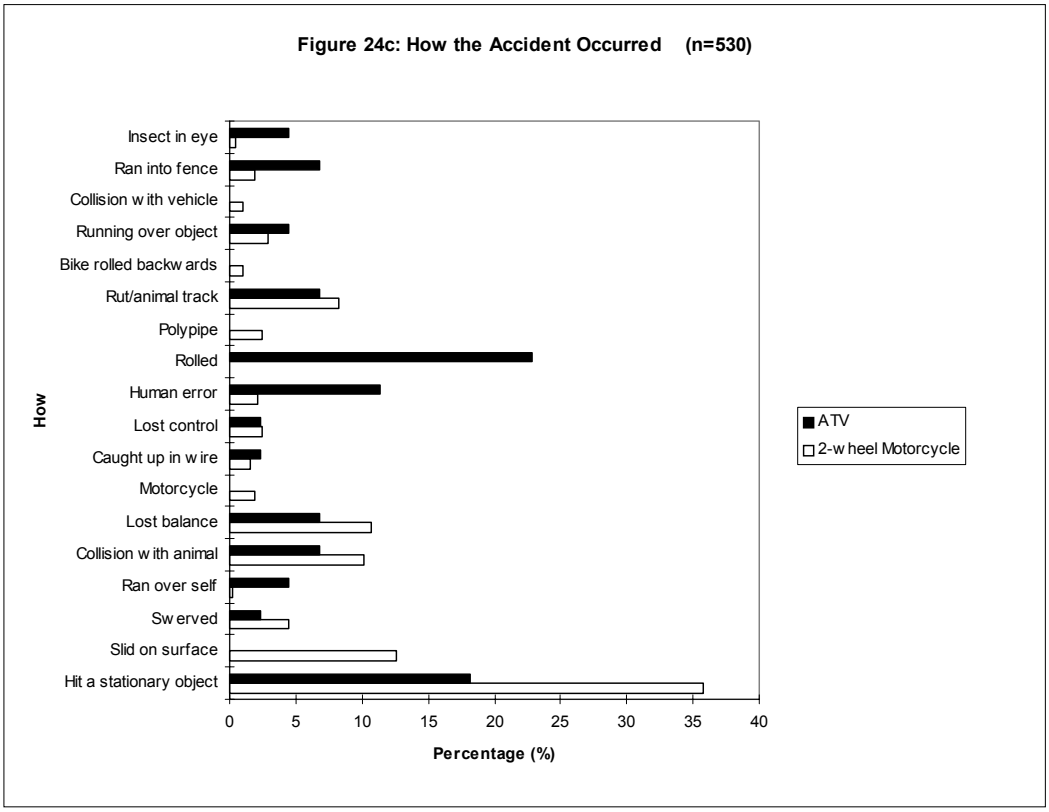
The 2-wheel motorcycle and the ATV, while both being classed as motorcycles, are two very different machines, and therefore it was expected that the types of injuries sustained would be different. Riders injured on ATVs tended to suffer sprains (25.6%) and fractures (23.4%), whereas riders injured on 2-wheel motorcycles commonly sustained cuts/lacerations (23.5%). Bruising was an injury common to both machines with 23.4% and 22.3% of injured riders sustaining bruising on ATVs and 2-wheel motorcycles respectively.



Lower leg injuries appear to be common for both ATV and 2-wheel motorcycle riders, although the percentage of injuries received varies considerably, 14.9% for ATVs and 21.6% for 2-wheel motorcycles. It was also observed that ATV riders commonly sustained injuries to the upper body, shoulder (12.8%) and wrist (8.5%), and trunk, ribs (10.6%), whereas 2-wheel motorcycle riders sustained injuries to the lower body, upper leg (11.0%) and ankle (10.0%).

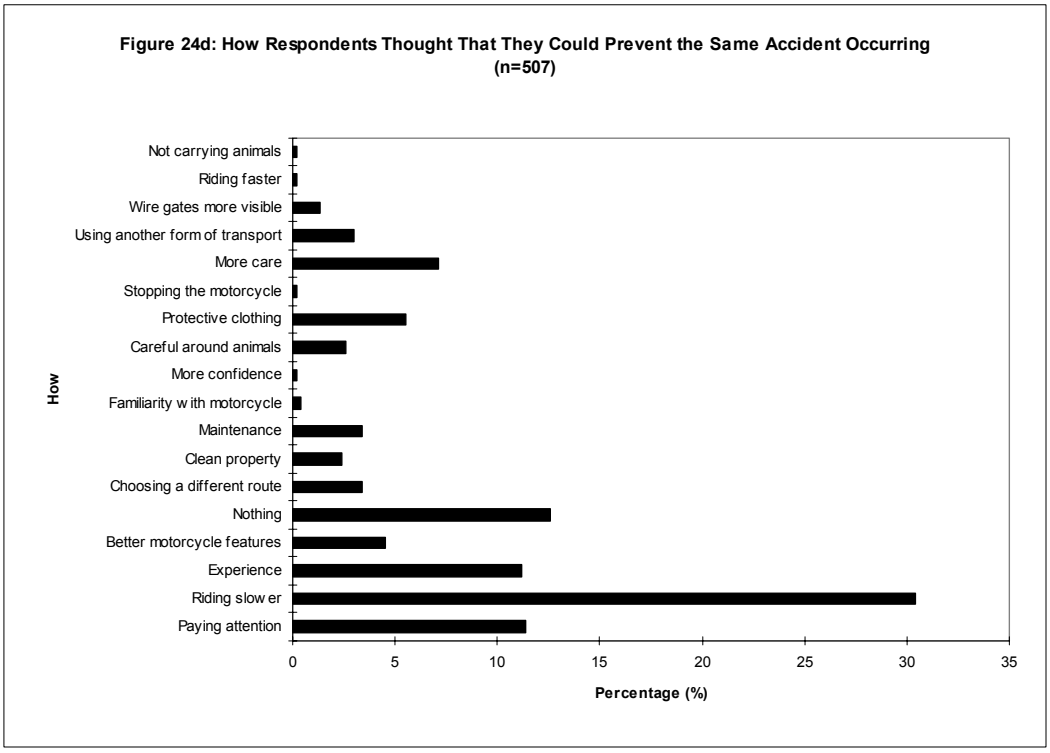


Injury from ATVs occurred mainly due to rolling the machine (22.8%), hitting a stationary object (18.2%) or human error (11.4%). Human error has been defined for the survey as a negative action performed by the rider which has resulted in a detrimental effect, for example jamming the brakes on resulting in a skid. Injury from 2-wheel motorcycles occurred mainly due to hitting a stationary object (35.8%), losing balance (10.7%) and colliding with an animal (10.1%).

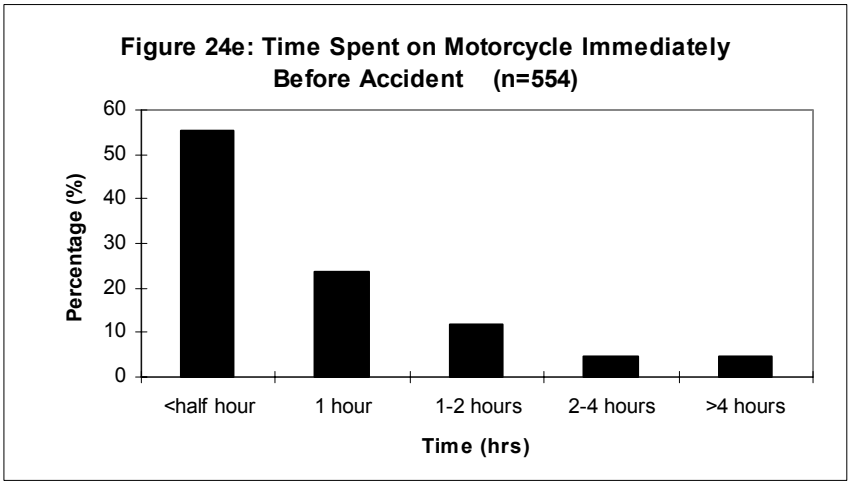


Also see Figure 31e.

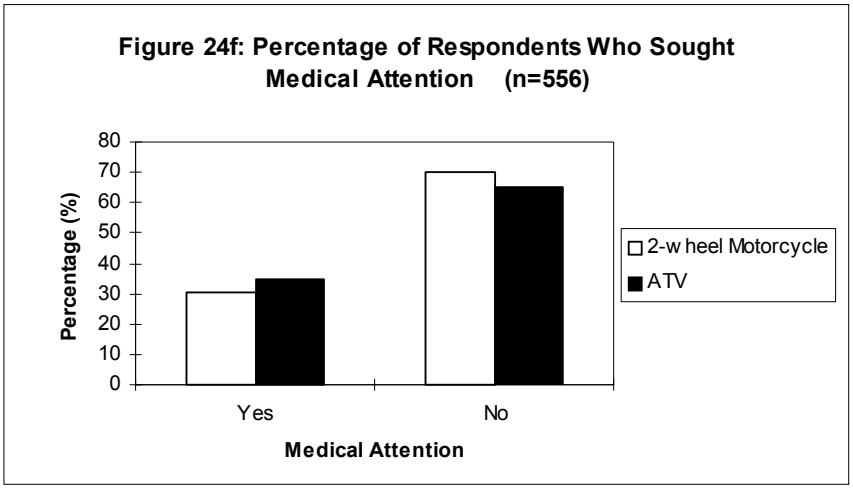
It is very difficult to determine how a particular accident may have been prevented because there are usually several contributing factors. However, bearing this in mind respondent/riders were asked to nominate a way in which they felt their accident could have been prevented. Riding slower was nominated by 30.4% of respondents, followed by nothing (12.6%), paying more attention (11.4%) and more experience (11.2%).



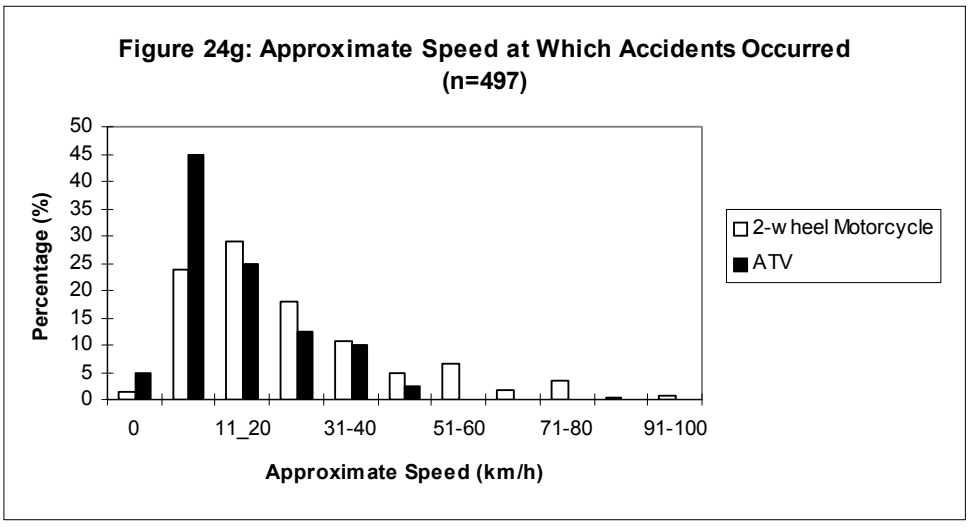
The majority of accidents occurred within the first hour of the rider hopping onto the motorcycle. 55.4% occurred within less than half hour and 23.5% occurred within 1 hour. This was an unexpected result as it was hypothesised by the researchers that accident incidence would increase proportionally with an increase in time spent on the motorcycle.



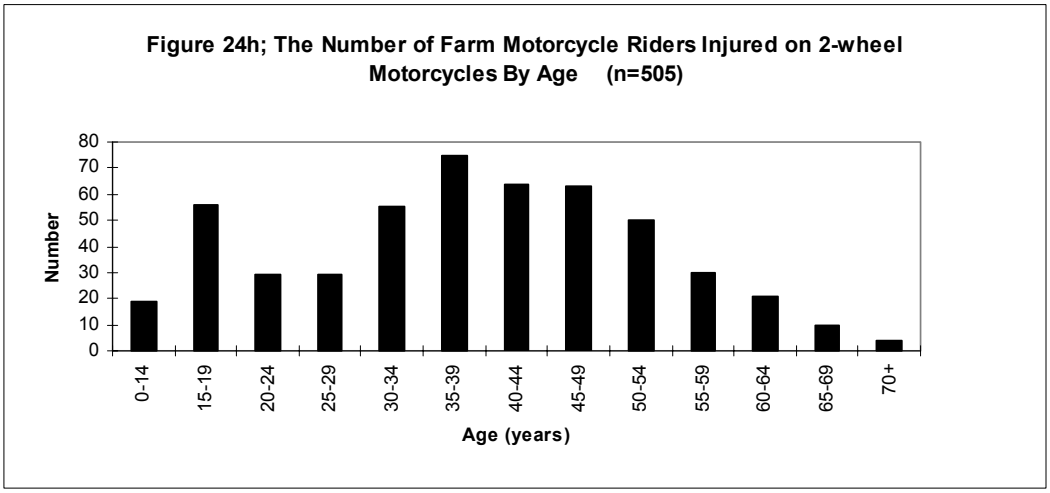
There was a marginally higher percentage of injured ATV riders who sought medical attention (34.8%) compared to injured 2-wheel motorcycle riders (30.1%). This result was expected after observing that a greater percentage of ATV riders sustain fractures and sprains which require medical attention.

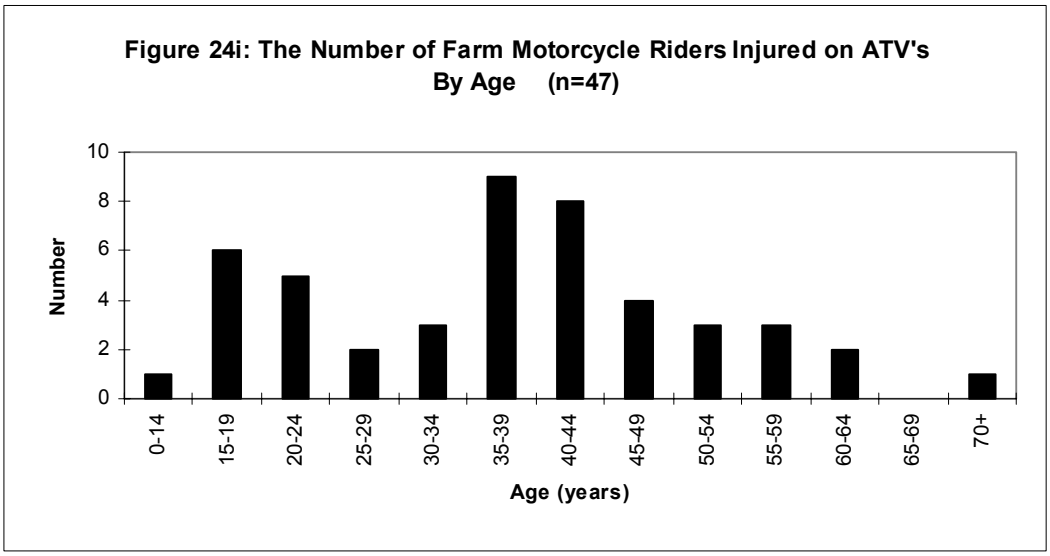


It was expected that a high proportion of accidents would occur at faster speeds due to the fact that riders would need an increased level of skill to control the machines under these conditions. This was not the observed case with the majority of accidents occurring at speeds less than 30 km/h. The highest percentage of ATV accidents (45%) occurred between speeds of 1-10 km/h, and the highest percentage of 2-wheel motorcycle accidents occurred between speeds of 11-20 km/h. It is also interesting to note that 5% of ATV accidents occurred while the motorcycle was standing still.



When studying injury and age the pattern for both 2-wheel motorcycles and ATVs are very similar. Looking at both graphs there are peaks at the 15-19 year age groups which was an expected result, and peaks at the 35-39 year age groups. Injury on ATVs also appeared to be an issue within the 20-24 and 40-44 year age groups.





The data is limited because there is no denominator data reporting age profile for riders of 2-wheel motorcycles and ATVs.

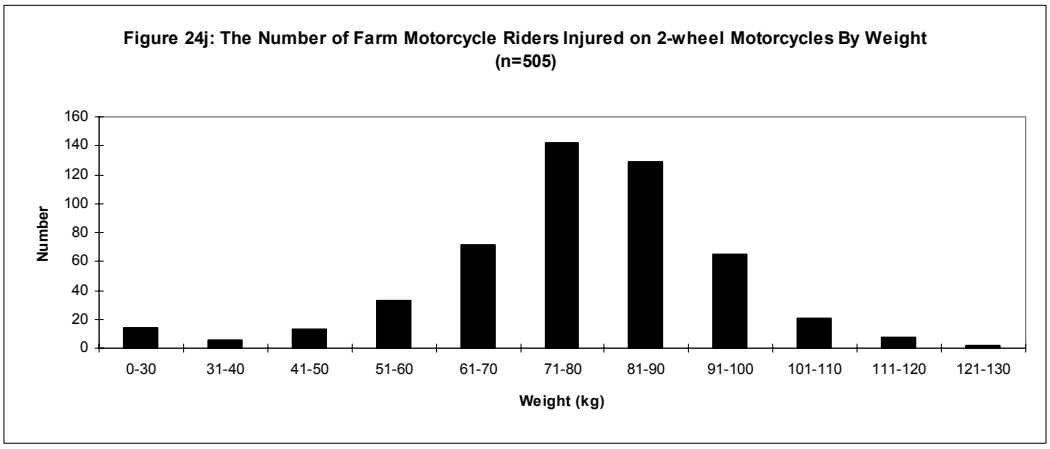
Table 11 The Relationship Between Farm Motorcycle Rider Age and Injury on 2-wheel Motorcycles and ATVs

Agegroup (years)	No. 2-wheel riders	No. Injured	Percentage Injured	No. ATV Riders	No. Injured	Percentage Injured
0-14	21	19	90.5	3	1	33.3
15-19	61	56	91.8	12	6	50.0
20-24	41	29	70.7	12	5	41.7
25-29	39	29	74.4	17	2	11.8
30-34	77	55	71.4	30	3	10.0
35-39	100	75	75.0	53	9	17.0
40-44	114	64	56.1	51	8	15.7

45-49	101	63	62.4	45	4	8.9
50-54	89	50	56.2	82	3	3.7
55-59	59	30	50.8	32	3	9.4
60-64	41	21	51.2	15	2	13.3
65-69	23	10	43.5	9	0	0.0
70+	7	4	57.1	9	1	11.1

The above table shows that 2-wheel motorcycle riders in the age groups 0-14 and 15-19 have the highest percentage of injured riders. The highest percentage of injured ATV riders is found in the 15-19, 20-24 and 0-14 years respectively.

The number of injured riders for both 2-wheel motorcycles and ATVs was highest in the 70-80 kg and 80-90 kg weight groups.



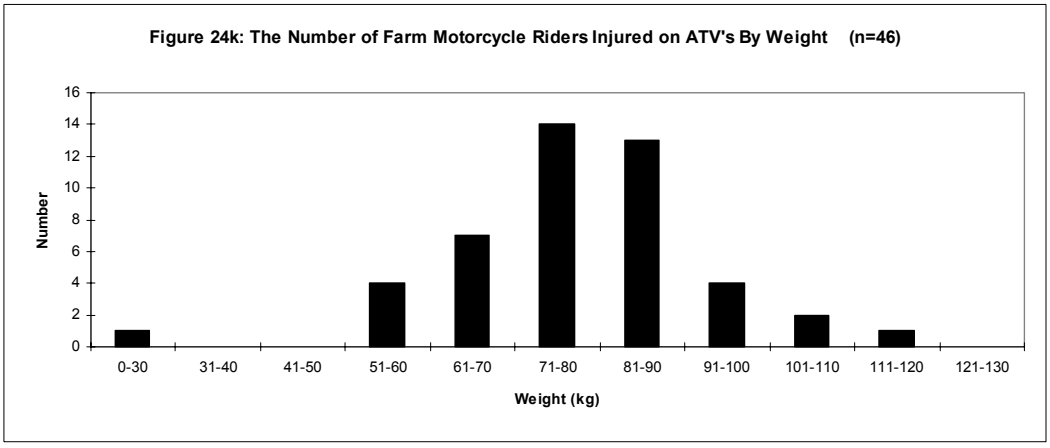
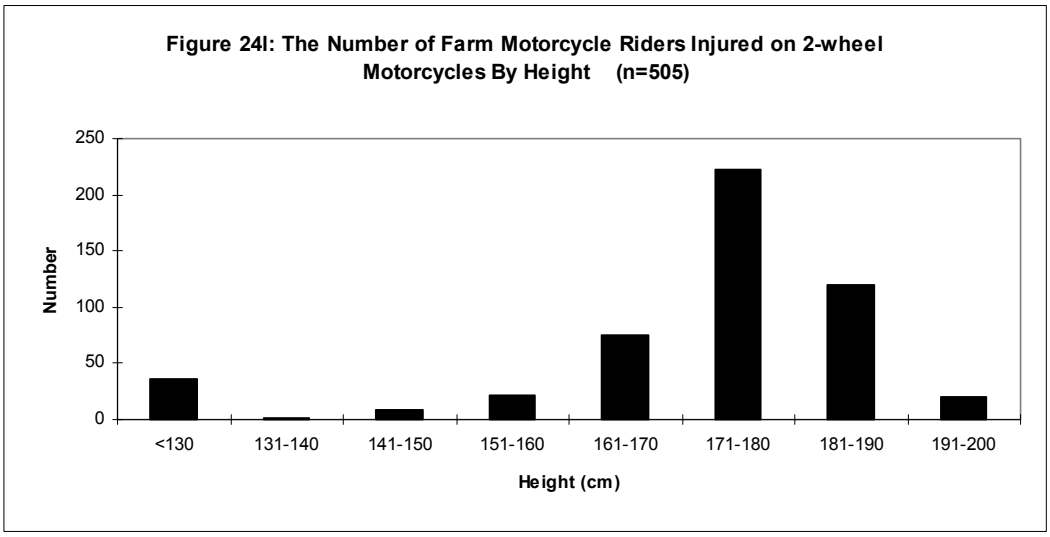


Table 12 The Relationship Between Farm Motorcycle Rider Weight and Injury on 2-wheel Motorcycles and ATVs

Weight (kg)	No. 2-wheel Riders	No. Injured	Percentage Injured	No. ATV Riders	No. Injured	Percentage Injured
0-30	18	14	77.8	17	1	5.9
31-40	7	6	85.7	1	0	0.0
41-50	13	13	100.0	0	0	0.0
51-60	38	33	86.8	19	4	21.1
61-70	116	72	62.1	59	7	11.9
71-80	234	142	60.7	86	14	16.3
81-90	209	129	61.7	79	13	16.5
91-100	94	65	69.1	49	4	8.2
101-110	29	21	72.4	17	2	11.8
111-120	10	8	80.0	6	1	16.7
121-130	2	2	100.0	0	0	0.0

2-wheel motorcycle riders in the weight groups of 41-50 kg, 121-130 kg, 1-60 kg and 31-40 kg had the highest percentage of injured riders, whereas the highest percentage of injured ATV riders fell in the weight group 51-60 kg.

The highest number of injured riders for both 2-wheel motorcycles and ATV"s was found in the 171-180 cm height group.



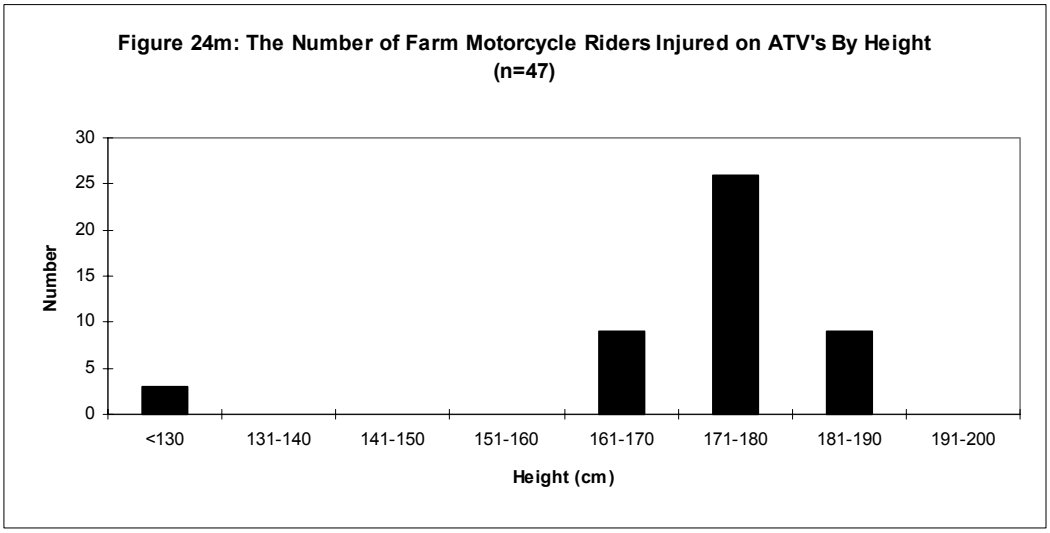


Table 13 The Relationship Between Farm Motorcycle Rider Height and Injury on 2-wheel Motorcycles and ATVs

Height (cm)	No. 2-wheel Riders	No. Injured	Percentage Injured	No. ATV Riders	No. Injured	Percentage Injured
<130	59	36	61.0	29	3	10.3
131-140	1	1	100.0	0	0	0.0
141-150	10	9	90.0	2	0	0.0
151-160	27	21	77.8	18	0	0.0
161-170	117	75	64.1	74	9	12.2
171-180	358	223	62.3	152	26	17.1
181-190	180	120	66.7	47	9	19.1
191-200	23	20	87.0	7	0	0.0

Injured 2-wheel motorcycle riders had high injury percentages in the 131-140cm and 141-150 cm height groups, whereas injured ATV riders had the highest percentages in the 181-190 cm and 171-180cm height groups.

Different injury patterns for 2-wheel motorcycles and ATVs were observed for different farm types. These observations may be attributed to the types of motorcycles used on farms and the tasks in which they are used for. The most striking features of these results are that dairy farms have a high number of ATV injuries, along with meat cattle-cereal grains, and sheep-cereal grains have a high percentage of 2-wheel motorcycle injuries. The cotton, fruit & vegetables and poultry farm types are dominated by ATV injuries whereas the meat cattle, sheep, sheep-meat cattle and cereal grain farm types are dominated by 2-wheel motorcycle injuries.

Figure 24n: The Number of Farm Motorcycle Riders Injured on 2-wheel Motorcycles and ATV's By Farm Type (n=537)

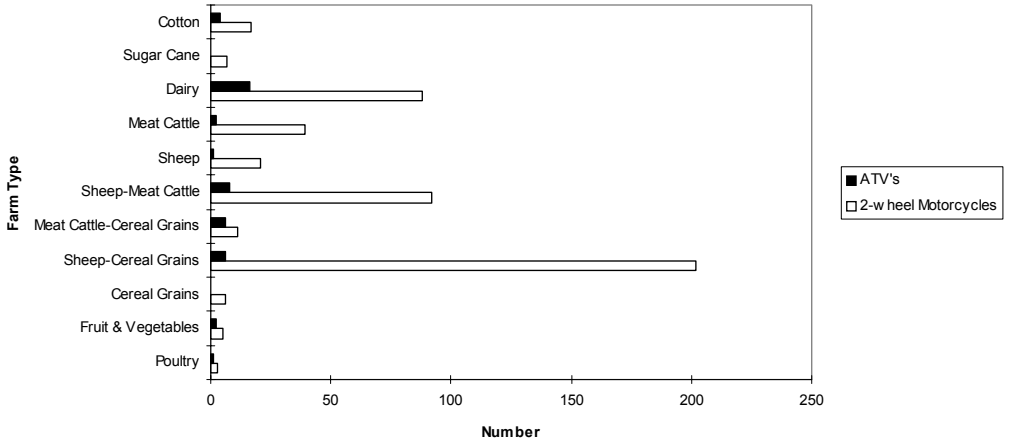


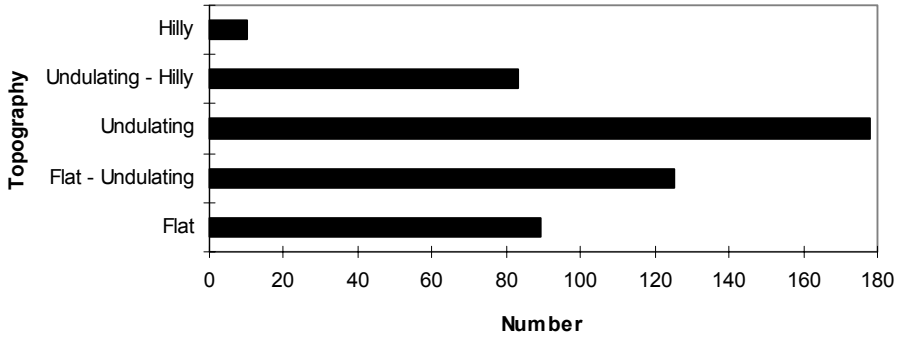
Table 14 The Relationship Between Farm Type and Injury on 2-wheel Motorcycles and ATVs

Farm Type	No. 2-Wheel Riders	No. Injured	Percentage Injured	No. ATV Riders	No. Injured	Percentage Injured
Poultry	4	3	75.0	1	1	100.0
Fruit & Vegetables	15	5	33.3	16	2	12.5
Cereal Grains	13	6	46.2	3	0	0.0
Sheep-Cereal Grains	335	202	60.3	86	6	7.0
Meat Cattle-Cereal Grains	21	11	52.4	12	6	50.0
Sheep-Meat Cattle	120	92	76.7	30	8	26.7
Sheep	35	21	60.0	13	1	7.7
Meat Cattle	53	39	73.6	19	2	10.5
Dairy	124	88	71.0	110	16	14.5
Sugar Cane	14	7	50.0	4	0	0.0
Cotton	22	17	77.3	28	4	14.3

The farm types with the highest percentage of injured 2-wheel motorcycle riders were cotton and sheep-meat cattle respectively. The farm types with the highest percentage of injured ATV riders were poultry and meat cattle-cereal grains.

