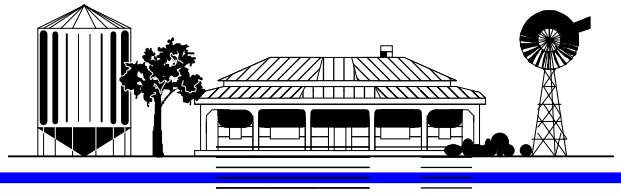
Profile of the Health and Safety of Australian Farmers, Farm Families and Farm Workers



Richard Coleman

Dr. Lyn Fragar

Christine Morton

Kirsty Winter

November- 1996

RIRDC Funded National Farm Injury Data Collection Project.

CONTENTS

Executive Summary

The cost impacts of poor agricultural health and safety have been estimated at between $0.5 and 1.3 billion dollars per annum. Agriculture rates as one of the most hazardous industries in Australia by any measure of the impact of injury and illness.

A major study of work-related fatalities in Australia for the years 1982-1984 indicated that the annual rural work-related rate was 22.09 per 100,000 persons, and followed only mining and transportation in significance. (Harrison J et al,1989) There were 224 fatalities where the deceased was involved in rural work at the time of injury. A further 34 children aged less than 15 years sustained fatal injuries in the course of farming activity.

All fatality reporting mechanisms and studies highlight the risks involved with tractor operation. Erlich et al (1993) note that 40% of all deaths in both the employed civilian workforce and children less than 15 years were caused by tractor. With tractor roll overs constituting 27% of the adult and 35% of the child deaths. Evidence from state based data systems confirm that tractor roll overs continue to be the primary cause of farm related injury death in the adult population.

In order to reduce injury deaths in agriculture Farmsafe Australia must address;

1. Tractor rollovers and ROPS fitment
2. Tractor Runovers
3. Machine Guarding
4. Confined Space entry
5. Childhood drowning

To prevent injuries requiring admission to hospital, Farmsafe needs to address;

1. Farm motorcycle injury
2. Horse related injuries
3. Machinery Injury - Specifically Guarding
4. Animal handling related injury.

Noise Induced Hearing Loss (NIHL) is a major problem affecting the quality of life of up to 80% of Australian Farmers. There are a range of potential reasons for the extent of noise induced hearing loss in farmers, farm machinery, including tractors, workshop tools and chainsaws, certain animal handling tasks such as feeding in piggeries and shooting all create damaging noise levels. There is potential for NIHL to be a farming epidemic given increases in mechanisation and the long hours necessary to operate a successful farm.

The data to describe the full extent of human health effects from exposure to pesticides is not available. There are a number of reasons for this including the potential long latency periods for chronic illness, the difficulty in diagnosing acute health effects, the non-specific nature of pesticide health effects and the lack of an effective monitoring system.