The majority of 2-wheel motorcycle injuries occurred on flat-undulating and undulating topographies, whereas the majority of ATV injuries occurred on flat and flat-undulating topographies.

Figure 24o: The Number of Farm Motorcycle Riders Injured on 2-wheel Motorcycles By Topography (n=485)



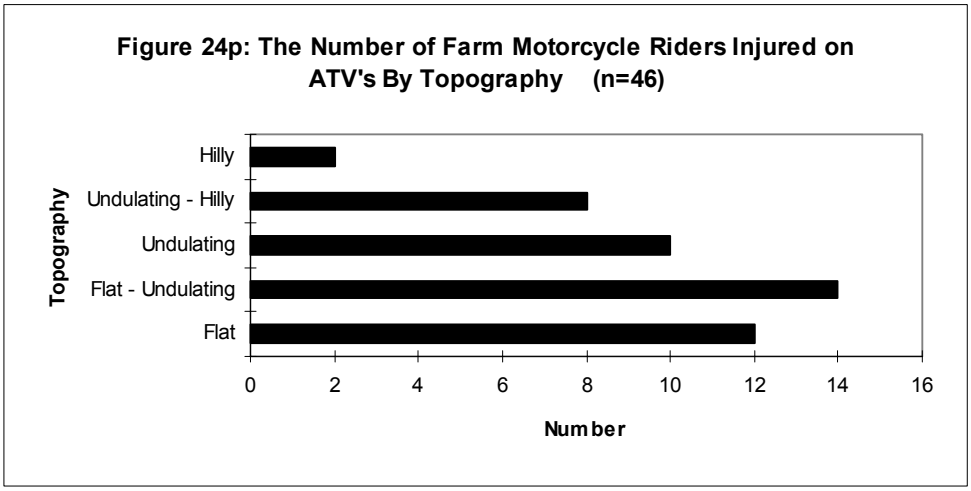


Table 15 The Relationship Between Farm Topography and Injury on 2-wheel Motorcycles and ATVs

Farm Topography	No.2-wheel Riders	No. Injured	Percentage Injured	No. ATV Riders	No. Injured	Percentage Injured
Flat	135	89	65.9	74	12	16.2
Flat-Undulating	230	125	54.3	91	14	15.4
Undulating	269	178	66.2	112	0	0.0
Undulating-Hilly	120	83	69.2	44	8	18.2
Hilly	12	10	83.3	4	2	50.0

For both 2-wheel motorcycles and ATVs the highest percentage of injured riders was found on hilly topography.

For both 2-wheel motorcycles and ATVs the greatest number of injuries occurred to riders that rode 3 days a week or more. In general, the number of injuries decreased as the number of days riding decreased. The exception was for ATVs where riders riding a few days a year had a higher injury number than those riding 1-3 days a month.

Figure 24q: The Number of Farm Motorcycle Riders Injured on 2-wheel Motorcycles By Number of Days Riding per Year (n=503)

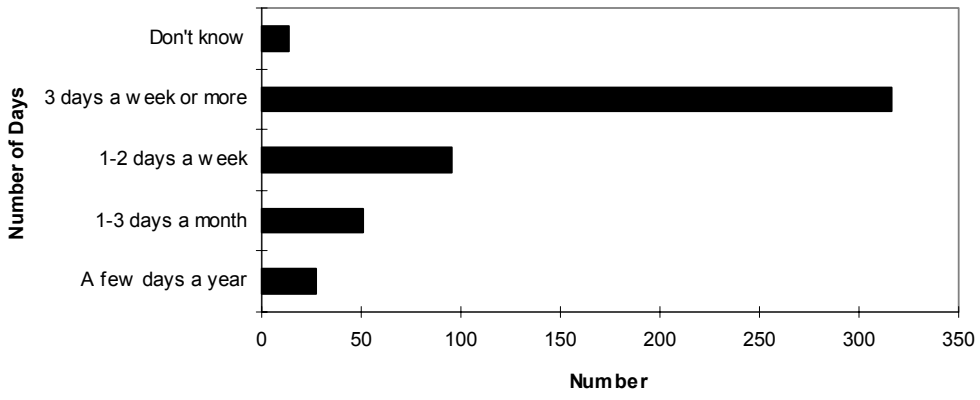
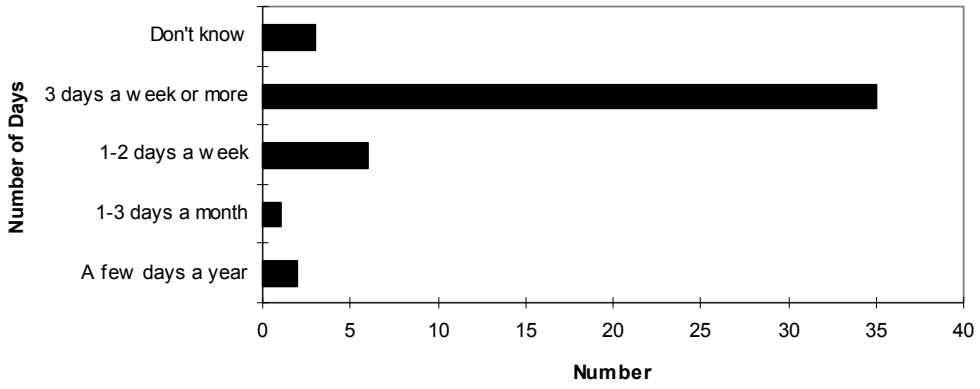


Figure 24r: The Number of Farm Motorcycle Riders Injured on ATV's By Number of Days Riding per Year (n=47)



As expected greater exposure, that is riding time gives greater risk of injury.

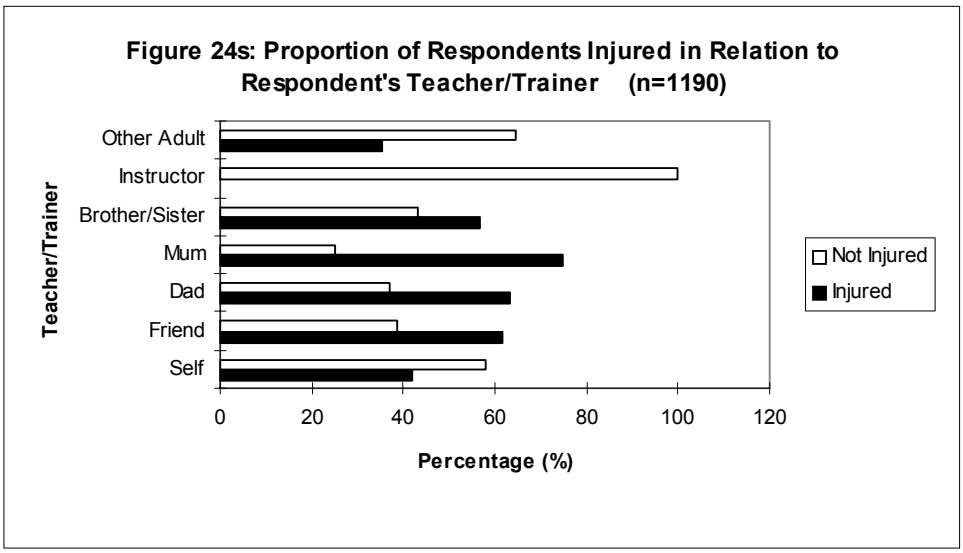
Table 16 The Relationship Between the Number of Days Riding Farm Motorcycles and Injury on 2-wheel Motorcycles and ATVs

No. Of Days Riding	No. 2-wheel Riders	No. Injured	Percentage Injured	No. ATV Riders	No. Injured	Percentage Injured
A few days a year	49	27	55.1	13	2	15.4
1-3 days a month	95	51	53.7	25	1	4.0
1-2 days a week	170	95	55.9	64	6	9.4

3 days a week or more	445	316	71.0	223	35	15.7
Don't know	14	14	100.0	4	3	75.0

For both 2-wheel motorcycles and ATVs the highest percentage of injured riders were found in the riders that rode 3 days a week or more. There was also a high percentage of injured ATV riders who rode a few days a year.

The respondent/riders who were self taught, or taught to ride a motorcycle by an instructor or other adult had a higher percentage of non injured riders compared to those taught by siblings, parents or a friend. Other adult has been defined as husband, wife or extended family such as aunt and uncle.



The respondent/riders who performed routine maintenance every 1-3 months suffered the highest number of injuries compared to the other groups.

Figure 24t: The Number of Farm Motorcycle Riders Injured By Routine Maintenance (n=552)

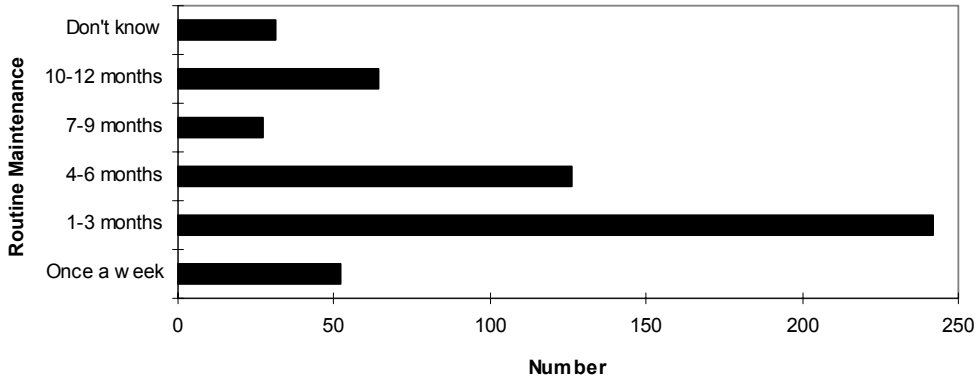
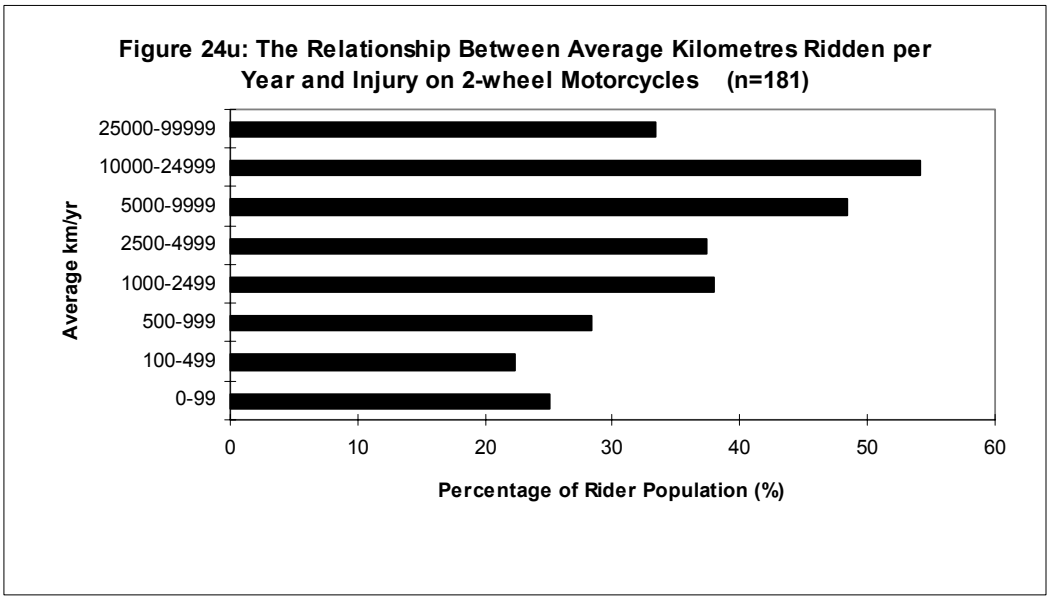


Table 17 The Relationship Between Performing Routine Maintenance on Farm Motorcycles and Injury on 2-wheel Motorcycles and ATVs

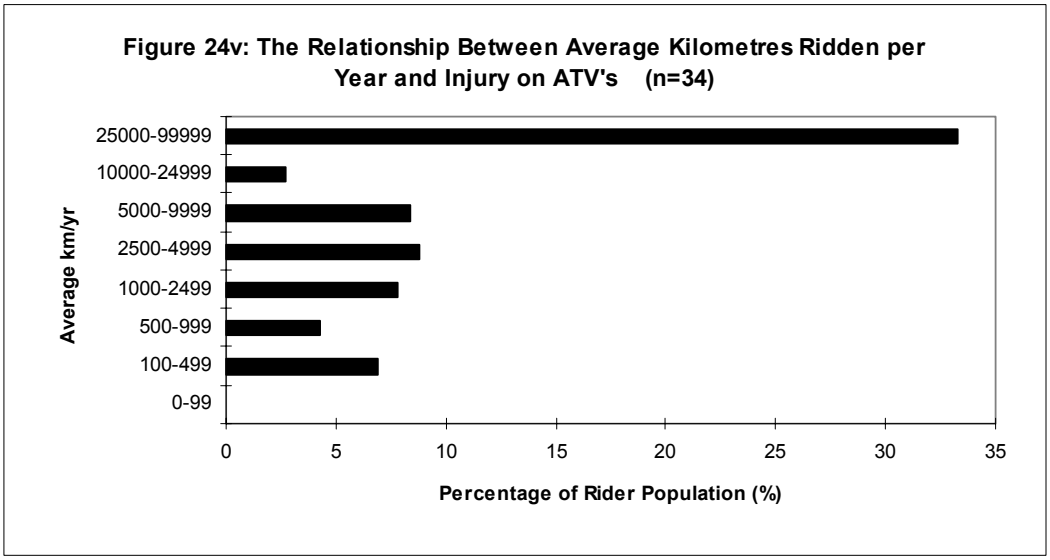
Routine Maintenance	No.2-wheel Riders	No. Injured	Percentage Injured	No. ATV Riders	No. Injured	Percentage Injured
Once a week	74	50	67.6	30	1	3.3
1-3 months	332	217	65.4	126	17	13.5
4-6 months	201	120	59.7	100	12	12.0
7-9 months	39	25	64.1	17	1	5.9
10-12 months	86	51	59.3	36	9	25.0
Don't know	51	23	45.1	16	6	37.5

The highest percentage of injured 2-wheel motorcycle riders was found in the group that performed routine maintenance once a week and the highest percentage of injured ATV riders was found in the group that didn't know when they performed routine maintenance.

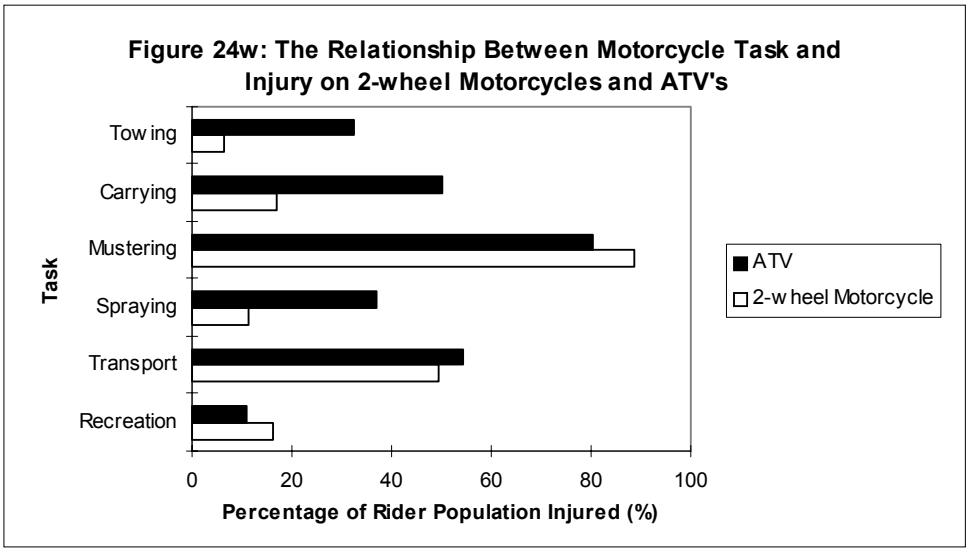
As expected the percentage of injured riders on 2-wheel motorcycles tended to increase with an increase in the number of kilometres ridden per year. The exception being the percentage injured in the 100-499 km/yr group and the 25,000-99,999 km/yr group. It should be noted the percentage injured in the 25,000-99,999 km/yr group was higher then the percentage injured in the 0-99 km/yr, 100-499 km/yr and 500-999 km/yr groups.



A similar pattern was evident when looking at injury on ATVs. The exception being the percentage injured in the 500-999 km/yr and 10 000-24 999 km/yr groups. It should be noted that the percentage injured in the 10 000-24 999 km/yr group is lower then the percentage injured in the other groups.

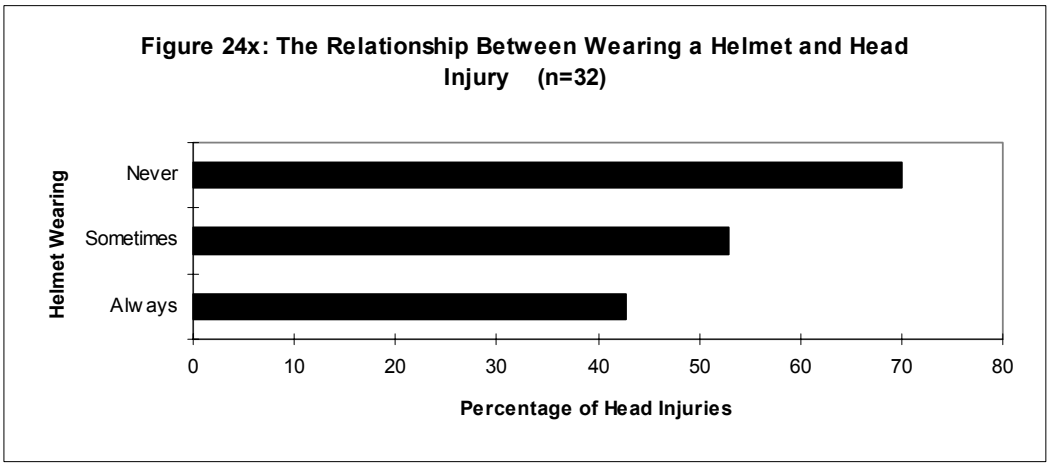


The task of mustering and using the farm motorcycle as transport resulted in a high percentage of injured riders for both ATVs and 2-wheel motorcycles. Mustering resulted in a slightly higher percentage of 2-wheel motorcycle riders being injured, whereas transport resulted in a higher percentage of ATV riders being injured. Compared to each other, ATV riders were more commonly injured when performing spraying or tasks that required towing or carrying, whereas 2-wheel motorcycle riders were more commonly injured when riding for recreation.

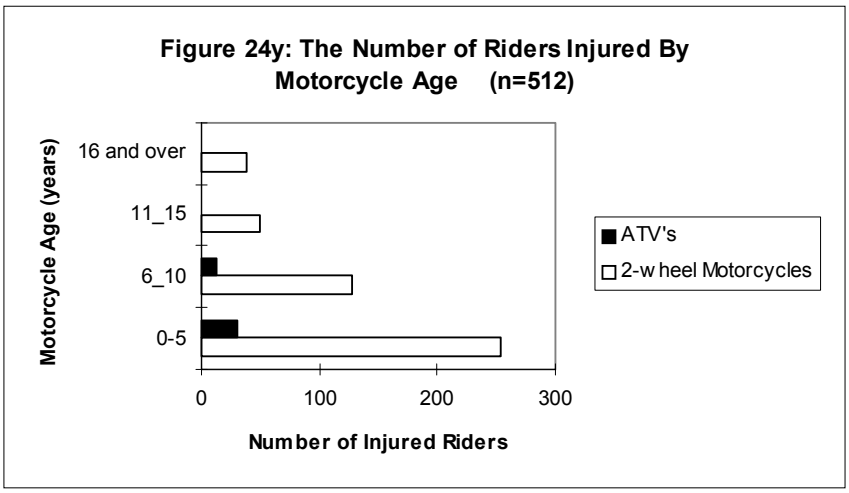


NB. For n values refer to Appendix 6

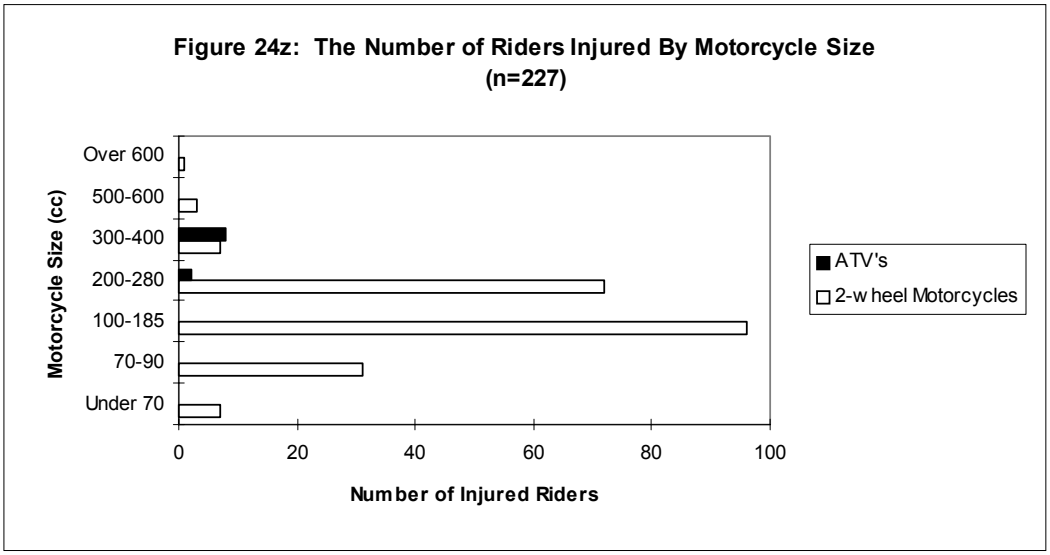
The graph shows the results for 2-wheel motorcycle riders only due to a lack of available data for ATV riders. The results show that respondents who always wear a helmet when riding suffer from less head injuries (42.8%) than those respondents who never wear a helmet when riding (70.0%).



The majority of both ATV and 2-wheel motorcycle injuries have occurred on motorcycles between the age of 0-5 years which was not the expected result. ATVs between the ages of 0-10 years are involved in a higher number of accidents, whereas over 11 years of age 2-wheel motorcycles are involved in more. This result probably reflects the time that ATVs were introduced for use in Australian agriculture.



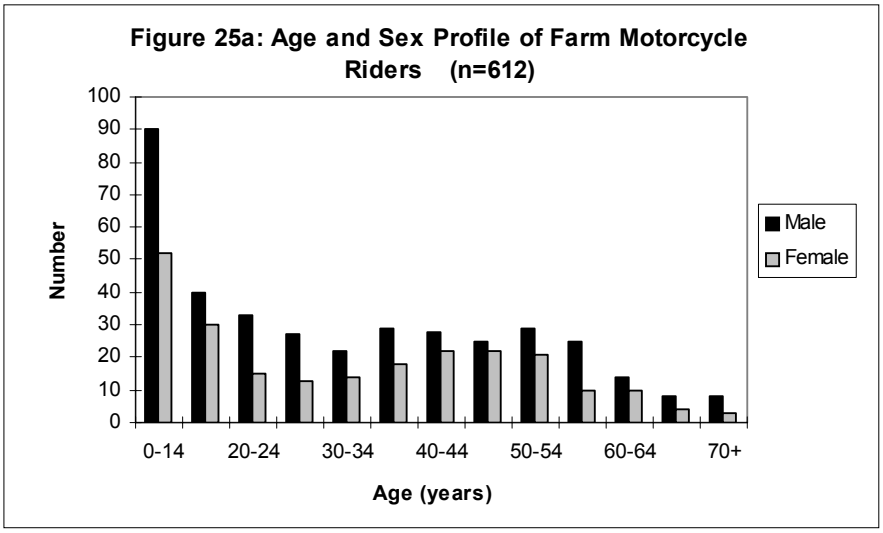
It was expected that in all cases the larger motorcycles would be involved in a greater number of accidents (Kraus et al., 1975). This was not the observed case with both the smaller ATVs and 2-wheel motorcycles being involved in a higher number of accidents.



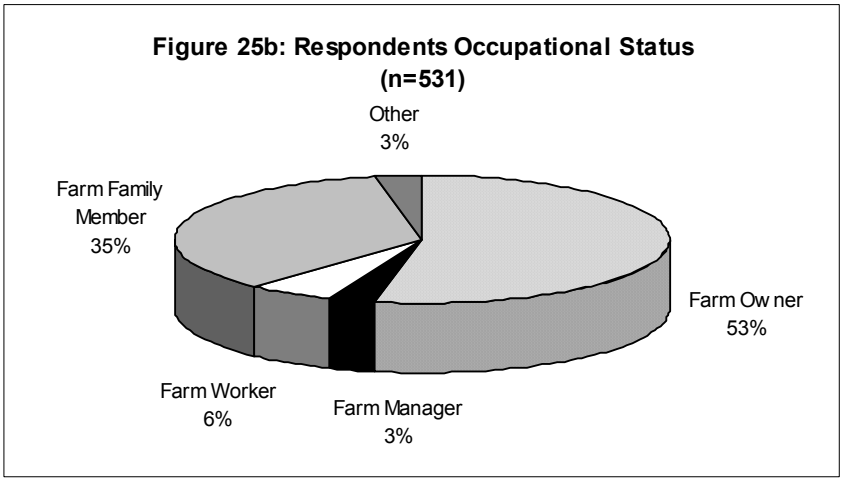
5.2 The Women on Farms Survey

5.2.1 Rider Profile

The age distribution for both male and female riders was similar. The highest number of male riders was found in the age groups 0-14 years, 15-19 years and 20-24 years. The highest number of female riders was found in the age groups 0-14 years and 15-19 years.



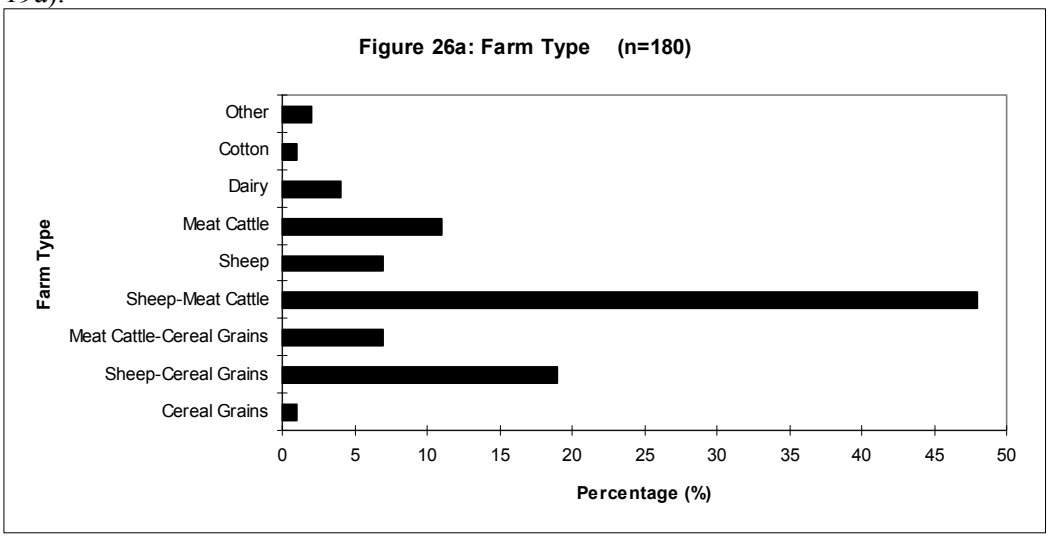
Farm Owners (53%) represented the largest proportion of riders, followed by Farm Family Members (35%). Farm Workers (6%), Farm Managers (3%) and Other (3%) made up the remaining proportions.



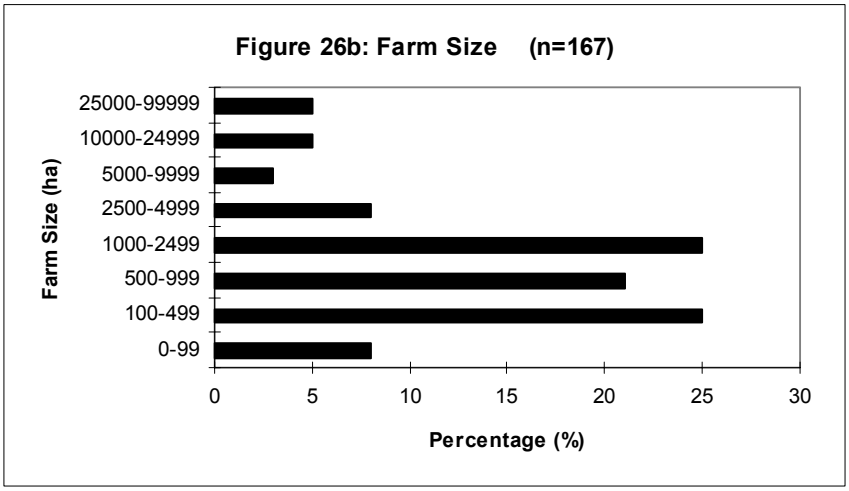
This is a similar pattern to what has been observed in the rider survey (see Figure 18b).

5.2.2 Farm Profile

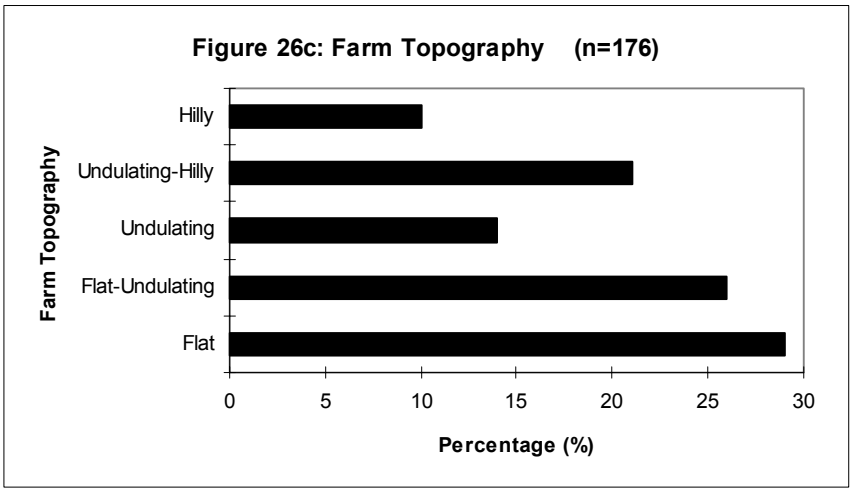
The enterprise mix of sheep-meat cattle made up (48%) of the total farm types represented in this study. Sheep-cereal grains was the next largest enterprise with a (19%) representation, followed by meat cattle (11%). The greater representation of sheep/cattle and lower representation of dairy enterprises compared to the Rider Survey should be noted (see Figure 19a).



The majority of farms fell into the size categories of 100-499 ha (25%), 1,000-2,499 ha (25%) and 500-999 ha (21%).



29% of riders indicated that their farm was flat. This survey had a higher representation of flat and hilly topographies compared to the rider survey (see Figure 19c).



5.2.3 Rider Experience

50.8% of riders use their motorcycles 3 days a week or more to perform a specific farm task.

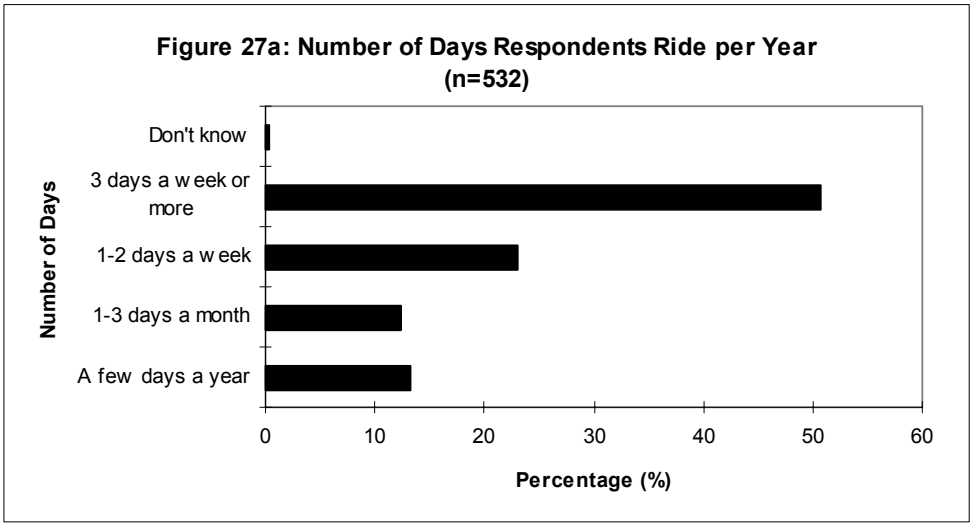
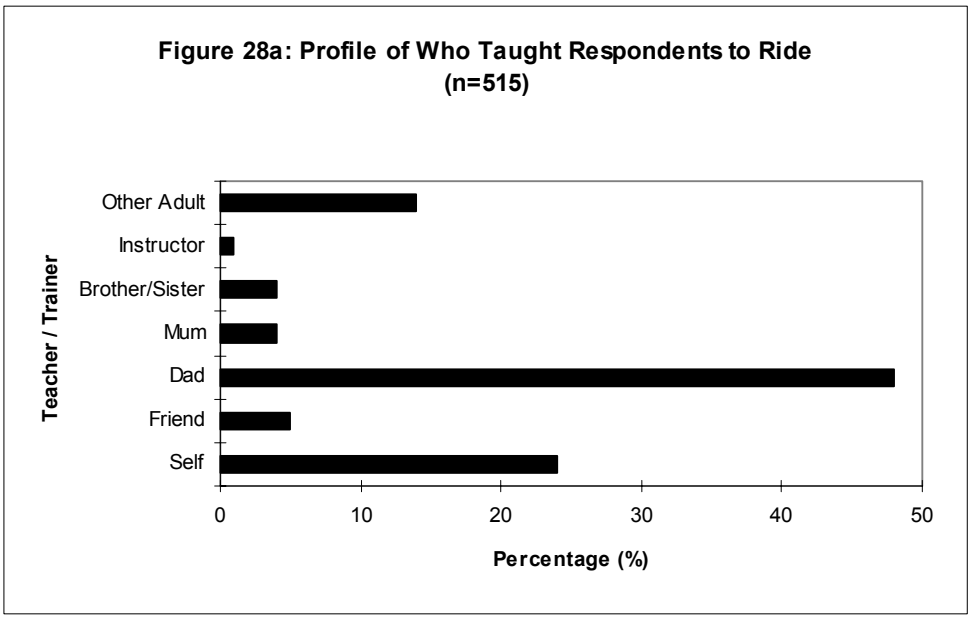


Figure 27a: Number of Days Respondents Ride per Year
(n=532)
Number of Days
Don't know
3 days a week or more
1-2 days a week
1-3 days a month
A few days a year
0
10
20
30
40
50
60
Percentage (%)

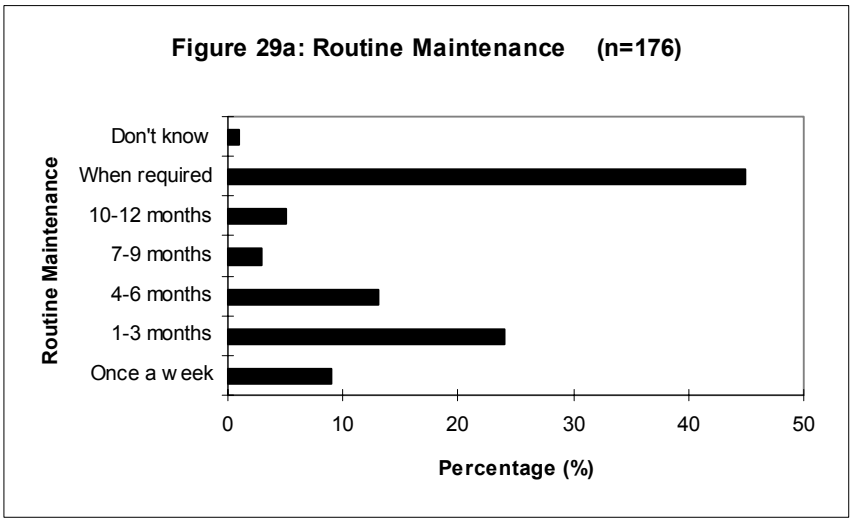
5.2.4 Rider Education and Training

The lack of farm motorcycle training is highlighted by the fact that 48% of riders have been taught to ride by their fathers, compared to 1% who are formally trained by qualified instructors. This result may reflect the age distribution of riders in the survey.

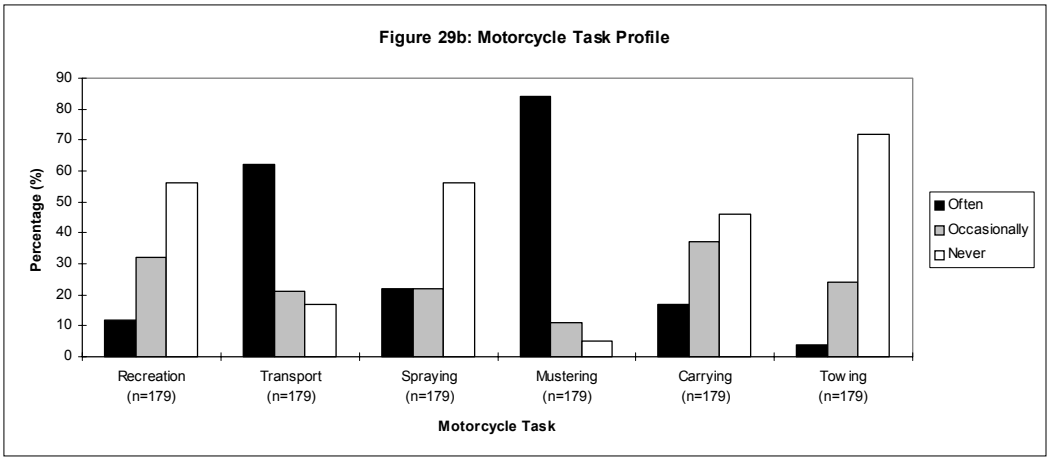


5.2.5 Farm Motorcycle Details

45% of respondents reported that routine maintenance was performed on the farm motorcycles when it was required. The next largest group of riders (24%) indicated that they performed routine maintenance every 1-3 months.

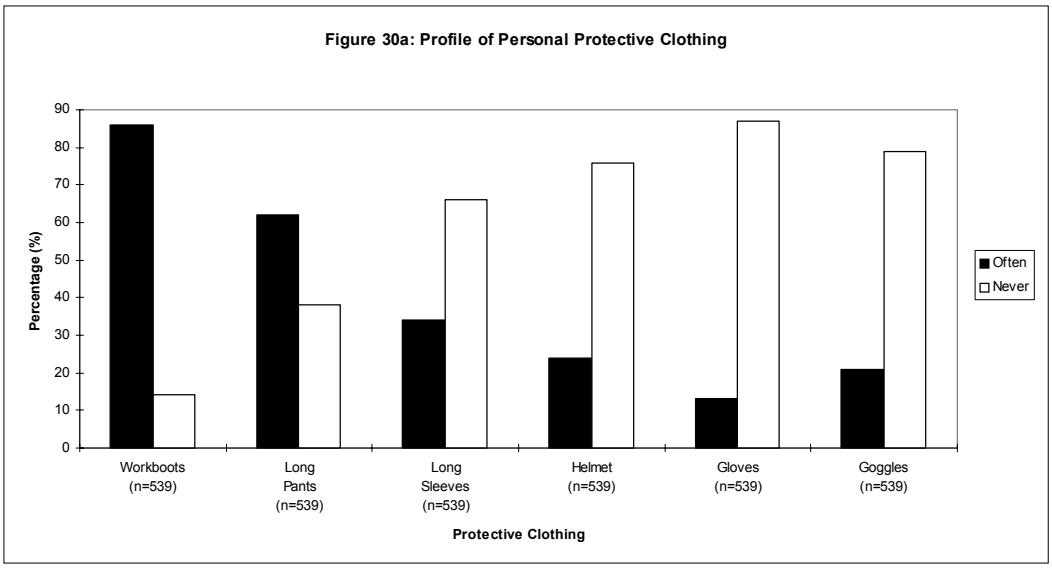


84% of riders indicated that they used their motorcycles primarily for mustering stock. Like the rider survey 56% indicated that they never used their motorcycles for recreation. This is despite the higher representation of young riders in this survey.

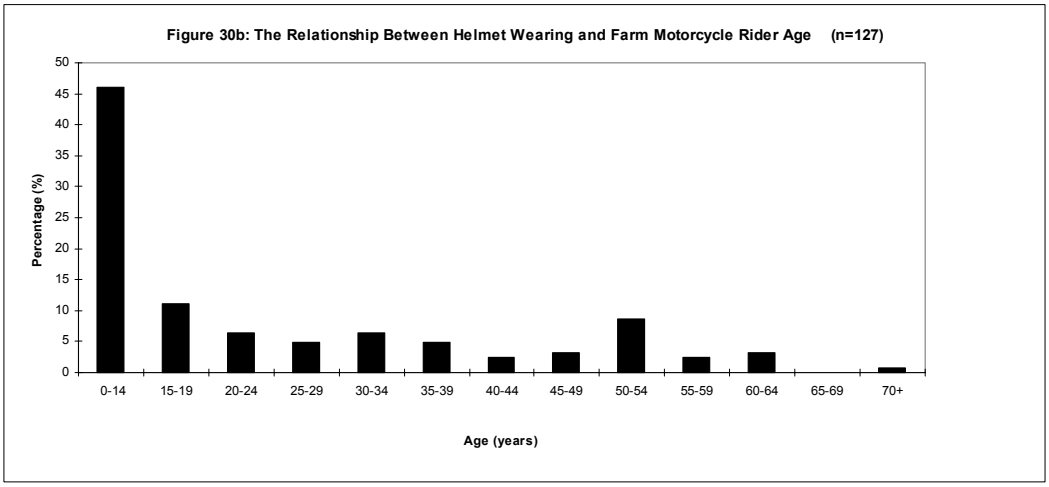


5.2.6 Protective Clothing and Equipment Profile

The profile of personal protective clothing in this survey broadly reflects that reported in the rider survey. 76% of respondents reported that riders never wear a helmet when riding, compared to 86% who reported that workboots were always worn. Eye protection is not worn in 79% of respondents and gloves are never worn in 87% of respondents. Long pants are always worn by 62% of respondents, whereas only 34% always wear long sleeve shirts.



The highest percentage of helmet wearers appears in the age group 0-14 years where 46% of riders indicated that they always wore a helmet. The next largest group of helmet wearers is found in the age group 15-19 years (11.1%) and 50-54 years (8.7%).

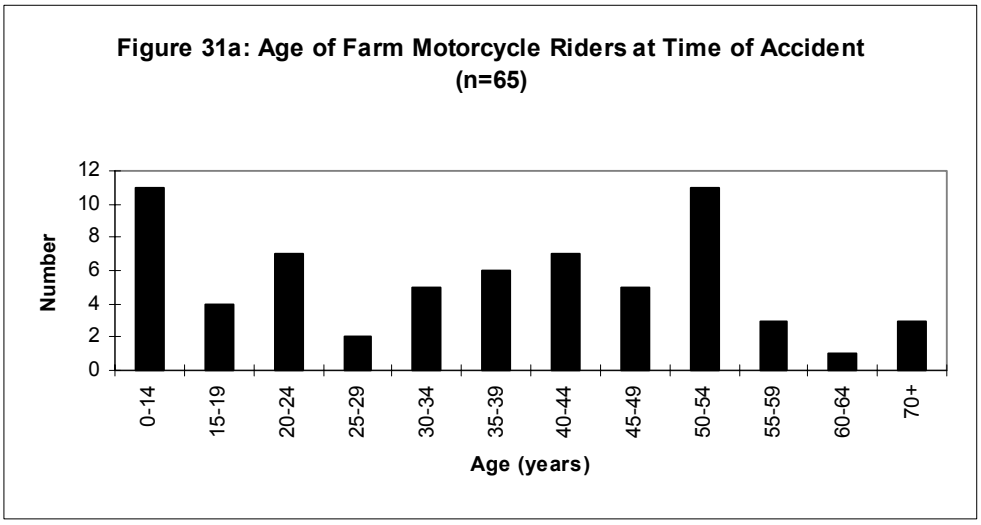


As this information has been reported by independent observers it is likely that this usage may be a more accurate profile than that reported in Figure 23b.

5.2.7 Farm Motorcycle Injury Details

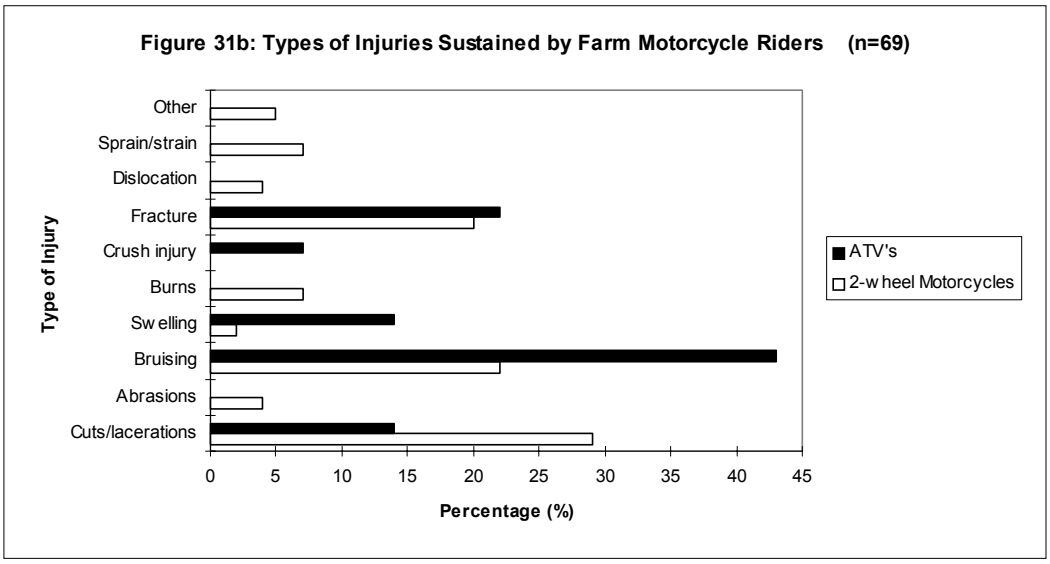
Within the past 2 years respondents reported that 72 (40%) riders reported had suffered an injury as a result of a farm motorcycle accident. From those injured, 79% had been injured while riding a 2-wheel motorcycle and 21% had been injured while riding an ATV.

The highest percentage of injured riders were observed in the age groups 0-14 years (17%) and 50-54 years (17%). It is also interesting to note that there is a steady incline in injury between the ages of 30 and 44, which then drops between the ages of 45-49 years and again increases dramatically between the ages of 50-54 years.

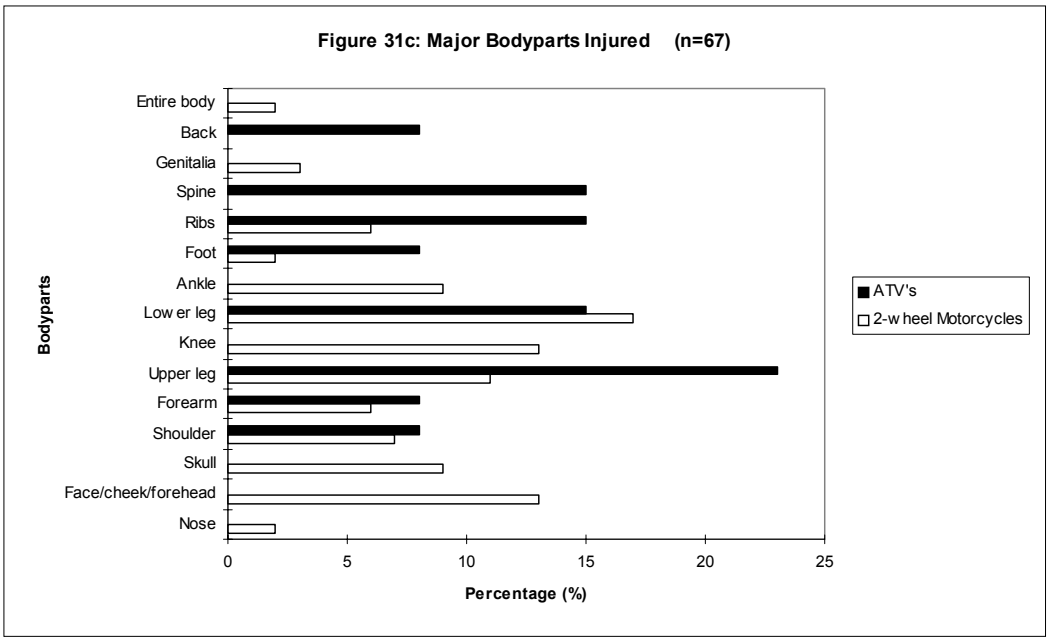


Riders injured on ATVs tended to suffer bruising (43%) and fractures (22%), and riders injured on 2-wheel motorcycles commonly sustained cuts/lacerations (29%), bruising (22%)

and fractures (20%). Note some difference in injury profile when compared to the rider survey (Figure 24a).

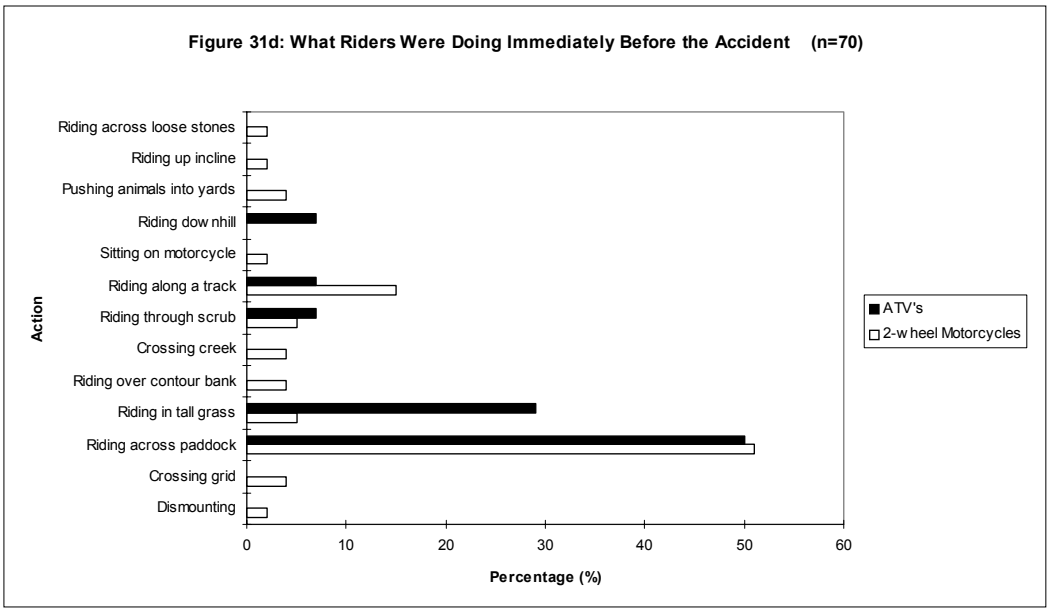


Upper leg injuries appear to be the most common for ATV riders (23%) and lower leg injuries appear to be the most common for 2-wheel motorcycle riders (17%). It was also observed that ATV riders commonly sustained injuries to the ribs (15%), spine (15%) and lower leg (15%), whereas 2-wheel motorcycle riders sustained injuries to the knee (13%), face ,cheek , forehead (13%) and upper leg (11%).

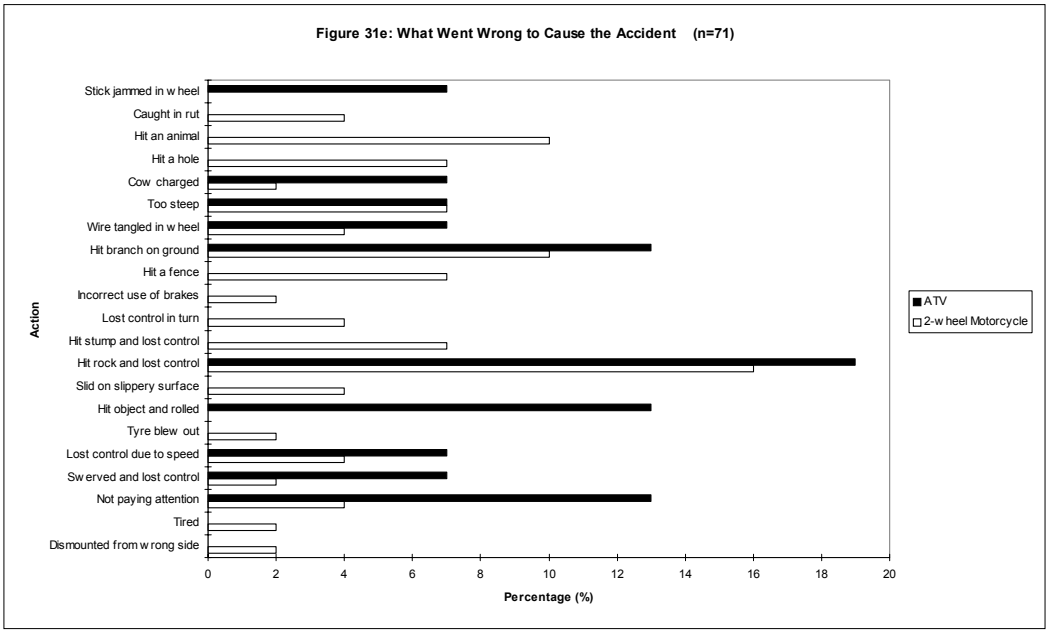


Note the difference in the upper leg injuries compared to the rider survey (see Figure 24b).

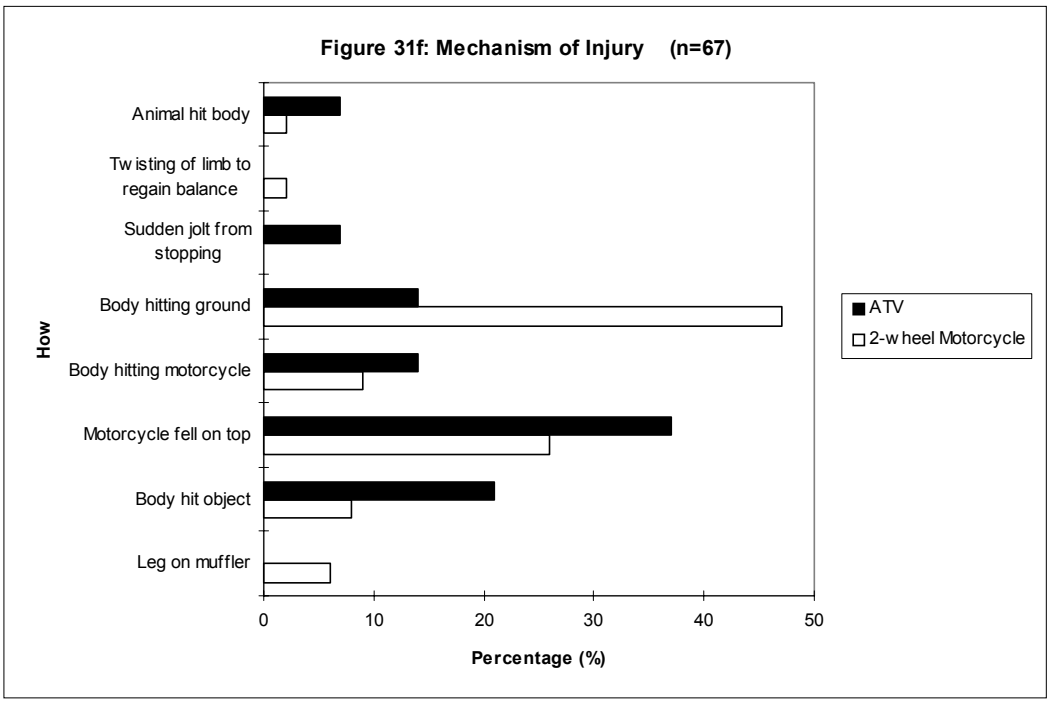
The majority of both ATV riders (50%) and 2-wheel motorcycle riders (51%) were riding across a paddock immediately before the accident. Other injuries occurred when ATV riders were riding in tall grass (29%), riding through scrub (7%), riding along a track (7%) and riding downhill (7%). 2-wheel motorcycle riders were observed as having a wider range of riding actions immediately before an accident compared to ATV riders.