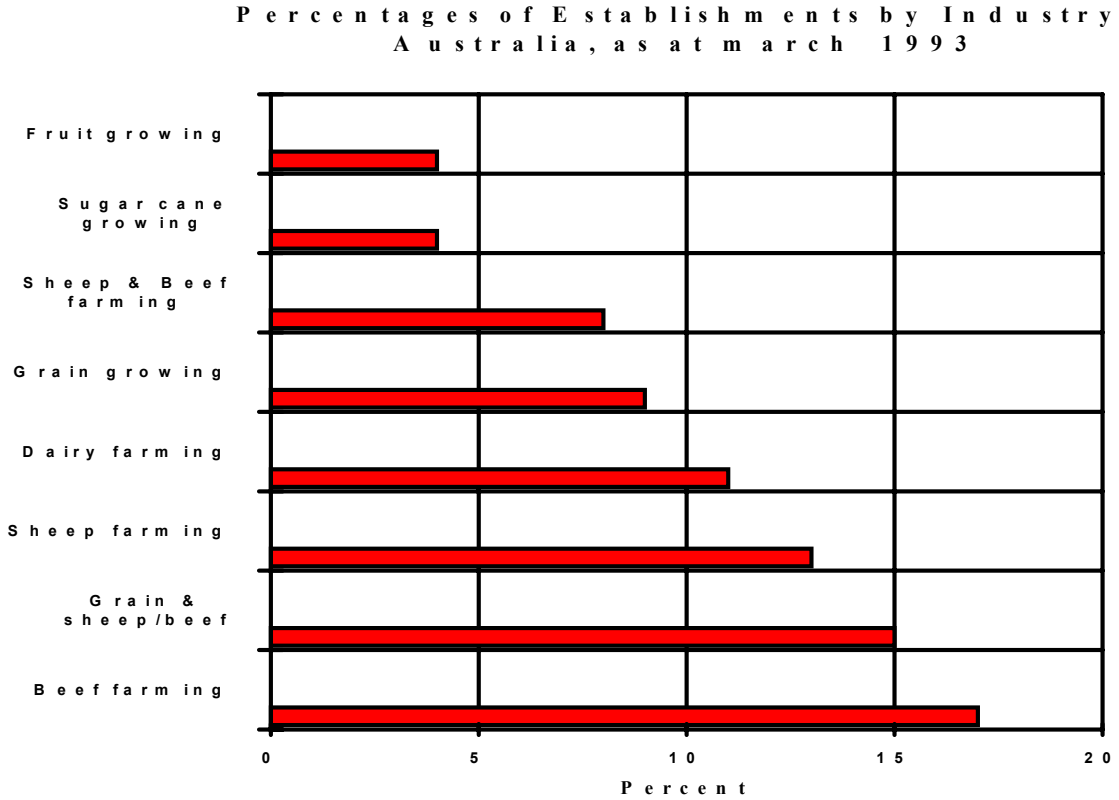
1. Introduction

1.1 Industry Structure

Both inter product process diversity and intra product diversity have implications for safety and health. Different dairy designs may have different back injury or burns risks which may be completely different from the both the type and likelihood of injury within broadacre cropping in a general sense and different again from injury risk during harvesting more specifically. These variations have been recognised by agricultural commodity groups in Australia and this has led to the development of specific commodity group health & safety plans and profiles.

The distribution of farm types is reflected in Figure 1. As can be seen, livestock industries predominate.

Figure 1.



Source: ABS Characteristics of Australian Farm No.71

The 1993/94 agricultural census conducted by the Australian Bureau of Statistics was responded to by 150,389 producers, each having an estimated value of agricultural output greater than $5000. This figure is the closest approximation we have to the number of farms in Australia. Producers with more than one property can chose to either return data about each property on one census form or to fill out a separate form for each property. The net effect of this is unknown. (ABS, Agstats,1994)

The scope of Australian agriculture is massive, some 469,053,831 Ha being devoted to agricultural production. (ABS, Agstats,1994)

In terms of number of establishments Australia wide, 6 farmtypes comprise 75.% of the total establisments. These farmtypes and their distribution interstate are displayed in Table 1.

Table 1.

Number of Establishments with Agricultural Activity, by Industry of Establishment, States and Territories, 31 March 1993

ANZSIC Code	Description	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	**Aust.**
0121	Grain Growing	2060	2502	1397	2911	2311	19	5	-	**11205**
0123	Grain - sheep/beef cattle	6843	2738	1682	3314	4008	82	2	-	**18669**
0123	Sheep-beef cattle	3584	2872	1117	987	633	418	-	28	**9639**
0124	Sheep	7216	4399	872	1523	2025	516	-	25	**16576**
0125	Beef Cattle	5615	5066	7673	538	1175	578	203	15	**20863**
0126	Dairy Cattle	1965	7627	1840	849	514	767	-	1	**13608**
	Total	**27283**	**25204**	**14581**	**10122**	**10666**	**2380**	**90236**	**69**	**90560**

Source: ABS Characteristics of Australian Farms CAT. No. 7102

Employment within agriculture is quantifiable with reference to the ABS Labour Force survey. Both the number and wage and salary earner composition of the Australian agricultural industry for 1993/94 is displayed in Table 2.

Table 2.