The survey questionnaire was more specific than the rider survey in questioning the cause of the accident. The majority of accidents for both ATVs and 2-wheel motorcycles were a result of an environmental hazard. The major hazard for both ATVs (19%) and 2-wheel motorcycles (16%) was observed as hitting a rock and subsequently losing control of the machine. Other major causes for ATVs were hitting branches on the ground (13%) and for 2-wheel motorcycles hitting animals (10%) or branches on the ground (10%). When considering rider hazards the major cause for ATVs was not paying attention (13%) and for 2-wheel motorcycles losing control due to speed (4%) and not paying attention (4%).

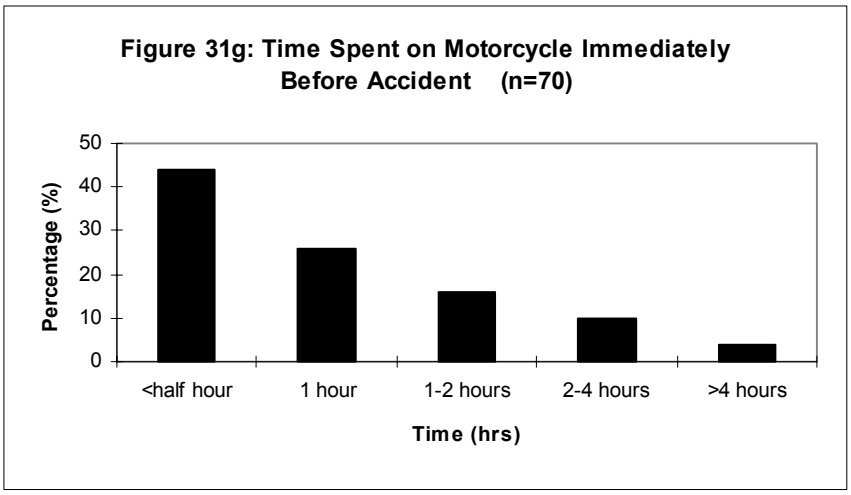


Injury from ATVs occurred mainly due to the motorcycle falling or rolling on top of the rider (37%), the riders body hitting a stationary object (21%), riders body hitting the ATV (14%) and riders body hitting the ground (14%). Injury from 2-wheel motorcycles occurred mainly due to the riders body hitting the ground (47%) and the motorcycle falling or rolling on top of the rider (26%).

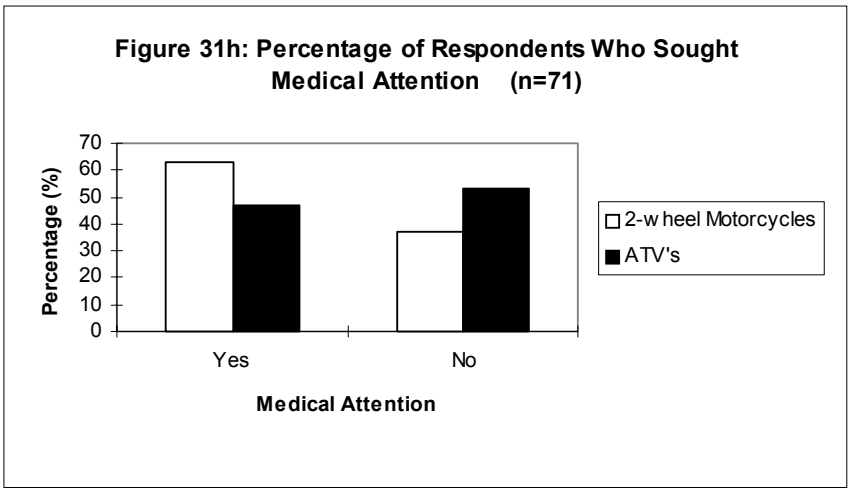


The mechanisms of injury are important from the point of view of looking at personal protective clothing and training.

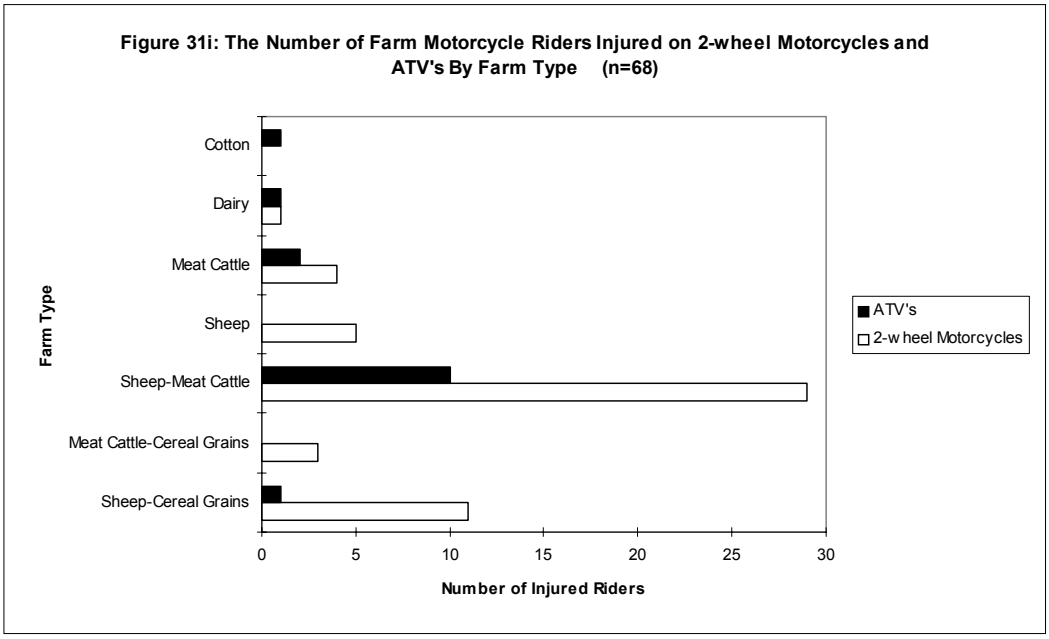
Like the rider survey (Figure 24e) 44% of accidents occurred within less than half hour and 26% occurred within 1 hour.



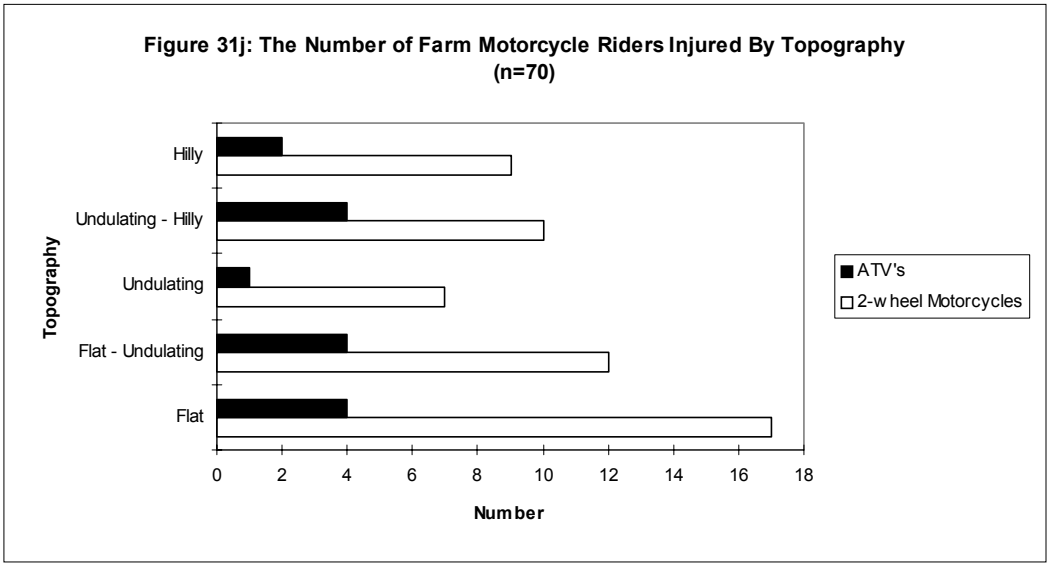
There was a higher percentage of injured 2-wheel motorcycle riders who sought medical attention (63%) compared to injured ATV riders (47%). This result is different to that reported in the rider survey (Figure 24f).



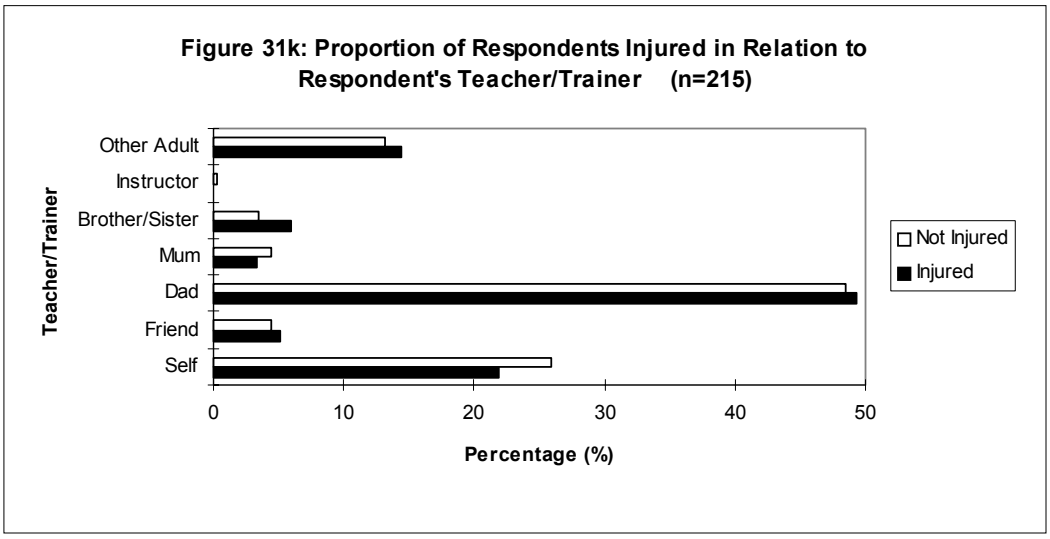
Different injury patterns for 2-wheel motorcycles and ATVs were observed for different farm types. The results show that sheep-meat cattle farms have a high number of both 2-wheel motorcycle injuries (29) and ATV injuries (10). Meat cattle, dairy and cotton are dominated by ATV injuries, whereas sheep-cereal grains, sheep and meat cattle-cereal grains are dominated by 2-wheel motorcycle injuries.



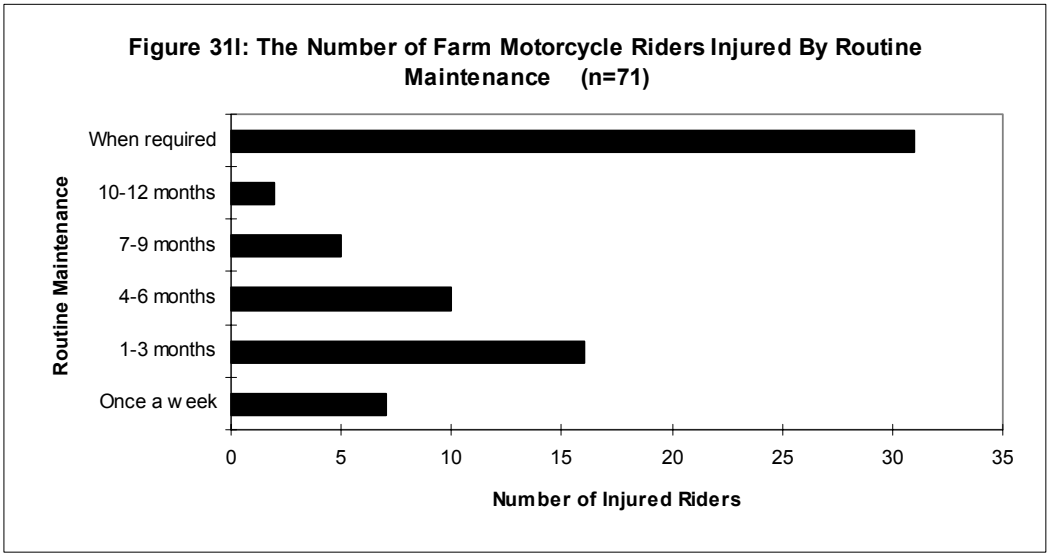
Injuries on ATVs tended to occur on flat, flat-undulating and undulating-hilly topographies. The majority of 2-wheel motorcycle injuries tended to occur on flat and flat-undulating topographies. It is interesting to note that there was no difference between the number of ATV injuries occurring on flat, flat-undulating and undulating-hilly topographies. When comparing both ATV and 2-wheel motorcycle injuries it is interesting to observe that 2-wheel motorcycle injuries are higher on flat, undulating and hilly topographies.



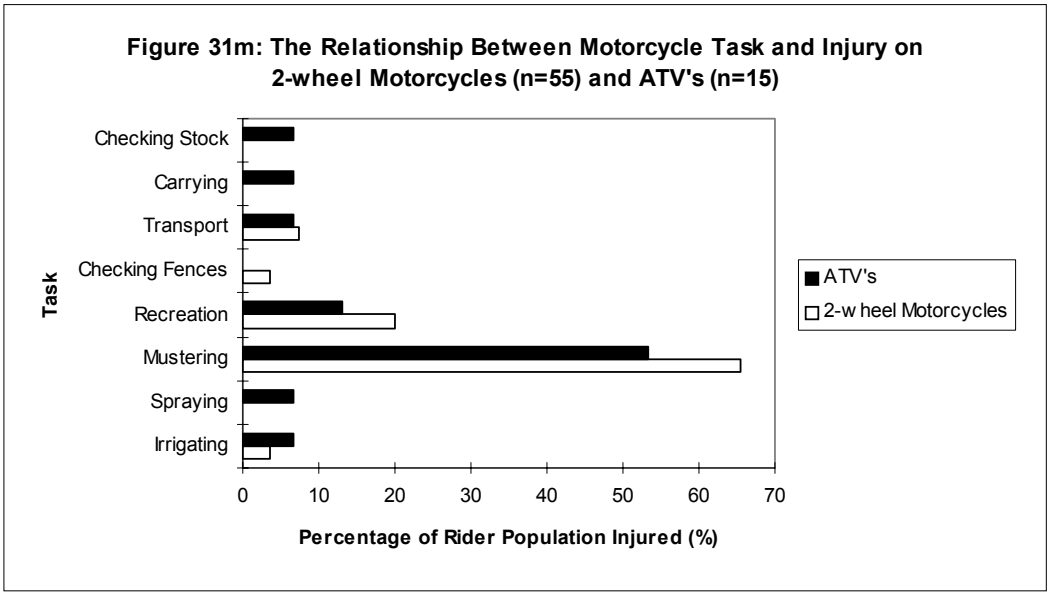
The riders who were self taught or taught by their mothers or an instructor had a higher percentage of non injured riders compared to those taught by siblings and other adults. There was very little difference between injured and non injured riders who were taught by their fathers.



The riders who performed routine maintenance when required suffered the highest number of injuries, compared to the other groups.

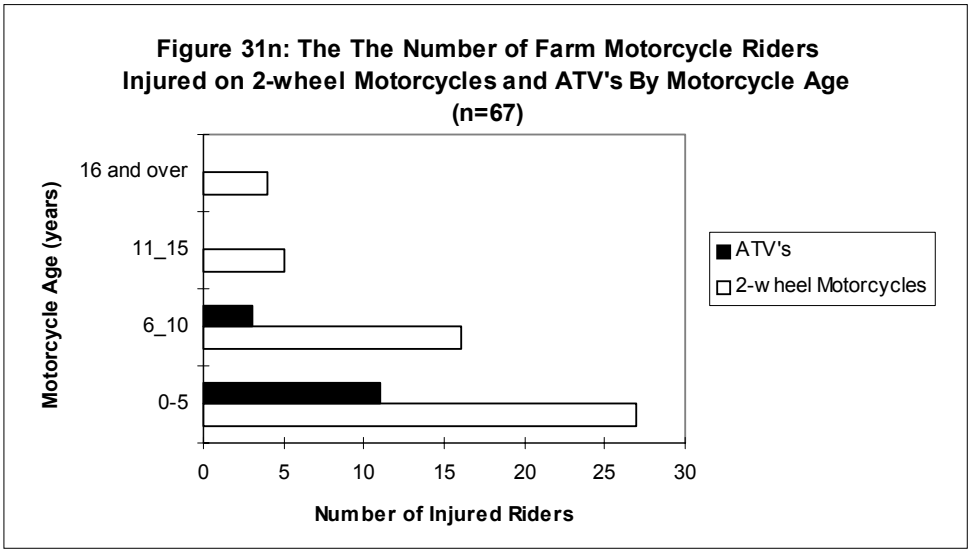


The task of mustering and using the farm motorcycle for recreation resulted in a high percentage of injured riders for both ATVs and 2-wheel motorcycles. Both mustering and recreation resulted in a slightly higher percentage of 2-wheel motorcycle riders being injured. Compared to each other, ATV riders were more commonly injured when performing spraying, irrigating, checking stock or tasks which required towing, whereas 2-wheel motorcycle riders were more commonly injured while checking fences or using the motorcycle as transport.

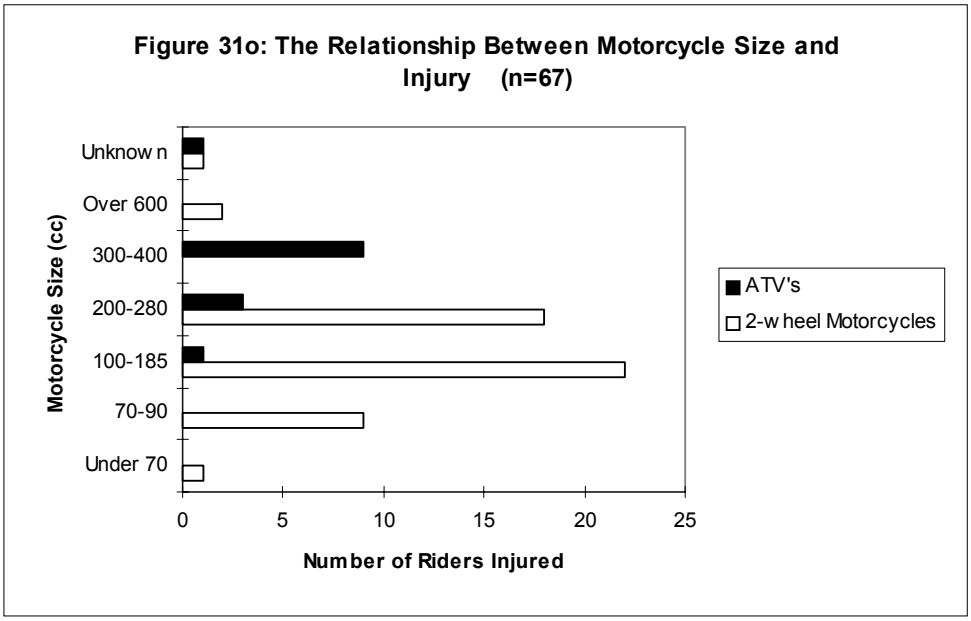


Note the higher recreation injury rate compared to the rider survey. The task of mustering appears to play a major role in injury in both surveys.

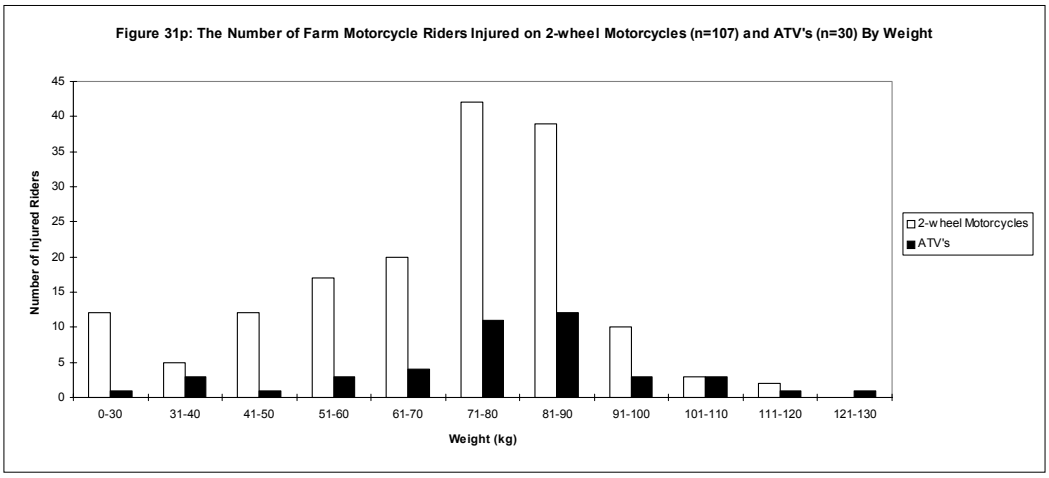
Similar to Figure 24y ATV and 2-wheel motorcycle injuries have occurred on motorcycles between the age of 0-5 years which was an unexpected result.

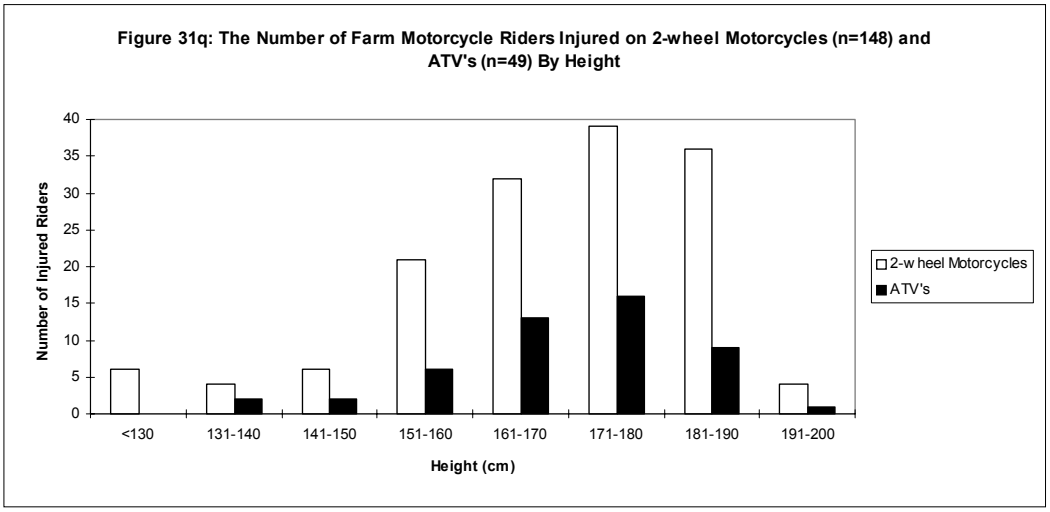


It appears that the smaller motorcycles are involved in a higher number of injuries compared to the larger machines. The majority of ATV injuries occurred on machines between the sizes of 300 and 400 cc, and the majority of 2-wheel injuries occurred on machines with a size between 100 and 185 cc.



This is a very similar pattern to that observed in Figure 24j and Figure 24k, although there is a higher number of injured riders represented in the height groups 151-170 cm and 181-190 cm.

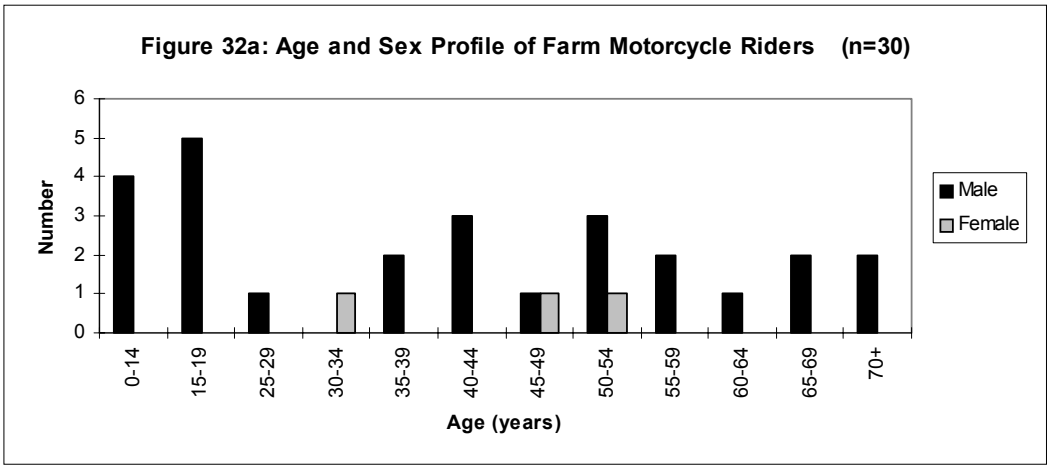




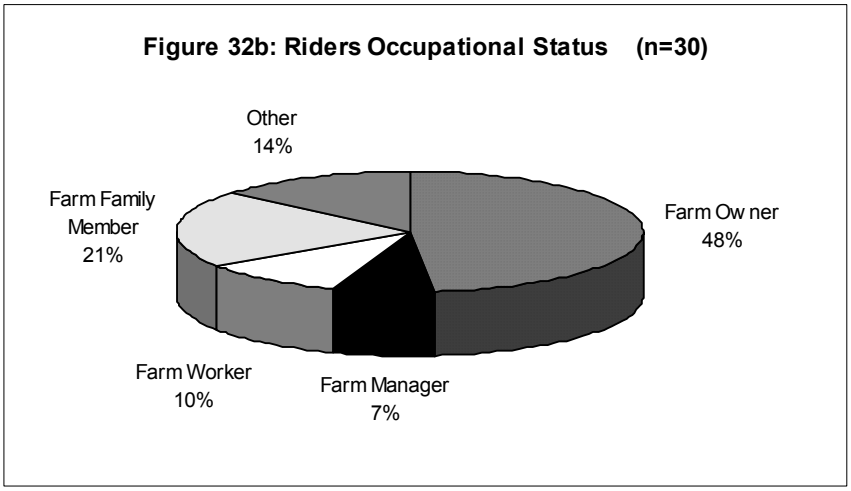
5.3 The Farm Motorcycle Injury Survey

5.3.1 Rider Profile

The age of the male injured farm motorcycle riders were spread over all age groups, excepting 30-34 years. Injured female riders were represented in the 30 -34 years, 45-49 years and 50-54 years age groups. Note the difference to the rider survey (Figure 24h) and the similarities to the Women on Farms Survey (Figure 31a).



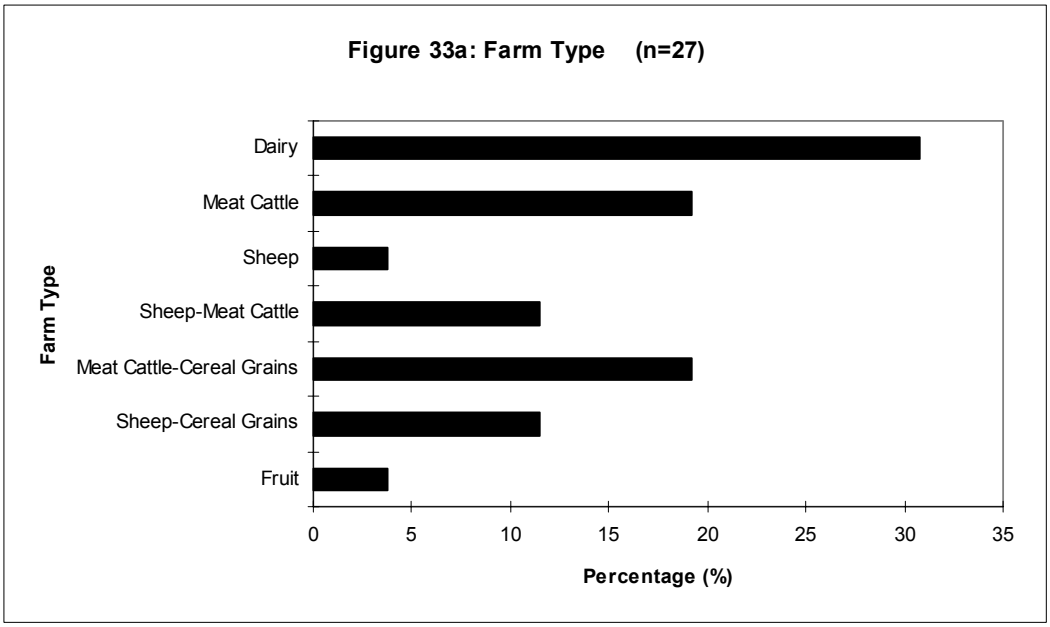
Farm owners (48%) represented the largest proportion of injured farm motorcycle riders, followed by farm family members (21%), other (14%), farm workers (10%) and farm managers (7%).



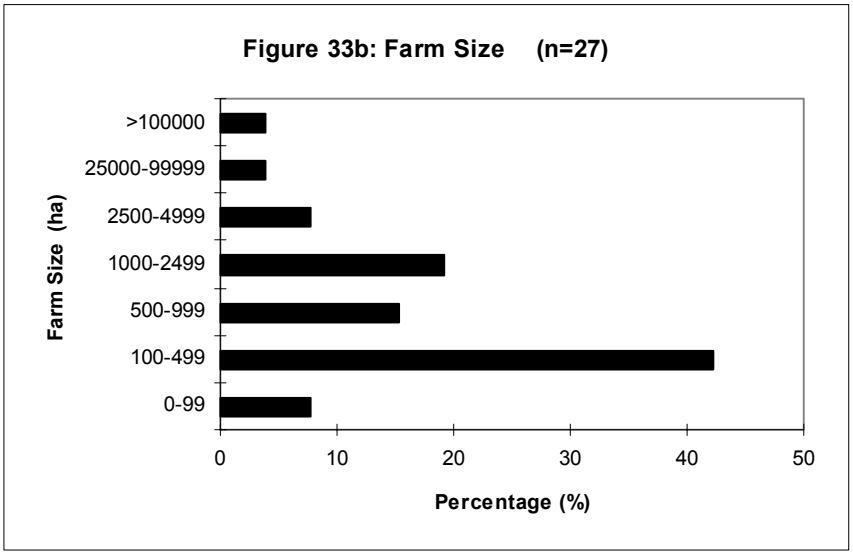
It should be noted that Other has a higher percentage of riders compared to the rider survey (Figure 18b) and the Women on Farms Survey (Figure 25b).

5.3.2 Farm Profile

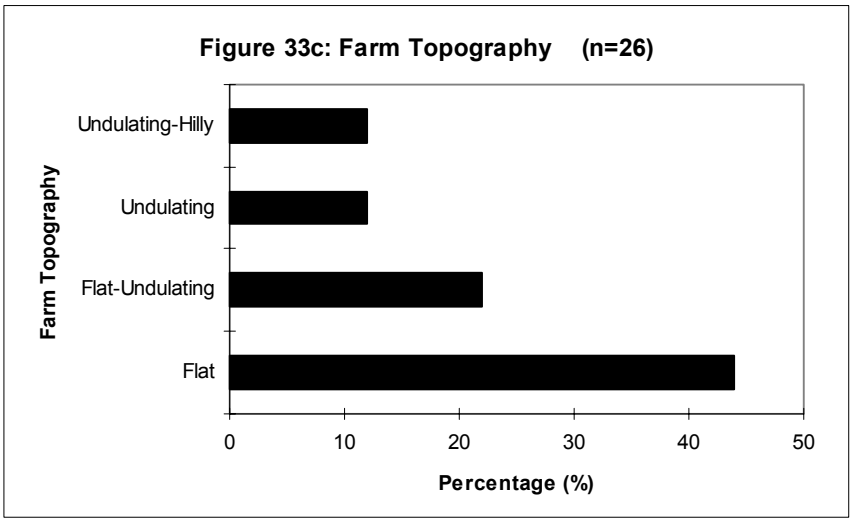
The highest percentage of injured riders came from the dairy industry (30.8%), followed by the meat cattle (19.2%) and meat cattle-cereal grain (19.2%) industries. Note the similar pattern in dairy representation to the rider survey (Figure 24l).



The majority of injured riders were from farms between the sizes of 100-499 ha. Note the similarity in distribution to the rider survey (Figure 19b) and the Women on Farms Survey (Figure 26b).

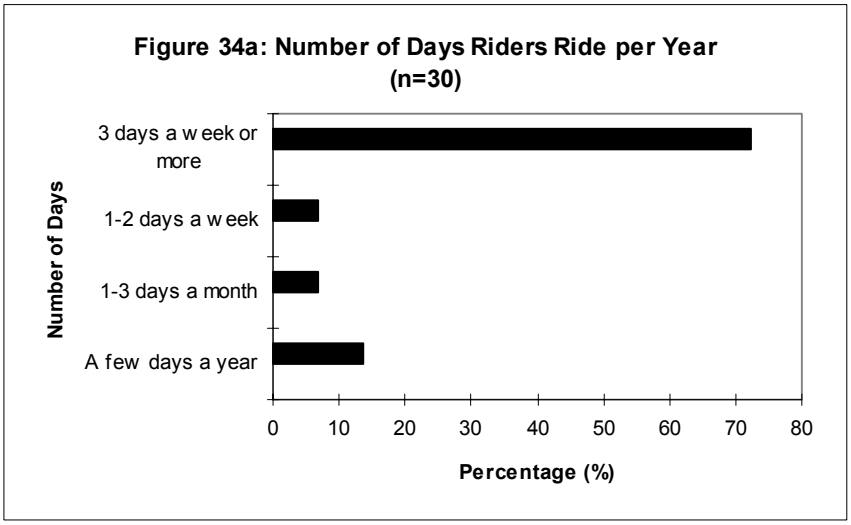


The majority of injuries occurred while operating the farm motorcycles on flat ground. Note the similarity in distribution to the Women on Farms Survey Figure 31j).

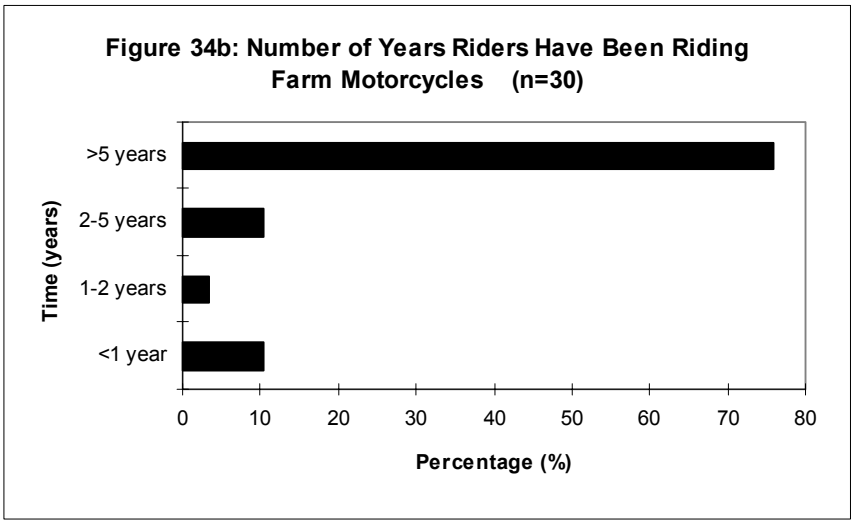


5.3.3 Rider Experience

Similar to both the rider survey and the Women on Farms Survey the majority of the injured riders operated a farm motorcycle 3 days a week or more.

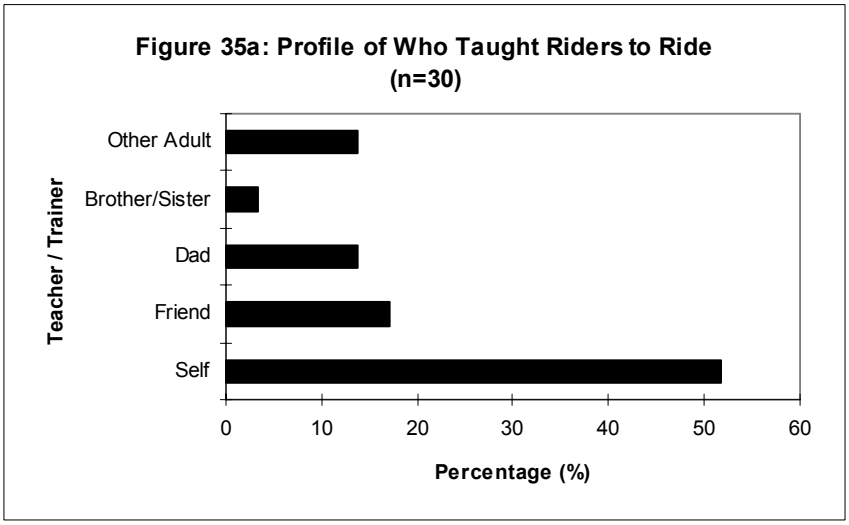


75.9% of injured riders had been riding a motorcycle for greater than 5 years, which is similar to the rider survey (see Figure 20b).

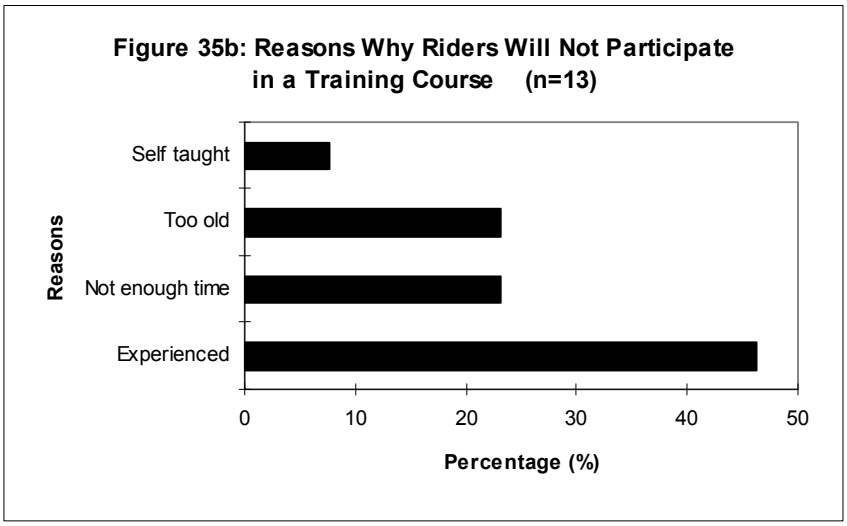


5.3.4 Rider Education and Training

From the 29 injured riders only 2 had completed a formal motorcycle training course. The lack of formal farm motorcycle training is highlighted by the fact that 51.7% of riders are self taught. This pattern is also evident in both the rider survey (Figure 21a) and Women on Farms Survey (Figure 28a).

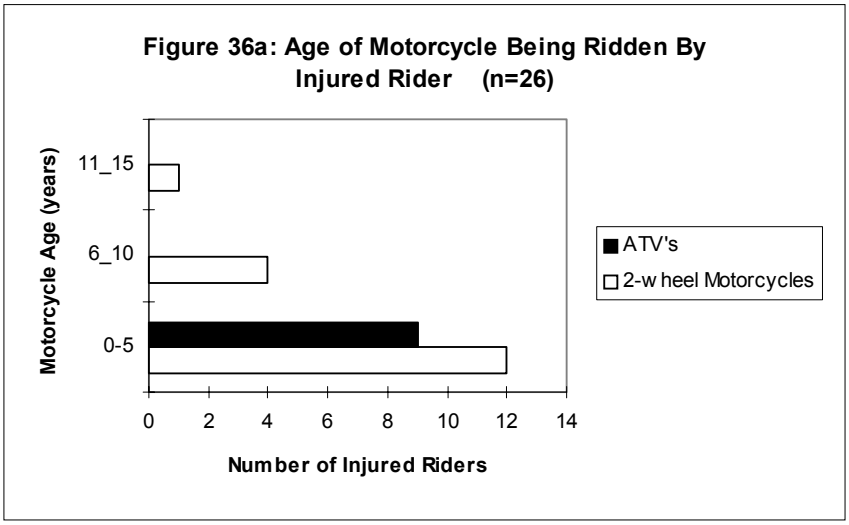


When asked if they thought rider education and training was important 80% of injured riders responded with a 'yes.' When asked if they would attend only 40% replied with a positive response. Similar to the rider survey, the main reason for not attending was that they considered themselves to be experienced riders.

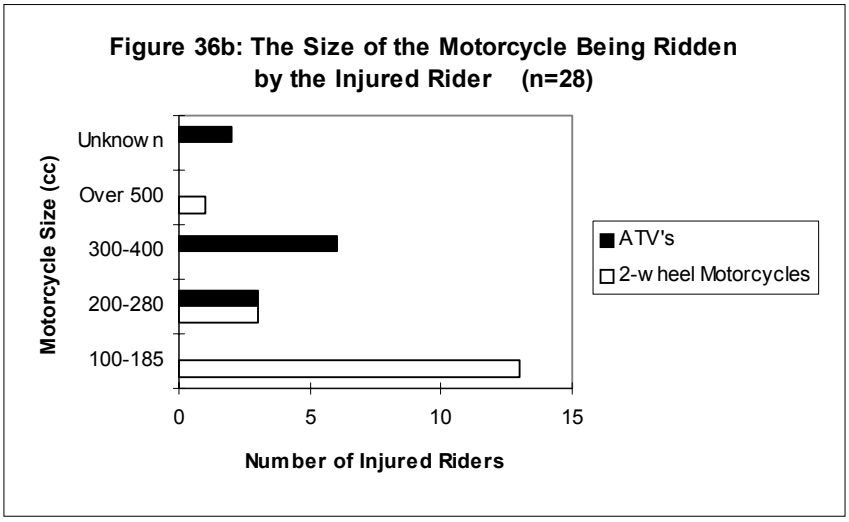


5.3.5 Farm Motorcycle Details

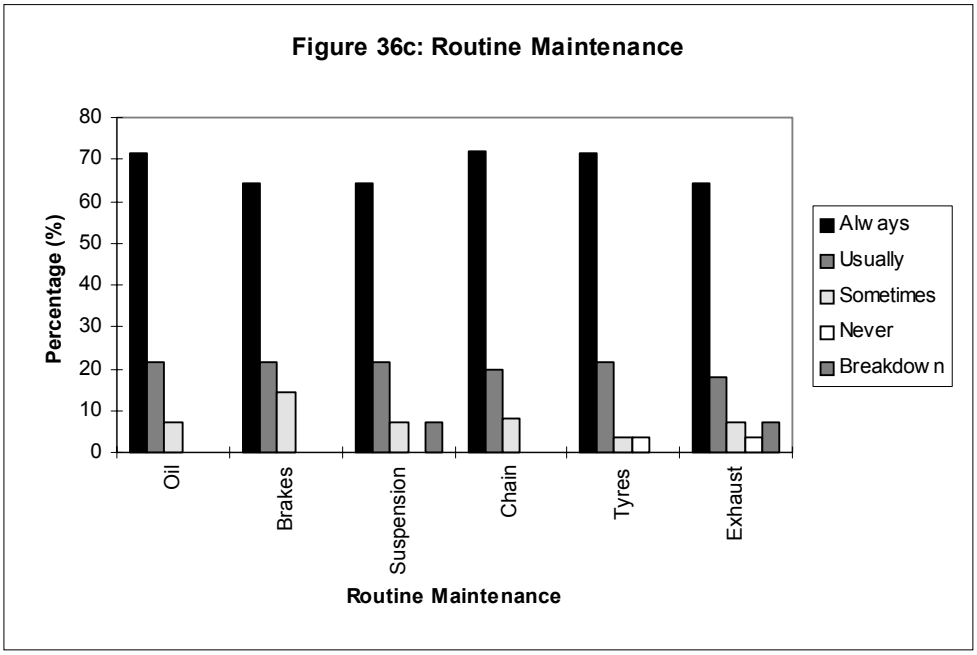
For both 2-wheel motorcycles (12) and ATVs (9) the highest number of accidents occurred on machines between the age of 0-5 years. A similar pattern is evident in both the rider survey (Figure 24y) and the Women on Farms Survey (Figure 31n).



The majority of 2-wheel motorcycle (13) accidents occurred on motorcycles between the sizes of 100-185 cc, whereas ATV (6) accidents tended to occur on motorcycles between the sizes of 300-400 cc. Note the difference in 2-wheel motorcycle accidents in the 200-280 cc size category compared to the rider survey (Figure 24z) and the Women on Farms Survey (Figure 31o).



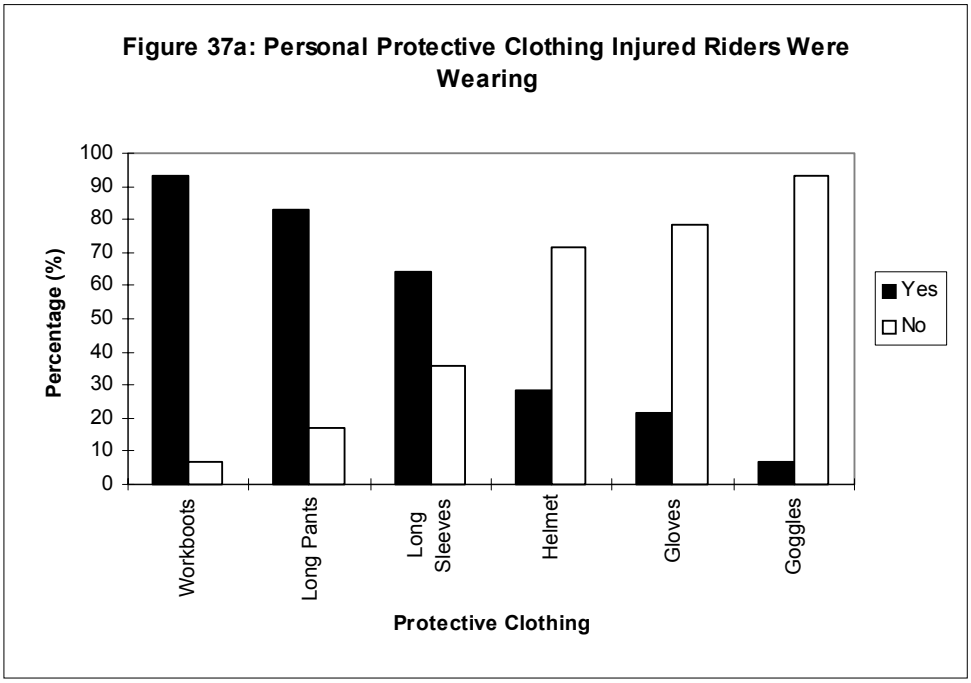
Unlike the rider survey, the injured riders considered checking the chain (72%) to be of most importance. This was followed by the tyres (71.4%), oil (71.4%), brakes (64.3%), suspension (64.3%) and exhaust (64.3%).



NB For n values refer to Appendix 6

5.3.6 Personal Protective Clothing and Equipment

At the time of the accident 92.9% of injured riders were wearing workboots, 82.8% wearing long pants and 64.3% wearing long sleeve shirts. At the same time only 28.6% were wearing a helmet, 21.4% wearing gloves and 7.1% wearing eye protection (goggles). This profile also reflects that reported in the rider survey (Figure 23a) and the Women on Farms Survey (Figure 30a).

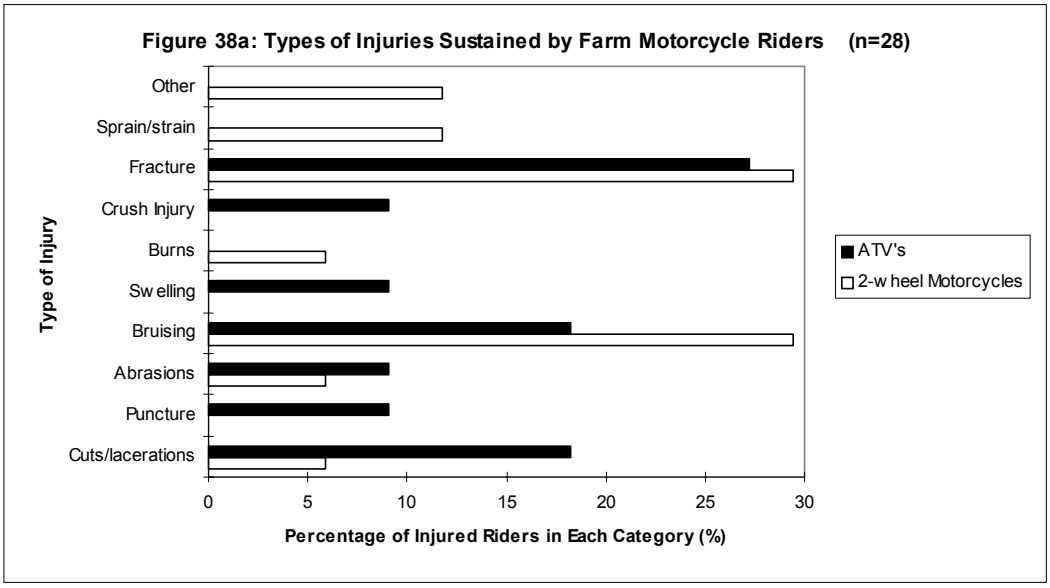


N.B. For n values refer to Appendix 6

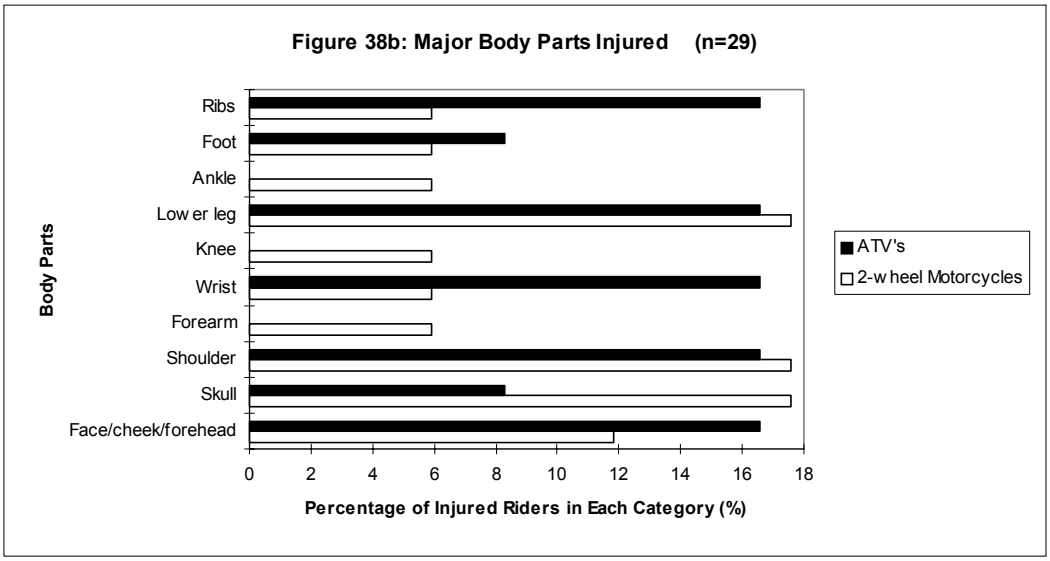
5.3.7 Farm Motorcycle Injury Details

58.6% of riders were injured on 2-wheel motorcycles and 41.4% of riders were injured on ATVs in the last 2 years.

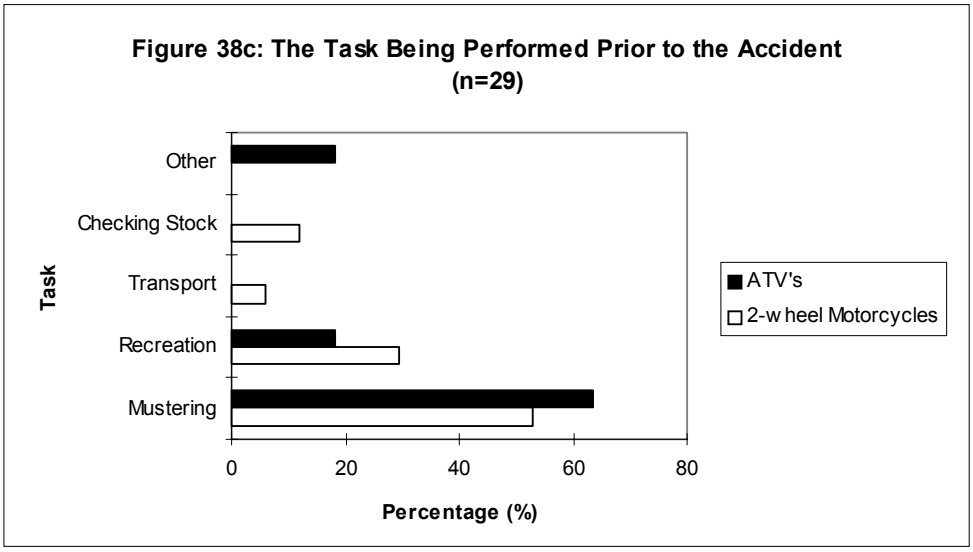
Riders who were injured on ATVs tended to suffer a high percentage of fractures (27.2%), bruising (18.2%) and cuts/lacerations (18.2%). Riders who were injured on 2-wheel motorcycles suffered a high percentage of fractures (29.4%) and bruising (29.4%). The similarities and differences between the rider survey (Figure 24a) and the Women on Farms Survey (Figure 31b) should be noted.



The major body parts injured for ATV riders were ribs (16.6%), lower leg (16.6%), wrist (16.6%), shoulder (16.6%) and face/cheek/forehead (16.6%). Injured 2-wheel motorcycle riders suffered a high percentage of lower leg (17.6%), shoulder (17.6%) and skull (17.6%) injuries. Note the difference in the skull injuries compared to the rider survey (Figure 24b) and the Women on Farms Survey (Figure 31c).

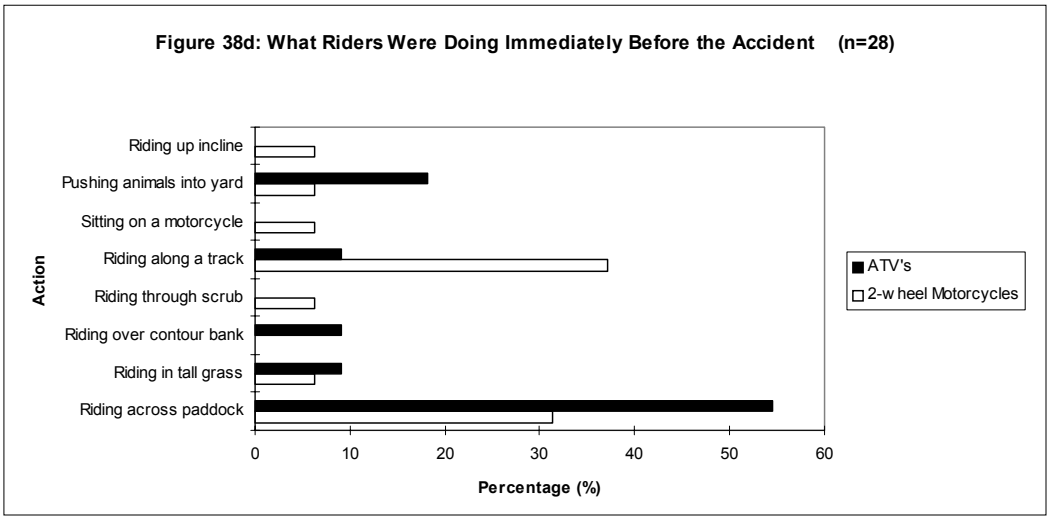


Prior to the accident occurring the majority of both ATV riders (63.6%) and 2-wheel motorcycle riders (52.9%) were mustering livestock. Note the similar pattern that appears with mustering in the rider survey (Figure 24w) and the Women on Farms Survey (Figure 31m).