Total Number and Percentage Composition of Wage and Salary Earners in Australian Agriculture 1993/94

Industry	Wage and Salary Earners	Total Employed	Percentage of Wage and Salary Earners
Agriculture	115,904	363,295	31.9%
Services to Agriculture	11,101	17,714	62.67%
Total	127,005	381,009	33.3%

Source: ABS, Labour Force 1993/94

At the 1990/91 Agricultural Census there were 219306 males and 188502 females resident on Australian farms. Unforntunately details regarding age breakdowns and employment are unvailable. (ABS, 1991 Agricultural Census, unpublished data)

The number of farms in Australia has markedly declined in the post war period. The number of farms in the early 1950's were estimated at more than 205,000 (Pestana, 1993). Farming operations have undergone a corresponding doubling of size in the average individual farm.

The majority of farms in Australia are still family owned and operated. Only 5% of farms are categorised as corporate farms and run as public or private companies. Approximately 60% of farms are operated under a family partnership, with 29% of farms being sole operated. (Pestana, 1994).

ABS Labour Force figures show that the period up until the mid to late 1980's was one of growth for the agricultural sector and was a time during which considerable change in the structure of the farm workforce occurred. Between the late 1980's and 1991 ABS surveys reveal that the farm workforce declined by over 5000 persons, Table 3.

Table 3

Farm Workforce by Industry, 1981 - 1991

Industry	1981	% of farm workforce	1986	% of farm workforce	1991	% of farm workforce
Cereal grains, sheep, cattle & pigs	258,019	67%	255,716	65.0%	239,629	63.0%
Fruit				9.5%	239,629	63.0%
Vegetables	14,947	9%	36,049	9%	37,227	5.1%
Poultry	10,919	3%	10,596	2.7%	9,903	2.6%
Other	47,237	12%	44,393	11.5%	50,367	13.2%
Services to Agriculture	19,338	5%	18,635	4.8%	15,780	4.1%
Total	386,509		391,398		381,225	

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

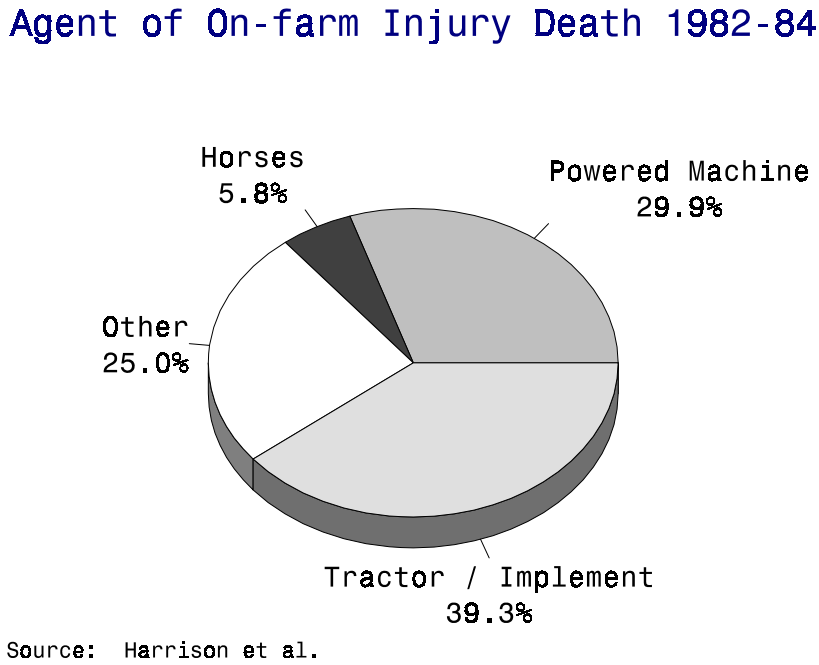
2. Farm Injury

2.1 Deaths from farm injury

A major study of work-related fatalities in Australia for the years 1982-1984 indicated that the annual rural work-related rate was 22.09 per 100,000 persons, and followed only mining and transportation in significance. (Harrison J et al,1989) There were 224 fatalities where the deceased was involved in rural work at the time of injury. A further 34 children aged less than 15 years sustained fatal injuries in the course of farming activity. Figure 2 describes the causes of on-farm injury deaths.