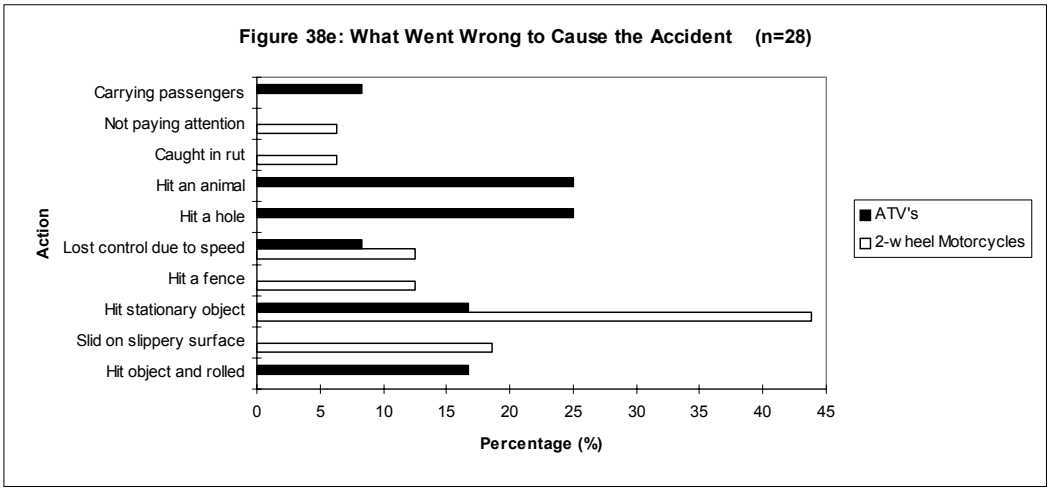


Also note that recreational injuries are higher on 2-wheel motorcycles in all 3 surveys.

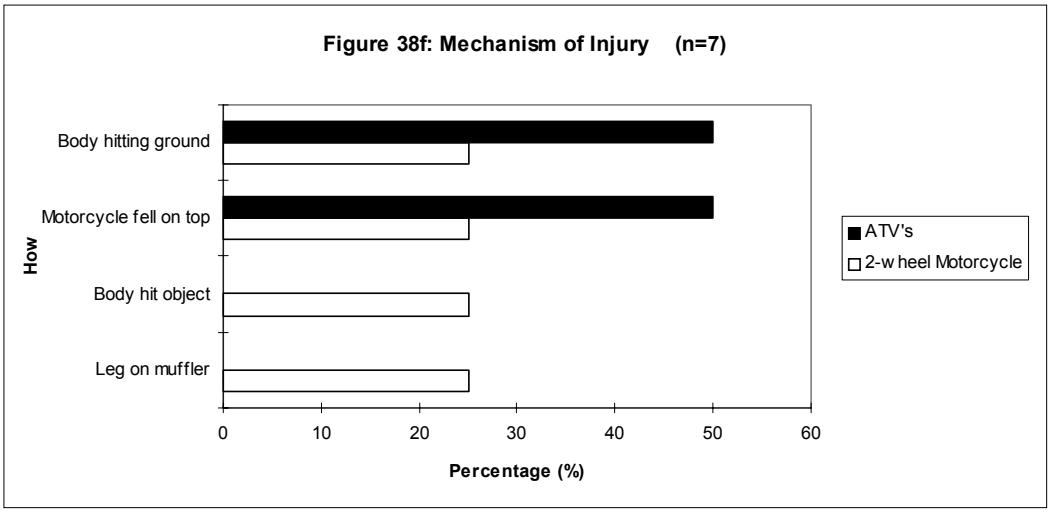
The majority of ATV accidents occurred while the rider was travelling across a paddock (54.5%), whereas the highest single group of 2-wheel accidents occurred while the rider was travelling along a track (37.2%). There was also a high percentage of 2-wheel motorcycle accidents occurring while the rider was also travelling across a paddock (31.3%). Note the higher percentage of 2-wheel motorcycle accidents occurring while riding along a track compared to the Women on Farms Survey (Figure 31d).



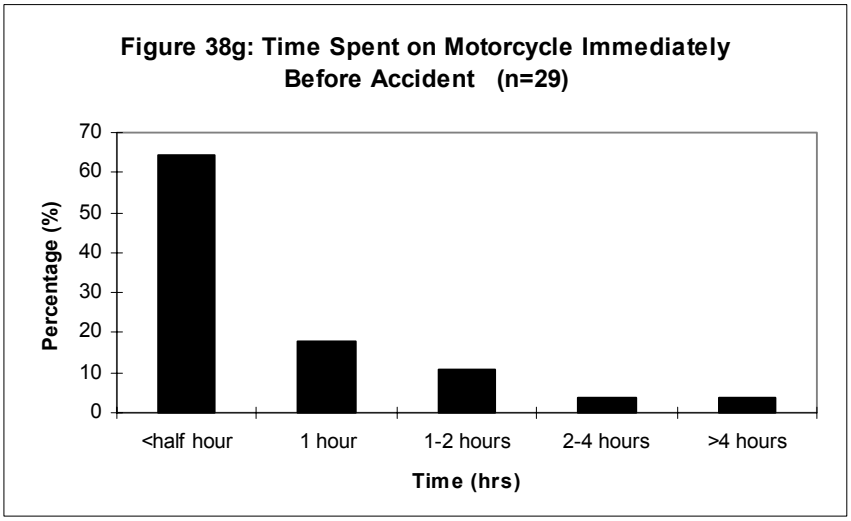
Hitting a hole (25%) or hitting an animal (25%) was the major cause of ATV accidents, whereas hitting a stationary object (43.8%) was the major cause of 2-wheel motorcycle accidents. Note the differences between the rider survey (Figure 24c) and the Women on Farms Survey (Figure 31e).



The mechanism of injury for ATV riders was either their body hitting the ground (50%) or the motorcycle falling on top (50%), for 2-wheel motorcycles it was their body hitting the ground (25%), motorcycle falling on top (25%), body hitting object (25%) and leg on muffler (25%).



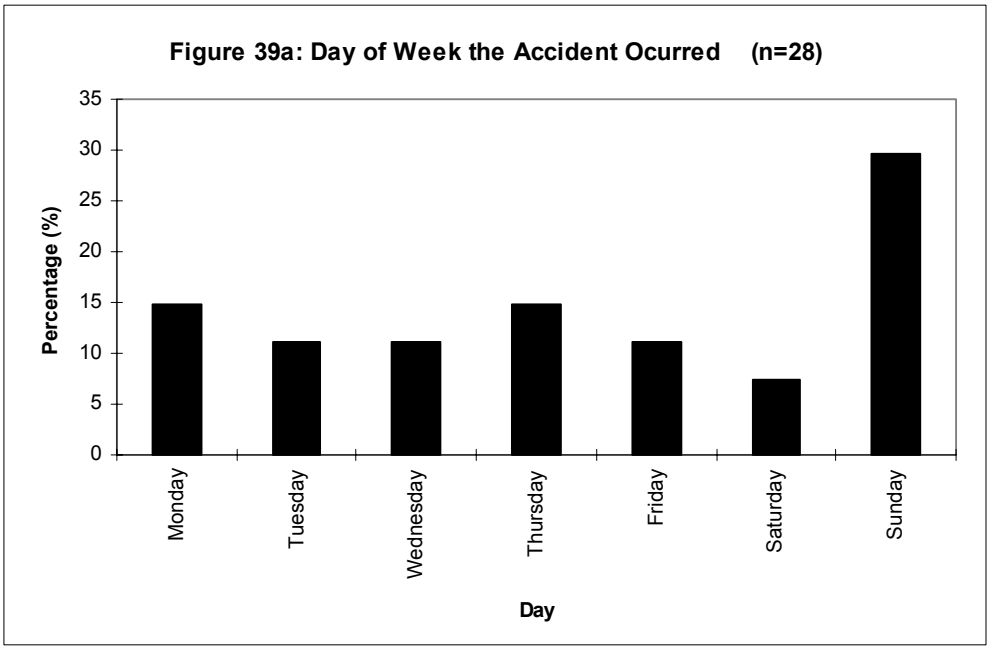
Like both the rider survey (Figure 24e) and the Women on Farms Survey (Figure 31g), the majority of accidents occurred within the first half hour of the rider hopping onto the motorcycle.



5.3.8 Farm Motorcycle Accident Details

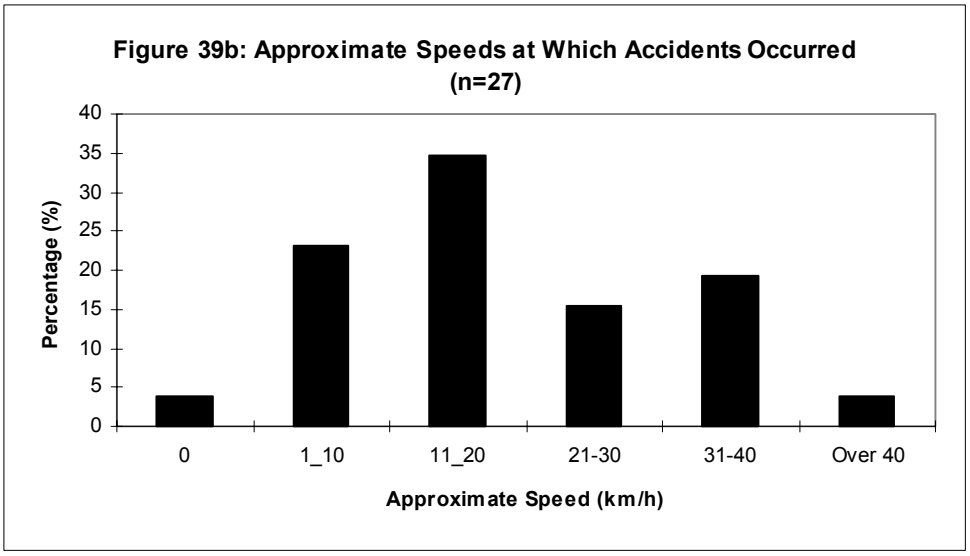
42.9% of accidents occurred between the times of 6.00 am - 12.00 pm and 57.1% of accidents occurred in the afternoon.

The highest percentage of accidents occurred on a Sunday (29.6%) which may reflect motorcycle usage patterns of farm family members. Motorcycle accidents were also high on both Mondays (14.8%) and Thursdays (14.8%).

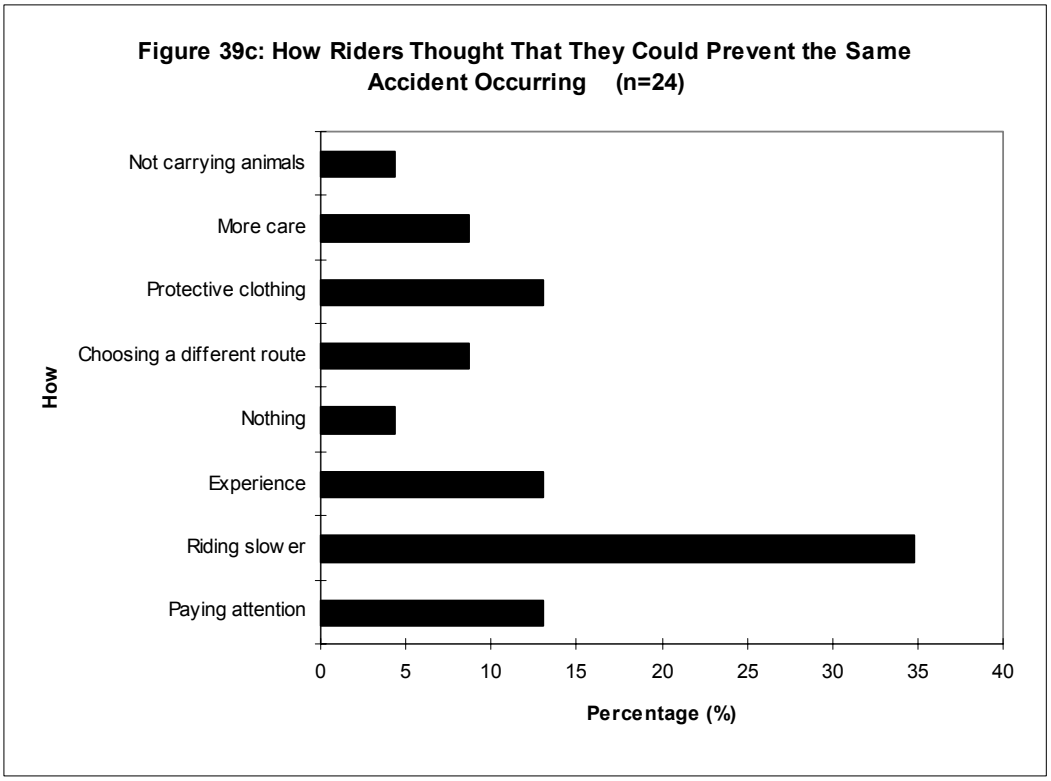


It was thought that there may be more accidents occurring as the light in the afternoon begins to fade but this was not the observed case with 96.6% of accidents occurring in light conditions (full daylight).

The majority of accidents occurred between speeds of 11-20 km/h (34.6%) and 1-10 km/h (23.1%). This is similar to the pattern observed in the rider survey (Figure 24g).



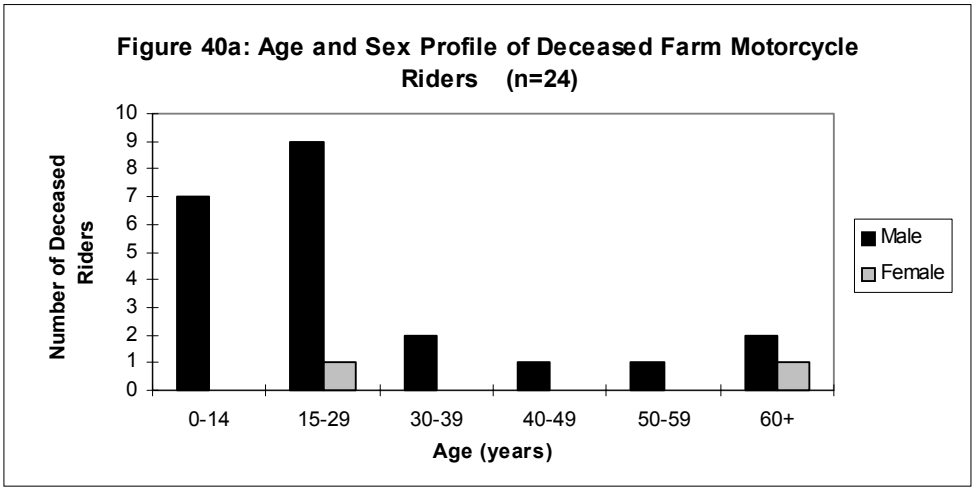
34.8% of injured riders felt that if they had have been travelling slower they may have been able to prevent the accident from happening. Note the similarity in the pattern compared to the rider survey (Figure 24d).



5.4 Farm Motorcycle Deaths

Preliminary results from a work-related fatality study conducted by the National Occupational Health and Safety Commission reported 24 farm motorcycle fatalities for the period 1989-1992. Five (5) of these deaths were attributed to ATVs and the remaining 19 to 2-wheel motorcycles. Twenty three (23) of the deceased were riders who were in control of the motorcycle at the time of the accident, and 1 was a bystander. (A further 5 deaths resulted from riding 3-wheeled motorcycles and are not included in this analysis).

Males were the deceased in 22 cases, and the age group 15-29 years had the highest number of deceased riders, followed closely by the 0-14 year age group.



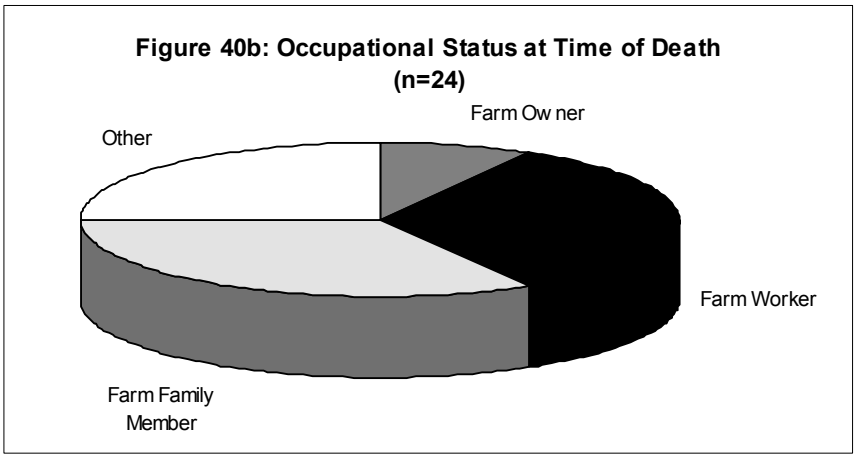
Source: NOHSC-Preliminary Results Work-Related Fatality Study (1989-1992)

Fatal injuries to 2-wheel motorcycle riders tended to occur as a result of hitting a stationary object or colliding with another vehicle, whereas fatal ATV injuries tended to occur as a result of the motorcycle rolling onto the rider.

Table 18 How the Fatal Accident Occurred

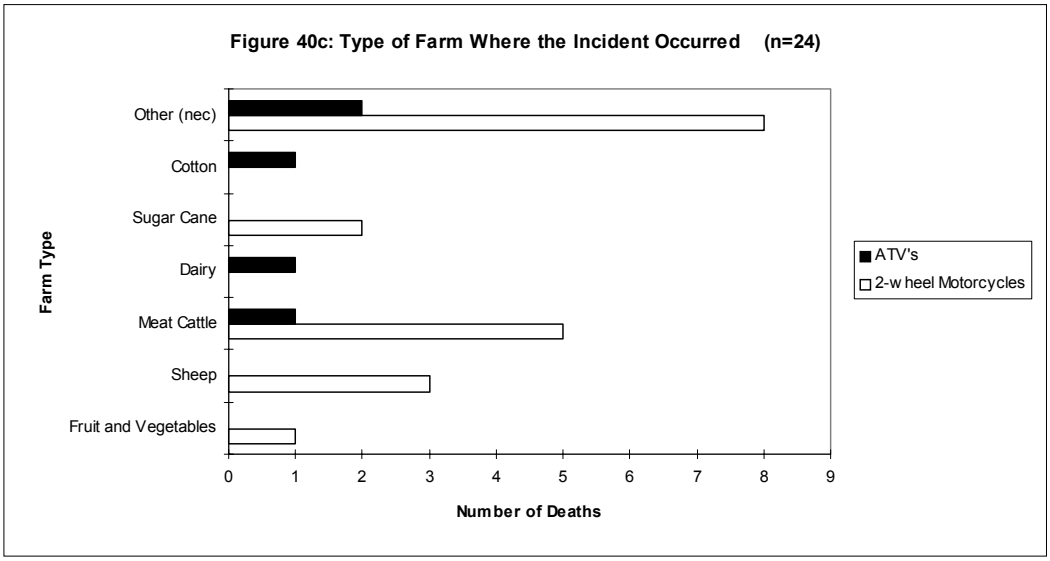
How Accident Occurred	Motorcycle Type	
	2-wheel Motorcycle	ATV
Hit stationary object	5	1
Ran over	1	
Washed off crossing		1
Collision with vehicle	5	
Hit an animal	1	
Rolled		3
Ran into fence	4	
Rut/animal track	1	
Unknown	2	

The majority of the deceased riders were farm workers (8) and farm family members (8). There were 2 farm owners and 6 'others' (not elsewhere classified) fatally injured.



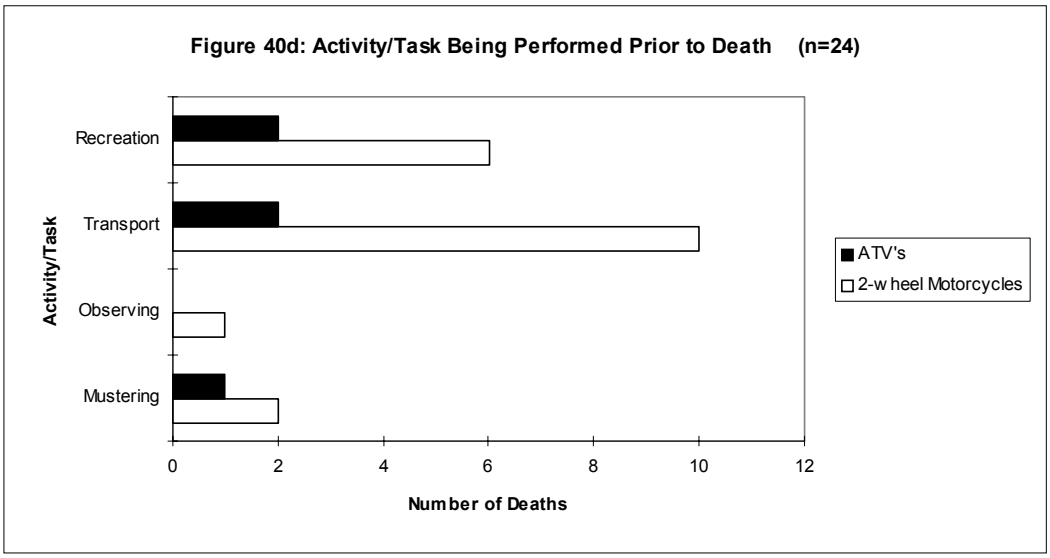
Source: NOH&SC-Preliminary Results Work-Related Fatality Study (1989-1992)

The meat cattle industry had fatalities occurring on both 2-wheel motorcycles and ATVs, whereas the fruit and vegetables, sheep and sugar cane industries had recorded fatalities only on 2-wheel motorcycles. Similarly the cotton and dairy industries had recorded fatalities only on ATVs.



Source: NOH&SC-Preliminary Results Work-Related Fatality Study (1989-1992)

Both 2-wheel motorcycles and ATVs have a high number of deaths occurring as riders are using the machines for personal transport and recreation. It is interesting to note that the age of the deceased who were using the machines for recreation ranged from 9 years of age to 66 years of age.



Source: NOH&SC-Preliminary Results Work-Related Fatality Study (1989-1992)

The major cause of death for 2-wheel motorcycle riders was head injury and the major cause of death for ATV riders was serious injury to the upper body or trunk. Of the deceased riders who suffered head injuries only one was wearing a helmet.

Table 19 Cause of Death

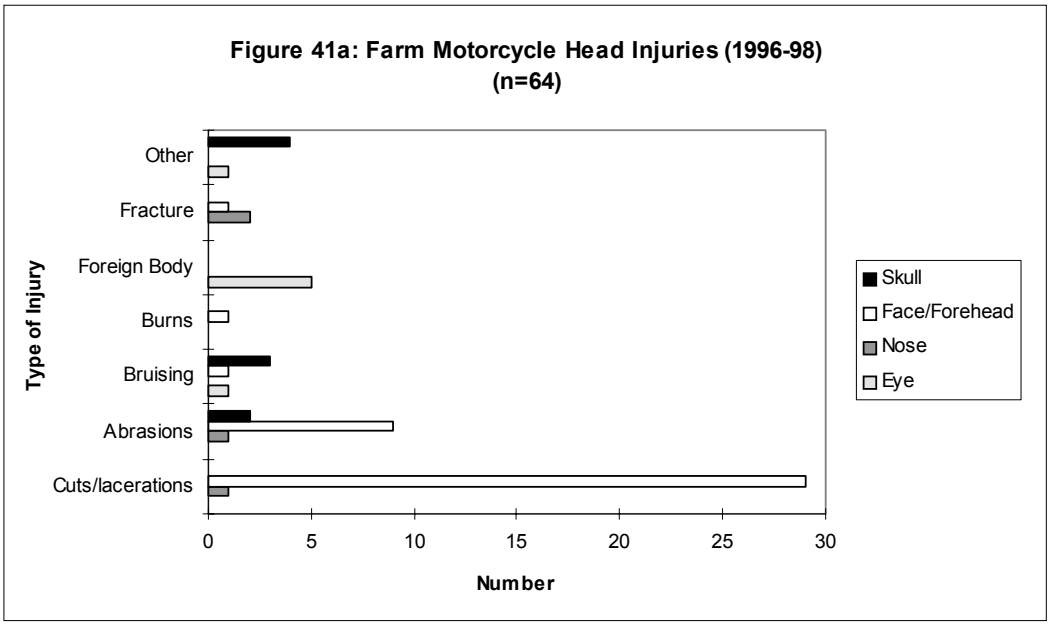
Cause of Death	Motorcycle Type	
	2-wheel Motorcycle	ATV
Head injury	8	1
Ruptured liver & spleen	1	1
Drowning		1
Heart damage		1
Multiple injuries	3	
Haemothorax	2	
Crushed larynx	1	
Haemopneumothorax	1	
Organ failure	1	1
Asphyxia	1	
Unknown	1	

Source: NOH&SC-Preliminary Results Work-Related Fatality Study (1989-1992)

5.5 Farm Motorcycle Head Injury

5.5.1 Head Injury

In total there were 64 (9.6%) cases of head injury reported from 667 injured farm motorcycle riders from the three surveys. The majority of head injuries came in the form of cuts/lacerations to the face and forehead.



From the 64 riders who received head injuries, 45 recorded an approximate speed at which the accident happened. 87% of the head injuries occurred at speeds less then 50 km/h, with the majority occurring in the 11-30 km/h category. (Table 13).

Table 20 Speed at Which the Head Injury Occurred

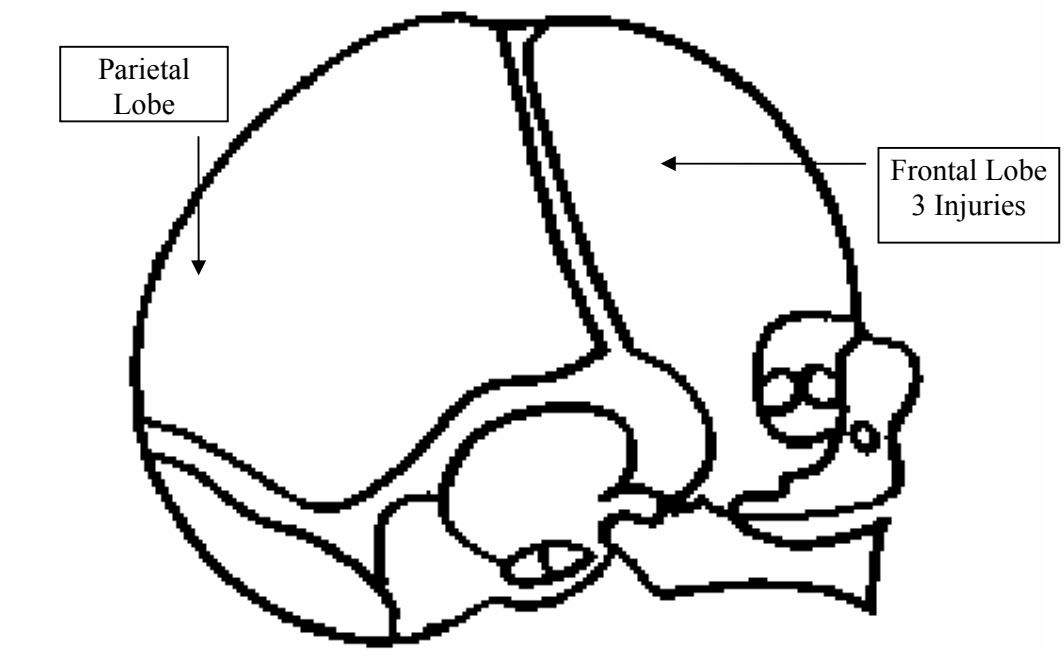
Industry	Speed (km/h)				
	0-10	**11-30**	**31-50**	**51-70**	**71-90**
Fruit and Vegetables			1		
Sheep-Cereal Grains	1	2	2	2	1
Meat Cattle-Cereal Grains		3			
Sheep-Meat Cattle	2	3	4	1	
Sheep		1			
Meat Cattle	2	3	2		
Dairy	5	3	3	1	
Sugar Cane	1				
Cotton		1			
Total	**11**	**16**	**12**	**4**	**2**

15 head injuries reported in the injury survey indicated the mechanism of head injury. The majority of head injuries occurred as a result of the riders head coming into contact with the ground.