Currently, the study methodology is being repeated and importantly an effort is being made to collect all farm deaths. This will enable us to characterize fatal injury occurring to those persons outside traditional employment ages. The previous study excluded toddler drownings if the deceased was not seen to be either a bystander or directly working. Farmsafe has sucessfully advocated for a broader conception of injury causation that encompasses the whole farm as a work-related hazard.

Figure 2



The Harrison study recorded 77 deaths in NSW in the 3 year period 1982-84. This data can now be augmented with NSW WorkCover Authority surveillance system data. Since 1987,

with data quality, scope and coverage consistently improving the NSW WorkCover Authority have maintained a fatalities surveillance system. This surveillance system is not dedicated to agriculture and is somewhat limited in the depth of information held, however it is extremely useful for describing the causes of on-farm deaths as a result of work-related injury. Table 4 lists the causes of death for 110 cases from the WorkCover surveillance system. It is not possible to draw detailed conclusions about the lower fatalities numbers appearing in the NSW WorkCover Surveillance System except to say that this is likely to reflect different study methodologies. Importantly both systems have highlighted common causes.

Table 4.

Frequency of Cause of Death - NSW WorkCover Data 1987-1995

Agency of Death	Specific Agent	Frequency of Occurrence	Common Mechanisms
Farm Vehicles	Truck	4	Runover Rollover
	Utility	*	
	Car	*	
	Trailer	*	
	Motorcycle 2 Wheel	*	
	Motorcycle 4 Wheel	*	
	Mobile Bin	*	
	Aircraft	4	Aircraft crash Struck by crop duster
	Other	*	
	Total	**17**	
Mobile Farm Machinery	Tractor	38	Rollover (14) Runover (23)
	Linkage	*	
	Tillage / Seeder	*	
	Earth Moving equip.	5	Rollover
	Harvesting Equipment	*	
	Grain Auger	3	Caught in moving machinery
	Elevator / Conveyor	*	
	Hay Baler	*	
	Posthole Digger	3	Caught in moving machinery
	Other	*	
	Total	**61**	
Farm Structures	Embankment	*	
	Silo-Grain	3	Grain asphyxiation
	Powerlines	3	Contact with overhead powerlines
	Other	*	
	Total	**10**	
Working Environment	Bush / Vegetation	*	
	Fire / Smoke	*	
	Lumber	*	
	Trees being Felled	5	Hit by falling trees / timber
	Confined Spaces	5	Asphyxiation by gas in confined spaces.
	Other	1	
	Total	**14**	
All Other Agents	**Total**	**8**	
Total		**110**	

* denotes <3 cases Source: NSW WorkCover 1995, Fatalities Surveillance System.
Fatalities Coded in Accordance with the Farm Injury Optimal Dataset (Coleman, 1994)

All fatality reporting mechanisms and studies highlight the risks involved with tractor operation. Erlich et al (1993) note that 40% of all deaths in both the employed civilian workforce and children less than 15 years were caused by tractor. With tractor roll overs constituting 27% of the adult and 35% of the child deaths. Evidence from state based data systems confirm that tractor roll overs continue to be the primary cause of farm related injury death in the adult population. However, all tractor run overs, the amalgamation of fatalities resulting from falls from tractors, run overs of bystanders and of persons attempting to start tractors from the ground do kill more people than Roll Over. (See Table 4.)

Analysis of NSW WorkCover Authority data has failed to reveal the high level of child Roll Over deaths reported by Erlich. Erlich reported a 12:1 Roll Over to other tractor death (presumably Run Over) ratio for children. NSW data regarding investigated farm fatalities over a 8 year period reveals a Run Over to other tractor death (Roll Over) ratio of 9:1[1]. As a grouped mechanism run overs are a more significant problem than roll overs, however as a single cause with readily available countermeasures (Roll Over Protection Structures), roll overs remain the biggest single cause of on farm death.

It has been accepted by Farmsafe Australia that in order to impact upon farm injury deaths the fitment of Roll Over Protection Structures must be a priority (Fragar LJ, 1996 & Davidson et al, 1996).