Table 21 Mechanism of Head Injury

How the Injury Occurred	No. Head Injuries
Head hit object	2
Motorcycle fell on top	3
Head hit ground	9
Animal hit head	1
Total	**15**

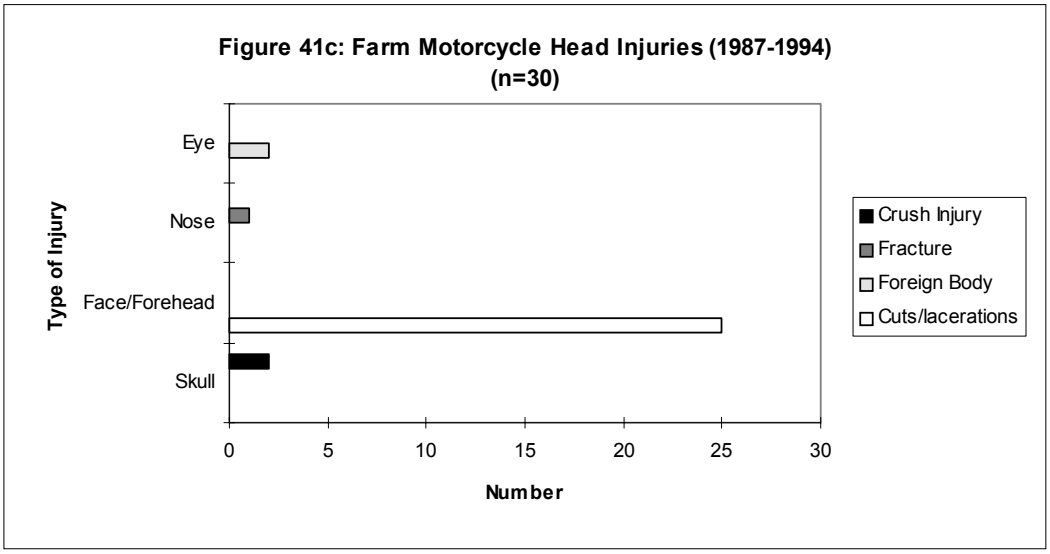
Figure 41b Location of Head Injuries



From the 64 riders who received head injuries, 7 from the injury survey indicated the region of their head that was injured.

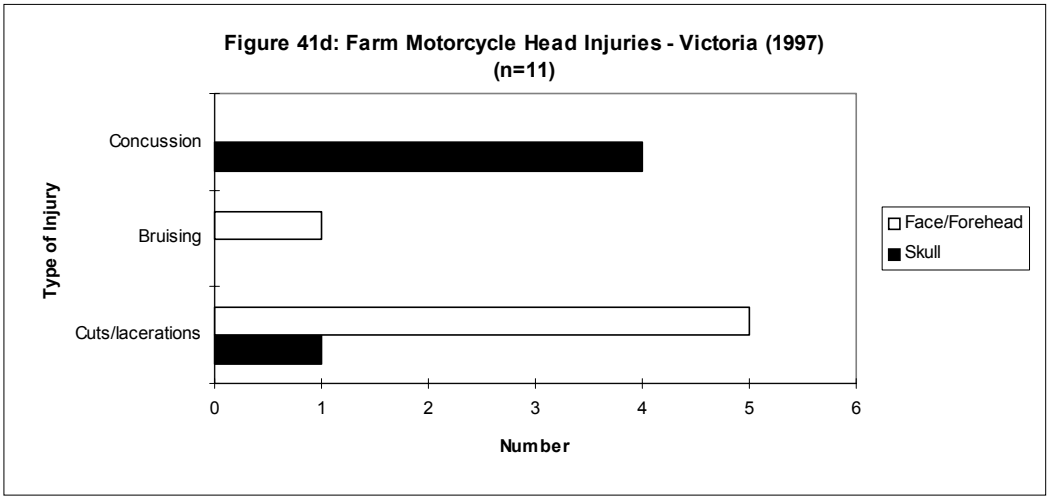
There were 54 head injuries recorded on 2-wheel motorcycles and 10 head injuries recorded on ATVs.

The National Injury Surveillance Unit (NISU) recorded 177 (10.4%) head injuries out of 1,697 farm motorcycle injury cases for the period 1987-1994. There was very little information regarding the types of injuries sustained to the head regions. Similar to Figure 41a the majority of head injuries were cuts and lacerations to the face and forehead.



Source: NISU (1987-1994)

The Victorian Injury Surveillance System (VISS) recorded 11 farm motorcycle head injuries presenting to 6 Victorian hospitals in 1997. Similar to both Figures 41a and 41b there were a high number of majority of cuts and lacerations to the face and forehead and a high number of concussion incidences recorded.



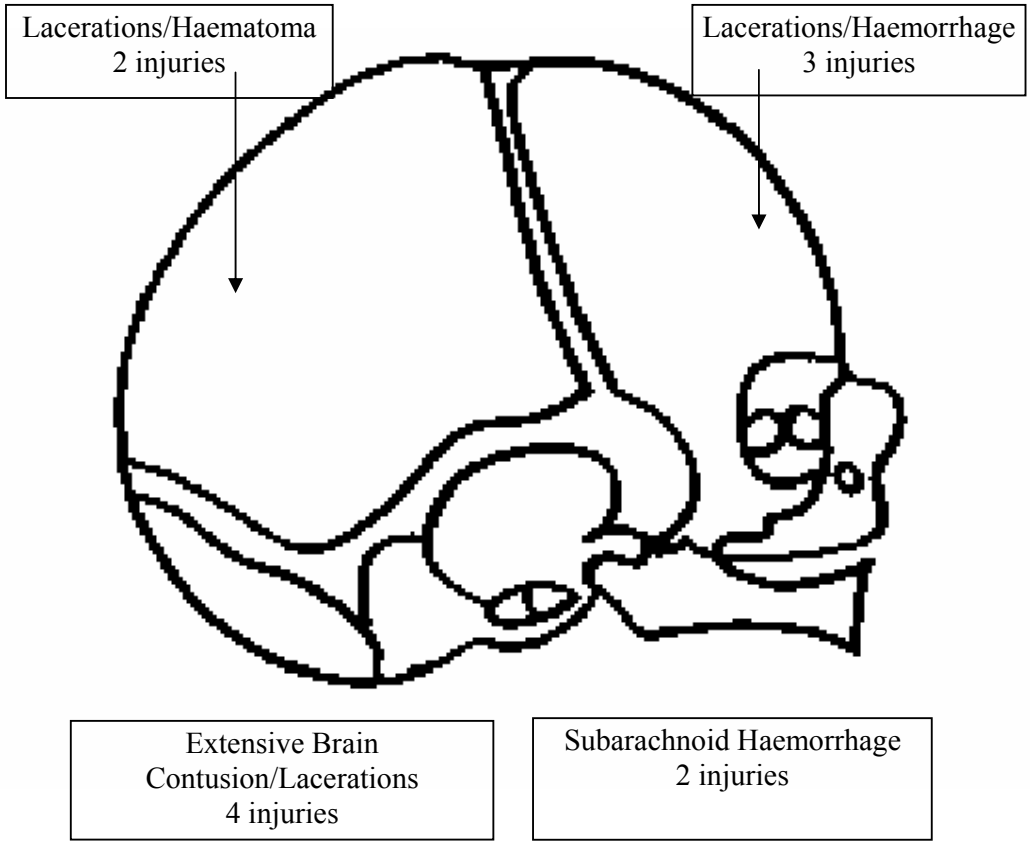
Source: VISS (1997)

The Victorian Emergency Minimum Dataset (VEMD) presentations for 1997 recorded 31 (19%) head injuries from 160 farm motorcycle injury cases. There was limited information available on the breakdown of these head injury events.

5.5.2 Farm Motorcycle Head Injury Deaths

A study conducted by the National Occupational Health and Safety Commission on work-related fatalities for the period 1989-1992 has provided important information on the types and location of head injuries sustained by farm motorcycle riders (Figure 41d). It is interesting to note that there were 12 head injuries recorded of which 11 involved skull fractures.

Figure 41e Number and Location of Fatal Farm Motorcycle Head Injuries



6 Discussion

This study was able to expand on the limited information available on the population exposed to the risk of farm motorcycle injury and the extent and use of motorcycles on Australian farms. This was achieved by developing a profile of farm motorcycle riders, a profile of farm motorcycles in use and a profile of the injuries sustained by farm motorcycle riders. Sheep, meat cattle and dairy industries had a high representation of respondent/riders, whereas industries such as pigs, poultry, fruit and vegetables were under represented. A wide range of farm sizes and farm topographies were also represented.

6.1 The Profile of Farm Motorcycle Riders

Respondent/riders were represented by a wide range of ages for both males and females, although there were more males represented then females. It is reasonable to suggest that there are probably more female riders, as shown in the Women on Farms Survey, but targeting this group was hindered by the method of survey distribution. The majority of respondent/riders were classified as farm owners and farm family members, with farm managers and farm workers being under represented. The Women on Farms Survey provided the best information on farm motorcycle riders across all ages, even though there was a higher response rate from males. Whole farm data is required to obtain farm motorcycle exposure information.

Farm motorcycles appear to be an integral part of farm life with the majority of respondent/riders using them for 3 days a week or more, particularly for mustering of livestock and personal transport. It has been suggested that the use of farm motorcycles for recreational purposes is high (Muiswinkel 1994). However over 50% of respondent/riders indicated that they never use their motorcycles for recreation. This may be an over representation because the boundaries between performing a farm task and riding for recreation are often blurred.

Over 97% of respondent/riders indicated that they had never completed a formal motorcycle training course. Interestingly over half of the respondent/riders felt that a training course would be beneficial, but when asked if they would attend less then half responded positively. The reason given for not attending was that they believed themselves to be experienced farm motorcycle riders. Respondent/riders over the age of 30 years had been mainly self taught whereas riders under the age of 30 years had been taught by their fathers. This probably reflects that motorcycles only came into routine use on farms in the last 25 years. Even though there was a range of teacher/trainers, self taught and fathers tended to dominate rider education.

When riding a farm motorcycle the majority of respondent/riders reported always wearing workboots but only sometimes wearing long pants and long sleeve shirts depending on the season. Gloves and goggles were only occasionally worn, although the representation of eye protection may be low due to the fact that the option of sunglasses was not given in the survey. Over 60% of respondent/riders indicated that they never wear a helmet when riding. To increase the rate of helmet wearing it was anticipated that helmets should be open faced, have an improved ventilation system, a brim to shield against the sun and a quick release

strap**. This was not the case with respondent/riders indicating that the helmet needed to be lighter before they would consider wearing one.** The highest percentage of helmet wearers was found in the age groups 0-14 years, 50-54 years and 65-69 years.

A major limitation of this study was the ommittance of a question that enquired to whether children under the age of 16 years are riding ATVs on farms. (It should be noted that manufacturers of ATVs strongly advise against children under the age of 16 riding ATVs, as well as carrying passengers). However, the injury data provides limited information on this subject (see below).

It was observed that 80% of riders operate their farm motorcycles at average speeds of less then 50 km/h, excepting riders in the sugar cane and cotton industries who tended to have a higher number operating at average speeds greater then 50 km/h. Both average and maximum speeds for the dairy industry was low, similarly for the sheep industry and meat cattle industry more then 60% of riders are travelling at maximum speeds less then 60 km/h, which has implications when considering farm motorcycle helmets. **Speeds are variable between industries, although animal handling industries generally tend to have lower operational speeds when compared to the cropping industries.** Surprisingly topography appears to play no major role in determining average speed and across all topographies average speed was less then 40 km/h in over 85% of riders. Topography appears to play a role in determining maximum speed with riders operating on undulating terrain having higher maximum speeds. This was an unexpected result that is difficult to explain. Is it possible that these riders have higher maximum speeds because of the need to accelerate when ascending a hill and letting the motorcycle 'have its head' when descending a hill.

The results from the profile of farm motorcycle riders imply that rider training needs to start at an early age and target both male and female riders, and incorporate a component on personal protective clothing and motorcycle maintenance.

6.2 The Profile of Farm Motorcycles in Use on Farms

Half of the respondent/riders owned 2-wheel motorcycles only, one quarter owned ATVs only and one quarter owned a combination of both 2-wheel motorcycles and ATVs. The types of motorcycles owned appeared to be related to farm type, farm size and farm topography. **The cotton, dairy and fruit industries mainly used ATVs, whereas sugar cane, sheep and sheep-cereal industries mainly used 2-wheel motorcycles.** The industries which included meat cattle, mainly used 2-wheel motorcycles, although there was a high percentage of combined ATV and 2-wheel motorcycle ownership. Smaller size farms used mainly ATVs and larger farms 2-wheel motorcycles which may reflect the need for riders on larger farms to travel greater distances at faster speeds. Topography also appeared to determine the type of motorcycles used, with flat farms having a combination ownership and undulating to hilly farms mainly using 2-wheel motorcycles. When considering these results there is a need to bear in mind the relatively new introduction of ATVs to Australian farms which may lead to a change in this profile.

It has been suggested by Wright et al. (1991) that farm motorcycle maintenance and replacement is poor, **these results confirm the observation of poor maintenance of brakes, suspension, chain and tyres which are critical to safety.** There is a general perception that farm motorcycles are bought and then rarely replaced as their condition begins to deteriorate. This was not the observed case with the majority of respondent/riders having a motorcycle replacement program, usually 2-5 years, on their farms. It is interesting to note that their financial position was not considered as a constraint to motorcycle replacement.

6.3 The Profile of Injuries Sustained by Farm Motorcycle Riders

There were 505 riders injured on 2-wheel motorcycles compared to 47 injured riders on ATVs in the previous 2 years. **This reflects a crude rate of injury, 33% of the 1 529 2-wheel motorcycles in operation compared to 7% of the 700 ATVs in operation.** This observation of higher injury rates on 2-wheel motorcycles is also supported by Muiswinkel (1994). Young males tended to have a higher percentage of injuries, a pattern which has been confirmed in prior research by Begg et al. (1993) and Hartigan (1994). Further analysis of injury data was hindered by the lack of denominator data for both 2-wheel motorcycle and ATV riders.

An injured motorcycle rider may receive more than one injury and to more than one region of his/her body. To simplify responses and analysis the injured riders were asked to nominate the major type of injury and the major body part injured. This may bias the results as injured riders may have different perceptions of what they consider a major (or serious) injury. **Injuries resulting from ATVs tended to be of a more serious nature,** fractures and sprains, compared to 2-wheel motorcycle injuries, cuts and lacerations, although fractures on 2-wheel motorcycles were a prominent injury in the farm motorcycle injury survey. ATV injured riders commonly suffered upper body injuries whereas 2-wheel motorcycle injured riders tended to suffer lower body injuries. Lower leg injuries featured in both ATVs and 2-wheel motorcycles, although the percentage for 2-wheel motorcycles was higher. It is difficult to compare these results with other findings due to the fact that previous research has not dealt with 2-wheel motorcycles and ATVs individually, but grouped them together as farm motorcycles.

The operating environment of a farm motorcycle rider creates a set of hazards which may change over time. Riding across a paddock and then hitting a stationary object, such as a rock, log or stump, was a common mode of accident for both ATV and 2-wheel motorcycle riders. Other common ATV hazards included rolling, hitting animals and carrying passengers, while 2-wheel motorcycle hazards included animal/tyre ruts, hitting animals and fences and losing control due to speed or slippery surfaces. A similar pattern of results were observed by Muiswinkel (1994). The mechanism of injury for ATVs and 2-wheel motorcycles were motorcycle falling on top of the rider and the riders body hitting the ground respectively.

A high percentage of farm motorcycle accidents were observed to happen within the first half hour of the riders hopping onto the motorcycle. It was previously thought that accidents would increase with an increase in hours/day spent on the motorcycle. This result may reflect the usage pattern of these motorcycles, for example short trips to turn the pump on,

collect the mail, check the sheep or muster dairy cattle. Evidence of where greater exposure increases risk of injury was found in the riders who rode 3 days a week or more.

It was thought that the greater the speed would increase the likelihood of an accident occurring and a resulting injury. This was not the case with the majority of accidents occurring at speeds less then 30 km/h. When interpreting these results it must be taken into consideration that these speeds have been 'guesstimates' and people's perceptions of speed can vary.

The animal enterprises had a high number of injuries. The dairy industry had a high number of ATV accidents along with sheep-meat cattle, and the sheep-cereal grains had a high number of both ATV accidents and 2-wheel motorcycle accidents. It was expected that accidents would occur mainly on undulating to hilly country but this was not the case with the majority of ATV and 2-wheel motorcycle accidents occurring on flat to undulating country.

It has been documented by Wright et al. (1991) that poor maintenance plays a vital role in increasing the number of farm motorcycle accidents. The results do not support this with riders who are maintaining their motorcycles every 1-3 months having a higher percentage of accidents. This result may not be a direct reflection on maintenance but a reflection on the number of days that the rider uses the motorcycle (ie exposure to the hazard), eg a rider using a motorcycle 3 days a week or more may require to perform maintenance more regularly then a rider who uses their motorcycle 1 day a week.

Mustering of livestock resulted in the highest percentage of accidents which was an expected result considering the majority of riders use their motorcycles for this task. It was expected that injury from recreation would be higher but this again was not the observed case.

The age of the motorcycle was expected to affect the number of accidents. This was not the observed case with the majority of ATV and 2-wheel motorcycle accidents occurring on machines between the ages of 0-5 years. There were more accidents on 2-wheel motorcycle over the age of 6 years compared to ATVs.

There is a general perception that motorcycles with a larger engine capacity are involved in a greater number of accidents because they are thought to travel faster. Early research by Kraus et al. (1975) supported this perception, but a more recent study by Lynn (1990) has shown that engine size is inversely correlated with crash frequency. The farm motorcycle study showed that the majority of 2-wheel motorcycle accidents occurred on motorcycles with smaller engine capacities, a finding that is supported by Haworth (1996). ATV accidents occurred on machines with engine capacities between 200 and 400 cc.

The information on accident details is very limited due to the poor response rate to the Farm Motorcycle Injury Survey. Available data shows that accidents occurred on Sundays, Mondays and Thursdays. Accidents on Sunday may reflect a higher percentage of farm family members riding. A high percentage of accidents occurred in the afternoon, with very few occurring after dark.

6.4 The Profile of Farm Motorcycle Fatalities

Preliminary farm motorcycle fatality data provided by the National Occupational Health and Safety Commission recorded 24 deaths over a 3 year period. Males were the deceased in 22 cases and the majority of fatalities occurred between the age groups 0-14 years and 15-29 years. Five deaths were attributed to ATVs and the remaining 19 to 2-wheel motorcycles, a pattern that may change as increasing numbers of ATVs are used on Australian farms. More recently details of 4 fatal ATV accidents have been made available by the Victorian Workcover Authority, Monash University and NSW State Coroners Reports (Appendix 5). The meat cattle industry had recorded fatalities on both ATVs and 2-wheel motorcycles, the sugar cane and sheep industries had recorded fatalities on 2-wheel motorcycles only, and the cotton and dairy industries recorded fatalities on ATVs only. These results possibly reflect the usage patterns of motorcycles in the different industries. The task of mustering livestock resulted in the highest percentage of injuries, whereas fatal injuries were observed to happen while using the motorcycle for personal transport or recreation. Possible reasons for this observation may be that speeds travelled are faster, and therefore the impacting forces greater, when the motorcycles are used for transport and recreation. Similar to ATV injuries, fatal ATV injuries occurred to the upper body or trunk regions. The majority of 2-wheel motorcycle injuries occurred to the lower body regions, whereas fatal injuries were head injuries. The data provided by the National Occupational Health and Safety Commission has provided important baseline information on farm motorcycle fatalities, but it should be noted that due to coding difficulties and the decision of the attending police officer or coroner to report it as a work related fatality, the database may not have captured all farm motorcycle fatality cases.

6.5 The Profile of Farm Motorcycle Head Injury

The study has been assisted by head injury data provided by National Injury Surveillance Unit, Victorian Injury Surveillance System and Victorian Emergency Minimum Dataset, and preliminary farm motorcycle fatality data provided by the National Occupational Health and Safety Commission. Injury to the head represents only a small fraction of the overall injuries sustained by farm motorcycle riders, but severe head injury accounts for nearly half of the recorded fatalities. Data from the rider surveys, NISU and VISS show that the majority of head injuries are cuts and lacerations to the face and forehead. Similarly, fatal head injuries are often lacerations and bruising of the brain, with the majority of injuries occurring to the frontal sections of the brain. Fatal head injuries have also been associated with fractures of the skull. Both injury and fatal injury to the head appear to have common characteristics which raises the question of 'what mechanism determines a fatal head injury?' Unfortunately due to data collection and coding difficulties head injury data is not comprehensive and therefore it is extremely difficult to answer the above question. Nevertheless, the available data will play an important role in determining the design standards for an on-farm motorcycle helmet. When determining requirements for an on-farm motorcycle helmet the first consideration should be the regions of the head that need to be protected. The results from studies show that the majority of both fatal and non-fatal head injuries occur to the front, side and top regions of the head, and therefore the helmet needs to be designed to protect these regions. The next important consideration is that the majority of head injuries appear to be a result of the riders head coming into contact with the ground as they fall or are thrown from the motorcycle. Thirdly it appears that head injuries occur at speeds less than 50 km/h, with the majority occurring at speeds between 11-30 km/h. Even though the data is limited it provides important baseline information for the design and construction of an on-farm motorcycle helmet.

6.6 Injury Caused by ATV Rollover

23% of injuries were due to ATV rollover and 67% (4 from 6) of ATV deaths were contributed to rollover.

There has been worldwide interest in determining whether fitment of some form of ROPS would reduce risk of injury and death associated with ATV use (Allinson, 1996 and Van Auken & Zellner, 1997). The recommendations in these reports are conflicting in relation to whether ROPS reduces risk or increases risk to the rider. The researchers met with representatives from all ATV manufacturer's to discuss the technical report on ROPS which was commissioned by Honda America. This report describes the *"results of preliminary analyses of the effects on rider injury potential of fitting two types of rollover prevention systems (ROPS) to an all-terrain vehicle, in accordance with draft performance guidelines proposed by the Occupational Safety and health Service, Department of Labour Te Tari Mahi, New Zealand. The analyses involved computer simulations of 43 ATV rollover accident configurations (based on 59 of 105 UK HSE accident summaries); standardised simulation procedures defines in ISO 13232-7 (1996) for models of the ATV, ROPS, terrain, and helmeted and unhelmeted riders; and risk/benefit analysis, and injury indices defined in ISO 13232-5 for motorcycle riders. Results indicated that fitment of the example ROPS*

devices would reduce the potential for chest compression and abdominal penetration injuries. However such fitment, though slightly less injurious that would be the case for a rigid ROPS, would also substantially increase the potential for head (closed skull brain) injuries, and cervical, thoracic, and lumbar spinal injuries due to contact with the ROPS, and other effects. Therefore such devices are not recommended for fitment to ATVs at this time (Van Auken & Zellner, 1997)."

The manufacturer's are therefore recommending against the fitment of ROPS to ATVs at this time.

7 Conclusion and Recommendations

This study has provided information on the extent and use of farm motorcycles on Australian farms, the farm population exposed to the risk of injury and the mechanisms of injury associated with farm motorcycles. It has also provided valuable information on the role of the interactions between rider, motorcycle and environment in injury.

Identified key risk factors include:

- common use/importance of motorcycles in Australian agriculture across most commodities
- all age groups are at risk including the very young and the very old
- lack of formal training in farm motorcycle use
- use of personal protective equipment and clothing was variable, with very few wearing helmets and long trousers
- speed of motorcycle riding where speeds could reach up to and above 100 km/h
- poor motorcycle maintenance of brakes, suspension, chain and tyres
- mustering of stock poses a high risk of use of farm motorcycles
- injuries associated with ATVs probably occur less frequently than 2-wheels but are more severe when reported
- rollover main cause of deaths by ATVs
- main cause of death from 2-wheel motorcycles is head injury (42%)
- main cause of death from ATVs is multiple crush injury (60%)

Since the early study results have been discussed with farmers in the context of the Managing Farm Safety Training Course it has become clear that farmers, farm managers and motorcycle riders do not have adequate knowledge regarding risks associated with motorcycle riding including stability factors on ATVs, correct loading, the manufacturer's advice in relation to passengers, towing capacity and tyre pressure for safe maintenance requirements (Fragar, L. & Houlahan, J. 1998 pers. comm. 31 March). This anecdotal advice is confirmed by the studies findings in relation to maintenance of motorcycles and source of motorcycle training.

Recommendations derived from the study include:

- in the development of injury databases more information regarding farm motorcycle injury and fatalities is required to better inform injury programs. There is a need to differentiate between 2-wheel motorcycles and ATVs and the different mechanisms of injury associated with each, although there are often similarities.
- the health and safety risks associated with the use of motorcycles on farms should be included in education and promotion programs to help farmers, farm managers and farm workers to manage occupational health and safety risks.
- competency based ATV and 2-wheel farm motorcycle training courses should be developed with the aim of improving both rider knowledge and rider skills. The courses need to cater for both young and older riders, as well as both male and female riders. The importance of rider, motorcycle and environmental factors and their interactions should be emphasised as well as safe use of the motorcycle in the performance of such tasks as mustering and chemical application.

- the importance of wearing protective clothing and maintaining the motorcycle should be emphasised to farm motorcycle riders.
- information regarding the carrying of passengers and recommended age of riders for both ATVs and 2-wheel motorcycles should be made available to all riders or their guardians.
- head injury information should be referred to an expert panel to determine a suitable standard for an on-farm motorcycle helmet. If possible a common standard for equestrian and motorcycle use on farms should be pursued.
- research information regarding the benefits and risks of the fitment of ROPS to ATVs should be referred to an expert panel to prepare advice for Australian suppliers, farmers and farm managers.

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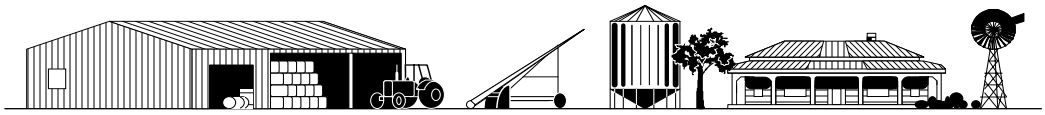
Appendix 1: Farm Motorcycle Rider Survey



AUSTRALIAN AGRICULTURAL HEALTH UNIT
FARM MOTORCYCLE RESEARCH PROJECT
PO BOX 256 MOREE NSW 2400
TELEPHONE (067) 529203 FAX (067) 526633

Date...../...../..... I.D. NUMBER:.....

FARM MOTORCYCLE RIDER SURVEY

THANK YOU FOR COMPLETING THIS SURVEY WHICH WILL HELP THE AG HEALTH UNIT IDENTIFY IMPORTANT ISSUES CONCERNING 2, 3, AND 4 WHEEL FARM MOTORCYCLE SAFETY.

INSTRUCTIONS
PLEASE PLACE A TICK OR CROSS IN THE APPROPRIATE BOX(ES)

1. PERSONAL DETAILS

We would like to ask you some personal details so that we are able to define the population exposed to the risk of injury from farm motorcycles. All information recorded will remain confidential.

a) Year of Birth: 19.....

b) Sex: □ Male □ Female

c) Height.....cm

d) Weight.....kg

e) Residential Postcode:.....

f) What class drivers licence do you hold?.....

g) How long have you held a driver's licence for?.....yrs

h) Do you hold a motorcycle licence? □ Yes / □ No

j) What is your employment status?
- □ Farm Owner
- □ Farm Manager
- □ Farm Worker
- □ Farm Family Member
- □ Other, specify.....

.....

i) How long have you held a motorcycle licence for?.....yrs

k) If you hold an on - road motorcycle licence how often have you ridden on the road in the past year?

□ Just Once □ 2 - 3 times □ 4 - 10 times □ 11 - 20 times

□ More than 20 times □ Don't know

* * * * * *

2. FARM DETAILS

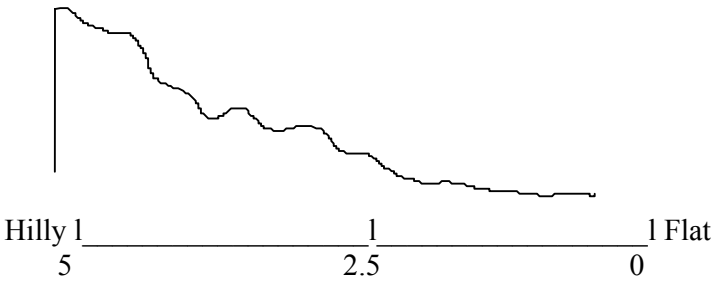
If you do not live or work on a farm but have ridden a farm motorcycle please move on to Section 3: Experience.

a) What type of farm are you on?

□ Cereal Grains
□ Meat Cattle - Cereal Grains
□ Sheep
□ Dairy
□ Sugar Cane
□ Poultry
□ Vegetables
□ Sheep - Cereal grains
□ Sheep - Meat Cattle
□ Meat Cattle
□ Pigs
□ Cotton
□ Fruit
□ Other, please specify.....

…….....

b) On the scale below rank the topography of your property (if your property is a mixture of hills and flat place a mark at 2.5, if it is more hilly then flat place a mark between 2.5 and 5).



c). Farm Size.....ha

* * * * * *

3. EXPERIENCE

a) How frequently would you ride a farm motorcycle?

□ 3 days a week or more □ 1 - 2 days a week
□ 1 - 3 days a month □ A few days a year
□ Don't know

b) How long have you been using farm motorcycles?

□ < 1 year □ 1 - 2 years □ 2 - 5 years □ > 5 years

c) At what age did you start riding a farm motorcycle?.....years

d) On a busy day how long would you spend riding a farm motorcycle?

□ < half hour □ < 1 hour □ 1 - 2 hours □ 2 - 5 hours
□ > 5 hours

On a slow day how long would you spend riding a farm motorcycle?

□ < half hour □ < 1 hour □ 1 - 2 hours □ 2 - 5 hours
□ > 5 hours

e) Who taught you how to ride a farm motorcycle? *(tick more then one if necessary)*

□ Self □ Friend □ Dad □ Mum

□ Brother / Sister □ Instructor □ Other Adult, please specify.....

f) Do you feel that a farm motorcycle education program, which would include safety and maintenance aspects, should be made more accessible to the people that ride these motorcycles.

□ Yes
□ No
□ Don't Know

g) Have you completed a motorcycle rider training course?

□ Yes / □ No

h) If yes: What year did you complete it? 19.....

Where was the course and who held it?

Where:.....

Who:.....

i) Would you make use of an education program?

- ☐ Yes **Go to Q3.i**
- ☐ No
- ☐ Don't Know

If no, whynot?.....

.....

.....

j) How often do you use a motorcycle, on the farm, for recreational purposes?

- ☐ Once a week or more
- ☐ Less then once a week
- ☐ Never

k) How often do you use a motorcycle, off the farm, for recreational purposes?

- ☐ Once a week or more
- ☐ Less then once a week
- ☐ Never

l) Approximately, how many kilometres would you do on your farm motorcycle per year?

.....km

* * * * * *

4. MOTORCYCLE DETAILS

If you do not have a motorcycle/s on the farm where you live or work please move on to Section 5: Protective Clothing and Equipment.

a) How many motorcycles are on the farm where you live and / or work?.....

b) Can you give the following technical details about the motorcycles on your farm?

	Motorcycle 1	Motorcycle 2	Motorcycle 3	Motorcycle 4
Make				
Size (cc)				
Year of Manufacture				
Age (yrs)				
2, 3 or 4 Wheeler				

c) Are the brakes of all motorcycles functioning well?
□ Yes □ No □ Don't know

d) Are all the hand control levers in good condition?
□ Yes □ No □ Don't know

e) Are the lights of all motorcycles functioning?
□ Yes □ No □ Don't know

f) How often is routine maintenance performed on your motorcycle?
Oil:
□ Always □ Usually □ Sometimes □ Never □ Breakdown
Brakes:
□ Always □ Usually □ Sometimes □ Never □ Breakdown
Suspension:
□ Always □ Usually □ Sometimes □ Never □ Breakdown
Chain:
□ Always □ Usually □ Sometimes □ Never □ Breakdown
Tyres:
□ Always □ Usually □ Sometimes □ Never □ Breakdown
Exhaust:
□ Always □ Usually □ Sometimes □ Never □ Breakdown

g) How often do you perform routine maintenance on your motorcycle/s?

□ Once a week □ 1 - 3 months □ 4 - 6 months □ 7 - 9 months
□ 10 - 12 months □ Don't know

h) What is the condition of the motorcycle seat? *(tick more then one if necessary)*
□ Fully Covered □ Cover Torn □ Cover Missing
□ Foam Deteriorating

i) What are the main use/s for your farm motorcycle/s?

Recreation:	□ Often	/ □ Occasionally	/ □ Never
Transport:	□ Often	/ □ Occasionally	/ □ Never
Spraying:	□ Often	/ □ Occasionally	/ □ Never
Mustering:	□ Often	/ □ Occasionally	/ □ Never
Carrying:	□ Often	/ □ Occasionally	/ □ Never
Towing:	□ Often	/ □ Occasionally	/ □ Never

Other:.....

j) What would the average speed of motorcycle operation be on your farm?.....km/h

k) What would the maximum speed of motorcycle operation be on your farm?.....km/h

l) During what periods of the day would you normally ride your motorcycle?
□ 6.00am - 10.00am □ 10.00am - 3.00pm □ 3.00pm - 6.00pm
□ After 6.00pm

m) Approximately how often would you consider replacing the motorcycles on your farm?

.....

* * * * * *

5. PROTECTIVE CLOTHING AND EQUIPMENT

a) When you ride a farm motorcycle how often do you wear?

Helmet: □ Always / □ Usually / □ Sometimes / □ Never
Long Sleeves: □ Always / □ Usually / □ Sometimes / □ Never
Work Boots: □ Always / □ Usually / □ Sometimes / □ Never
Long Pants: □ Always / □ Usually / □ Sometimes / □ Never
Gloves: □ Always / □ Usually / □ Sometimes / □ Never
Goggles: □ Always / □ Usually / □ Sometimes / □ Never

b) What features would you like to see in an on farm helmet (helmet designed specifically for agricultural use)?
□ Open Face □ Quick Release Strap □ Ventilation System □ Brim
□ Other, please specify.....

.....

.....

* * * * * *

6. INJURY DETAILS

a) Have you had a farm motorcycle injury?

□ Yes **Go to Q6.b**

□ No **Go to Q7**

ACCIDENT

b) If yes, please specify the type of injury you sustained in your most recent accident *(please tick only one).*

□ Cuts / Lacerations
□ Puncture / Penetrating
□ Abrasions
□ Bruising
□ Swelling / Pain
□ Burns
□ Foreign Body
□ Crush Injury
□ Fracture
□ Dislocation
□ Sprain / Strain
□ Other, please specify.....

If yes, please specify the body part injured *(choose the body part that was most seriously injured).*

Head:
- □ Eye
- □ Nose
- □ Ear
- □ Face/cheek/forehead
- □ Skull

Upper Body:
- □ Shoulder
- □ Upper arm
- □ Elbow
- □ Forearm
- □ Wrist
- □ Finger
- □ Hand

Trunk:
- □ Ribs
- □ Spine
- □ Pelvis
- □ Chest
- □ Abdomen
- □ Back
- □ Genitalia

Lower Body:
- □ Hip
- □ Upper leg
- □ Knee
- □ Lower leg
- □ Ankle
- □ Toes
- □ Foot

c) If yes, please specify the way the accident occurred (eg collision with stump, swerved to miss a rock, lost balance etc)

.....

.....

.....

.....

d) If yes, what type of farm motorcycle were you riding?

Make:.....

Engine Size:.....cc

Age of Motorcycle:.....yrs

Number of Wheels: □ 2 wheels □ 3 wheels □ 4 wheels

e) If yes, approximately how long had you been on the motorcycle?
□ < half hour □ 1 hour □ 1 - 2 hours □ 2 - 4 hours □ > 4 hours

f) If yes, approximately how fast were you going when the accident

occurred?.....km/h

g) If yes, what physical activities had you been performing in the last 24 hrs?
eg, shearing, drenching, fencing etc

.....

.....

h) Did you seek medical treatment? □ Yes / □ No

i) In hindsight, what do you think could have prevented the accident or reduced your injury?, eg, better brakes, riding slower, wearing a helmet, more experience etc

.....

.....

.....

* * * * * *

7. NEAR MISS INCIDENTS

a) Have you ever had a fall from a motorcycle that has not resulted in injury? , eg, hit a rock and thrown over the handlebars landing on your back

.....

.....

.....

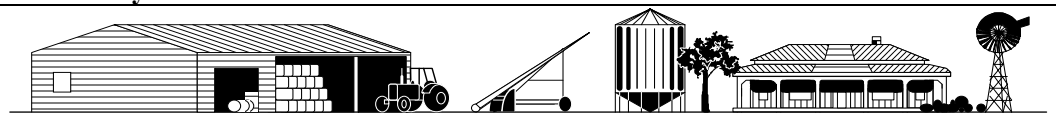
b) If yes, what advice could you give to other riders to prevent them from having the same fall or from sustaining an injury.

.....

.....

THANK YOU VERY MUCH FOR YOUR TIME

Appendix 2: Women on Farms Survey



AUSTRALIAN AGRICULTURAL HEALTH UNIT
FARM MOTORCYCLE RESEARCH PROJECT
PO BOX 256 MOREE NSW 2400 TELEPHONE (067) 528210 FAX (067) 526633

WOMEN ON FARMS
THE AUSTRALIAN AGRICULTURAL HEALTH UNIT NEEDS YOUR HELP

The majority of Australian Farms have at least one farm motorcycle in operation. The farm motorcycle, or the "agbike, " has adopted the role of both horse and farm utility (ute) on many Australian Farms. These machines are worked tirelessly and it seems that very little thought is given to the risks and dangers associated with farm motorcycle operation.

The Australian Agricultural Health Unit is undertaking a project looking at improving safety for farm motorcycle riders. In the interests of improved farm safety we would like to enlist your help, and ask that you complete the following survey and

return it to: **REPLY PAID 159**
ATTN: TARA SCHALK
AUSTRALIAN AGRICULTURAL HEALTH UNIT
PO BOX 256
MOREE NSW 2400

WE ENCOURAGE YOU TO BE A PART OF IMPROVING SAFETY AND HELP US HELP FARMERS

INSTRUCTIONS

SECTION 1 - PERSONAL DETAILS

Please complete for every member of your family, including yourself.

SECTION 2 - FARM DETAILS

Place a tick or a cross in the appropriate boxes.

SECTION 3 - MOTORCYCLE DETAILS

Place a tick or a cross in the appropriate boxes

SECTION 4 - INJURY DETAILS

If someone in your family has been injured in a farm motorcycle accident please complete Section 4. The injury does not need to be a serious injury, minor cuts and bruises are also classed as an injury.

1. PERSONAL DETAILS

	Year of Birth	Sex	Height	Weight	Age at Which Started to Ride	Who Taught	How Often Do They Ride	Employment	Driver's Licence	When They Ride They Wear The Following
Example	*1960*	*M*	*190cm*	*90kg*	*8*	*Dad*	*3 days/w*	*Farm Owner*	*5BR*	*Helmet, Long Sleeves, Work Boots, Long Pants, Gloves, Goggles*
Person 1										
Person 2										
Person 3										
Person 4										
Person 5										

Person 6										

2. FARM DETAILS

Residential Postcode: ..... Farm Size:..... What type of farm are you on?

Is your farm:

- □ Hilly
- □ Undulating to Hilly
- □ Undulating
- □ Flat to Undulating
- □ Flat

□ Cereal Grains □ Sheep - Meat Cattle
□ Sheep □ Meat Cattle
□ Dairy □ Pigs
□ Sugar Cane □ Cotton
□ Fruit □ Poultry
□ Vegetables □ Other.....

3. MOTORCYCLE DETAILS

Howmany motorcycles do you have on your farm?.....

How often is routine maintenance performed on your motorcycle/s?

□ Once a week □ 1-3 months □ 4-6 months □ 7-9 months □ 10-12 months □ When required □ Don't know

What are the main use/s for your farm motorcycle/s?

Recreation: □ Often / □ Occasionally / □ Never
Transport: □ Often / □ Occasionally / □ Never
Spraying: □ Often / □ Occasionally / □ Never
Mustering: □ Often / □ Occasionally / □ Never
Carrying: □ Often / □ Occasionally / □ Never
Towing: □ Often / □ Occasionally / □ Never
Other:.....

During what periods of the day would your motorcycle/s be normally ridden?

□ 6.00am - 10.00am □ 10.00am - 3.00pm □ 3.00pm - 6. 00pm □ After 6.00pm

4. INJURY DETAILS

If someone on your farm has been injured in the last 2 years please complete the following Section

Age at time of accident:…….. Sex: □ Male / □ Female What was the motorcycle being used for? Eg mustering……

Please specify the nature of the injury and the body part affected? (eg fracture, right forearm)

…….

…….

In detail write what the rider was doing just before the accident (eg, riding through gully while mustering sheep)

……..

…….

What went wrong to cause the rider to have the accident (eg losing control of the motorcycle after hitting a rock)

……..

……..

How did the injury occur? (eg fell and arm hit a rock resulting in a fracture)

…….

…….

What type of farm motorcycle was the rider on?
Make:……..

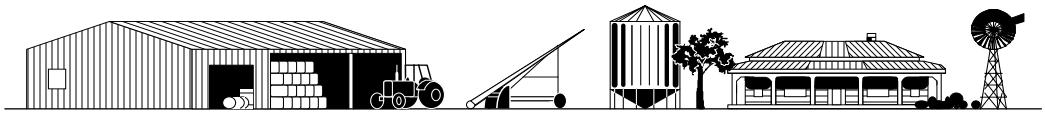
Approximately how long had the rider been on the motorcycle?
□ < half hour □ 1 hour □ 1-2 hours □ 2-4 hours □ > 4 hours

Engine Size:……..cc
Age of Motorcycle:……yrs

Did the rider seek medical treatment? □ Yes / □ No

Number of Wheels:……

Appendix 3: Farm Motorcycle Injury Survey



AUSTRALIAN AGRICULTURAL HEALTH UNIT
FARM MOTORCYCLE RESEARCH PROJECT
PO BOX 256 MOREE NSW 2400 TELEPHONE (067) 528210 FAX (067) 526633

FARM MOTORCYCLE INJURY SURVEY

THANK YOU FOR COMPLETING THIS SURVEY WHICH WILL HELP THE AG HEALTH UNIT IDENTIFY IMPORTANT ISSUES CONCERNING 2, 3, AND 4 WHEEL FARM MOTORCYCLE SAFETY.

INSTRUCTIONS
PLEASE PLACE A TICK OR CROSS IN THE APPROPRIATE BOX(ES)

1. PERSONAL DETAILS

All information recorded will remain confidential.

a) Year of Birth: 19.....

b) Sex: □ Male □ Female

c) Height.....cm

d) Weight.....….....kg

e) Residential Postcode:.....

f) What class licence do you hold?.....

g) What is your employment status?
- □ Farm Owner
- □ Farm Manager
- □ Farm Worker
- □ Farm Family Member
- □ Other, specify.....

.....

h) How long have you held a driver's licence for?.....yrs

i) Do you hold a motorcycle licence? □ Yes / □ No

j) How long have you held a motorcycle licence for?.....yrs

k) If you hold an on- road motorcycle licence how often have you ridden on the road in the past year?

□ Just Once □ 2 - 3 times □ 4 - 10 times □ 11 - 20 times

□ More than 20 times □ No times □ Don't know

* * * * * *

2. FARM DETAILS

If you do not live or work on a farm please move onto Section 3: Questions About the Motorcycle You Were Riding.

a) What type of farm are you on?

□ Cereal Grains
□ Meat Cattle - Cereal Grains
□ Sheep
□ Dairy
□ Sugar Cane
□ Poultry
□ Vegetables
□ Sheep - Cereal grains
□ Sheep - Meat Cattle
□ Meat Cattle
□ Pigs
□ Cotton
□ Fruit
□ Other

b) On the scale below rank the topography of your property (if your property is a mixture of hills and flat place a mark at 2.5, if it is more hilly than flat place a mark between 2.5 and 5).

Hilly l_____l_____l Flat
5 2.5 0

c). Farm Size.....ha

* * * * * *

3. QUESTIONS ABOUT THE MOTORCYCLE YOU WERE RIDING

a) Were you riding your own farm motorcycle when the accident occurred?

□ Yes / □ No

b) How familiar with the motorcycle were you?

□ Very Familiar □ Reasonably Familiar □ Unfamiliar

c) What type of farm motorcycle were you riding?

Make:.....

Engine Size:.....cc

Age of Motorcycle:.....yrs

Number of Wheels: □ 2 Wheels □ 3 Wheels □ 4 Wheels

d) How long have you been using farm motorcycles?

□ < 1 year □ 1 - 2 years □ 2 - 5 years □ > 5 years

e) How frequently would you ride a farm motorcycle?

□ 3 days a week or more □ 1 - 2 days a week
□ 1 - 3 days a month □ A few days a year
□ Don't know
□ Other, please specify.....

f) At what age did you start riding a farm motorcycle?.....years

g) Who taught you how to ride a farm motorcycle?
(You may tick more then one box if necessary)

□ Self □ Friend □ Dad □ Mum

□ Brother / Sister □ Instructor □ Other Adult, please specify.....

h) Were the brakes of the motorcycle functioning well? □ Yes / □ No / □ Don't Know

i) Were the hand control levers in good condition? □ Yes / □ No / □ Don't Know

j) Were the lights of the motorcycle functioning? □ Yes / □ No / □ Don't Know

k) How often is routine maintenance performed on your motorcycle?

Oil:
□ Always □ Usually □ Sometimes □ Never □ Breakdown

Brakes:
□ Always □ Usually □ Sometimes □ Never □ Breakdown

Suspension:
□ Always □ Usually □ Sometimes □ Never □ Breakdown

Chain:
□ Always □ Usually □ Sometimes □ Never □ Breakdown

Tyres:
□ Always □ Usually □ Sometimes □ Never □ Breakdown

Exhaust:
□ Always □ Usually □ Sometimes □ Never □ Breakdown

l) How often is routine maintenance performed on the motorcycle you were riding?
□ Once a week □ 1 - 3 months □ 4 - 6 months □ 7 - 9 months
□ 10 - 12 months □ Don't know

m) What was the condition of the seat? *(You may tick more then one box if necessary)*

□ Fully Covered □ Cover Torn □ Cover Missing
□ Foam Deteriorating

* * * * * *

4. PROTECTIVE CLOTHING AND EQUIPMENT

a) Were you wearing any protective clothing when the accident occurred?

□ Yes / □ No

If you were not wearing any protective clothing when the accident occurred, please move onto Q4.d.

(You may tick more then one box if necessary)

b) If yes, please specify:

□ Long Trousers
□ Work Boots
□ Helmet
□ Goggles
□ Gloves
□ Long Sleeves

c) If you were wearing a helmet did it stay on during the impact? □Yes / □No

What type of helmet were you wearing?, eg, open face, full face etc

.....

d) What features would you like to see in an on farm helmet (helmet designed specifically for agricultural use)?

(You may tick more then one box if necessary)

□ Open Face □ Quick Release Strap □ Ventilation System □ Brim

□ Other, please specify.....

.....

* * * * * *

5. INJURY DETAILS

a) What purpose was the motorcycle being used for?

□ Recreation
□ Transport
□ Carrying
□ Towing

□ Spraying □ Other.....
□ Mustering

b) In detail write what you were doing just before the accident (eg, riding through gully while mustering sheep).

.....

.....

.....

.....

c) What went wrong to cause you to have the accident, eg, losing control of the motorcycle after hitting a rock.

.....

.....

.....

d) How were you injured? (eg fell and arm hit a rock resulting in a fracture)

……...

……

e) Please specify the body part injured *(choose the body part that was most seriously injured).*

Head:
- □ Eye
- □ Nose
- □ Ear
- □ Face/cheek/forehead
- □ Skull

Upper Body:
- □ Shoulder
- □ Upper arm
- □ Elbow
- □ Forearm
- □ Wrist
- □ Finger
- □ Hand

Trunk:
- □ Ribs
- □ Spine
- □ Pelvis
- □ Chest
- □ Abdomen
- □ Back
- □ Genitalia

Lower Body:
- □ Hip
- □ Upper leg
- □ Knee
- □ Lower leg
- □ Ankle
- □ Toes
- □ Foot

f) What type of injury did you have? *(please tick only one).*

- □ Cuts / Lacerations
- □ Abrasions
- □ Swelling / Pain
- □ Foreign Body
- □ Fracture
- □ Puncture / Penetrating
- □ Bruising
- □ Burns
- □ Crush Injury
- □ Dislocation
- □ Sprain / Strain
- □ Other, please specify.....

If you did not sustain a head injury, please move onto Section 6: Accident Details.

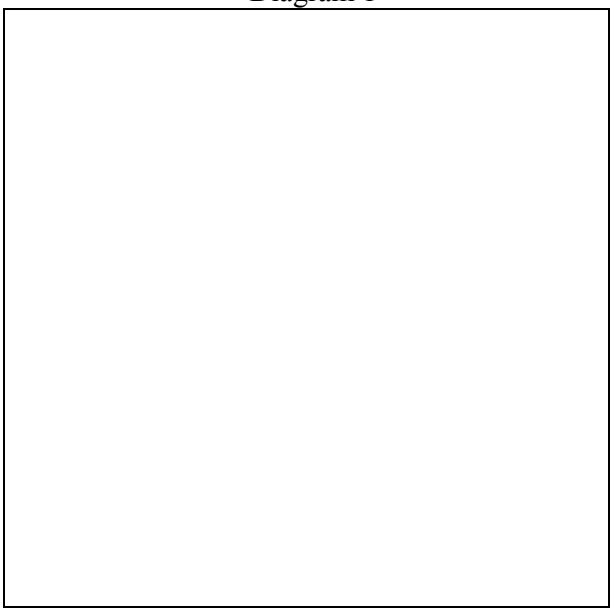
g) If you sustained a head injury, can you describe the injury? (eg, abrasion, concussion, open penetrating wound etc).

.....

.....

h) If you sustained a head injury, can you identify, using the diagrams below, the area of your head that was injured?

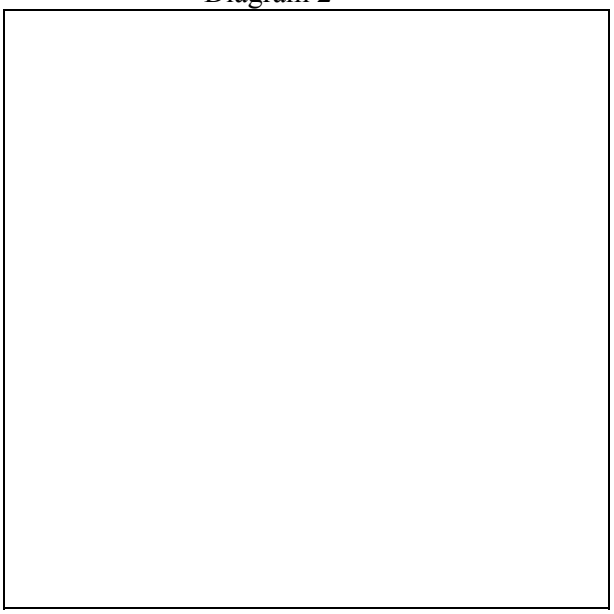
Diagram 1



What area of your head was injured? *(tick more then one if necessary)*

□ Section 1 □ Section 2 □ Section 3 □ Section 4 □ Section 5

Diagram 2



What area of your head was injured? *(tick more then one if necessary*

□ Section A □ Section B □ Section C □ Section D □ Section E

□ Section F □ Section G

6. ACCIDENT DETAILS

a) Date:...../...../19..... Day of Week:.....

Time:..... Light / Dark:.....

Temperature: Cold Cool Warm Hot
 Don't Know

b) What were the weather conditions like at the time of the accident? *(tick more then one if necessary).*

 Cloudy Windy Raining Frosty Sunny Foggy
 Don't Know

c) What sort of environment (terrain) were you riding on / in?

 Sand Long Grass Bush / Trees Rocky / Rough
 Gravel Smooth / Grass Bitumen
 Descent Ascent Other, please specify.....

.....

d) Can you estimate at approximately what speed the accident occurred?.....km / h

e) Approximately how long had you been on the motorcycle before the accident occurred?

 < half hour 1 hour 1 - 2 hours 2 - 4 hours > 4 hours
 Don't Know

f) What physical activities had you been performing in the last 24 hours prior to your accident? eg, shearing, drenching, fencing etc.

.....

g) In hindsight, what do you think could have prevented the accident or reduced your injury?, eg, better brakes, riding slower, wearing a helmet, more experience etc

.....

.....

.....

h) At the time of the accident what was the motorcycle loaded with? eg spray tank, bale of hay, tool box etc

.....

.....

i) The motorcycle you were riding did it have any other fittings attached to it? eg a safety rollover frame

.....

j) Were you towing anything at the time of the accident? eg a trailer

…….....

k) Would any of these factors have contributed to your accident?

- □ Lack of experience
- □ Fatigue
- □ Ill Health
- □ Poor Work Practice
- □ Carelessness
- □ Haste
- □ Maintenance

□ Other, please specify.....

.....

l) Were you the rider or the pillion passenger at the time of the accident?……..

If you were the rider please move onto and complete Section 7: Education Program

If you were the pillion passenger please complete the following Section: Rider

RIDER

a) Rider's Year of Birth: 19.....

b) Sex of Rider: □ Male □ Female

c) Height of Rider.....cm (approx) □ Other, specify.....

d) Weight of Rider.....kg (approx) ……

e) Rider's employment status?
- □ Farm Owner
- □ Farm Manager
- □ Farm Worker
- □ Farm Family Member

f) How long has the Rider been using farm motorcycles to your knowledge?
□ < 1 year □ 1 - 2 years □ 2 - 5 years □ > 5 years

g) How frequently would the Rider use a farm motorcycle to your knowledge?
- □ 3 days a week or more
- □ 1 - 2 days a week
- □ 1 - 3 days a month
- □ A few days a year
- □ Don't know
- □ Other, please specify.....

h) At what age did the Rider start riding a farm motorcycle?.....years

7. EDUCATION PROGRAM

a) Do you feel that a farm motorcycle education program, which would include safety and maintenance aspects, should be made more accessible to the people that ride these motorcycles.

- □ Yes
- □ No
- □ Don't Know

b) Have you completed a motorcycle rider training course?

□ Yes / □ No

c) If yes: What year did you complete it? 19.....

Where was the course and who held it?

Where:.....

Who:.....

d) Would you make use of an education program?

- □ Yes
- □ No
- □ Don't Know

If no, whynot?.....

.....

.....

THANK YOU VERY MUCH FOR YOUR TIME

Appendix 4 Motorcycle Training Courses Attended by Respondent/Riders

Date of Training	Place of Training	Trainer
1974		Yamaha Australia
1996	Armidale	RTA
1978	Inverell	Motocross School
1985	Sydney	Stay Upright
1994	Inverell	RTA
1969	Marylands	Police Academy
1956	Beebury	
1980	Geraldton	Traffic Department
1994	Perth	Ajax Driver Learning
1994	Coastal Park	Stephen Gall's Academy of Off Road Riding
1996	Kyogle	Tucki Motocross
1972		
1995	Nowra	Nowra Bike Farm
1995	Tocal	Tocal Ag College
1996	Tocal	Tocal Ag College
1996	Tocal	Tocal Ag College
1996	Tocal	Tocal Ag College
1996	Tocal	Tocal Ag College
1996	Tocal	Tocal Ag College
1996	Tocal	Tocal Ag College
1996	Tocal	Tocal Ag College
1991	Warrnambool	VicRoad Pre Licence
1993	Shepparton	DECA
1996	Wangaratta	DECA
1956	Seymour	Army
1987	Shepparton	DECA
1996	Wangaratta	DECA
1984	Dubbo	Morris Park Sports Club
1984	Shepparton	Dookie University
1989	Warrigal	
1995	Wagga Wagga	RTA
1997	Wollongbar	TAFE
1996	Wollongbar	TAFE

Appendix 5 Farm Motorcycle Fatalities

Case 1

During the period of 1990-1994 2 children aged between 0-14 years were fatally injured while riding ATVs. The first child died as a result of a spider or snake bite while being pinned under the ATV after swerving to miss an electric fence, the other died as a result of unknown injuries after losing control of the ATV in an empty dam (Begg, 1997).

Case 2

During February 1997 a 62 year old self-employed farmer was operating an ATV with a 100 litre spray tank fitted to spray weeds on his property. The area was very steep, and the ATV hit a cow rut causing the deceased to be catapulted over the handlebars (Victorian Workcover Authority, 1997).

Case 3

During March 1997 a 21 year old male employee was fatally injured while mustering sheep on an ATV. The cause of death was stated as haemorrhage from severe head injuries (New South Wales State Coroners Report, 1997).

Appendix 6 n Values

Figure 24u: The Relationship Between Motorcycle Task and Injury on 2-wheel Motorcycles and ATVs

Task	n Values	
	2-wheel Motorcycles	ATVs
Recreation	491	46
Transport	491	46
Spraying	491	46
Mustering	491	46
Carrying	490	46
Towing	491	46

Figure 36c Routine Maintenance

Routine Maintenance	n Values
Oil	29
Brakes	29
Suspension	29
Chain	26
Tyres	29
Exhaust	29

Figure 37a: Personal Protective Clothing Injured Riders Were Wearing

Personal Protective Clothing	n Values
Workboots	29
Long Pants	30
Long Sleeves	29
Helmet	29
Gloves	29
Goggles	29