Both the number and three year moving mean of fatal tractor run overs and roll overs in NSW between 1988 and 1995 are presented in Figure 3. There appears to be a visual downward trend in both total run overs and roll overs. However, the volatility in year to year numbers prevents us from being confident that the trend will continue. Lack of adequate denominator data prevents a thorough examination of causal factors of any trend that may exist. If a downward trend exists it may just as likely result from the continued long term drought related reduction in farm work as to any sustainable changes in work practices or increased use of ROPS. The uncertainty of cause and effect is compounded by

[1] This dicrepancy has been discussed with Dr. T. Driscoll a co-author of the Erlich paper. The Erlich paper as published did contain an error. The majority of child deaths in the 1982-1984 data set were caused by being runover by tractors and trailed implements and not by tractor rollovers as published. This was an unfortunate oversight as it had the effect of focussing discussion soley upon the need for rollover protection structures (ROPS) and prevented an examination of the prevention of run over deaths.

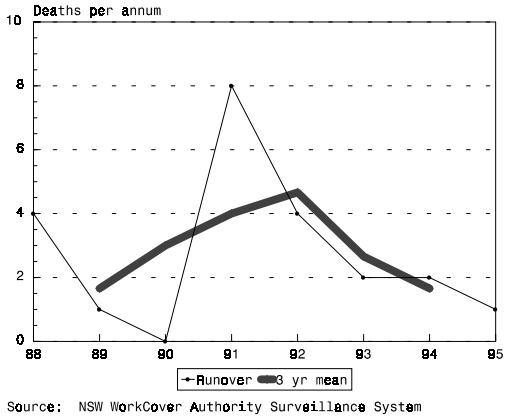
the similar shape of the trend line of the three year moving mean of Run Over deaths. Run overs occur in a variety of circumstances, in situations where there has been an extra rider, when persons attempt to start tractors from the ground and in circumstances where bystanders are run over. The apparent recent downward trend in Roll Over fatalities may be as a result of increased ROPS usage. This is impossible to confirm as the data regarding ROPS usage rates are limited and cannot provide information regarding changes over time. ROPS fitment rates will have no effect upon the rate of Run Over fatalities. Given the fact that both the Roll Over and Run Over lines are approximately the same shape and that they trend downwards after 1990 & 1991 respectively, it appears that the two rates of these mechanisms of injury are not acting independently.

It is hypothesised that the frequency of tractor roll overs and run overs are related primarily by the exposure in person-hours of tractor work being done. The range of countermeasure factors such as changing safety culture, training and ROPS usage, would be unlikely to produce such similar effects, of this magnitude and which occur at the same time. Unfortunately, there is no accurate measure of the person-hours of tractor work being done in NSW. Using economic activity measures may be a suitable proxy measure for exposure to tractors, in periods of drought both tractor usage and production levels are down, in good times both rise. However, it should be noted that this essential simple linear relationship is confounded due to the nature of tractor usage changing in periods of growth and recession. The extent to which risk changes with economic climate is not clear cut. The use of tractors to tow trailers and feed out to stock may involve higher relative risks of both Roll Over and Run Over when compared to the relatively stable processes of planting and harvesting. A better exposure measure would quantify person-hours of exposure and would detail the type of exposure.

Time series data for all NSW WorkCover Authority investigated farm fatalities is presented in Figure 4. While the graph of the three year mean is of a similar shape to that of the means for the tractor deaths, the slopes are less acute. It is possible that this reflects in part the significance of the tractor deaths and the mediating influence of other causes less likely to be linked directly to production of crops or animal products. Further analysis of the role of economic activity as a determinant in frequency of causes of death is beyond the scope of this report, however, it is recognised that this is an area that requires further research.

Figure 3.

Tractor Run Over Fatalities in NSW 1988 - 1995
Frequency and 3 year moving mean.



Source: NSW WorkCover Authority Surveillance System

Tractor Roll Over Fatalities in NSW 1988 - 1995
Frequency and 3 year moving mean.

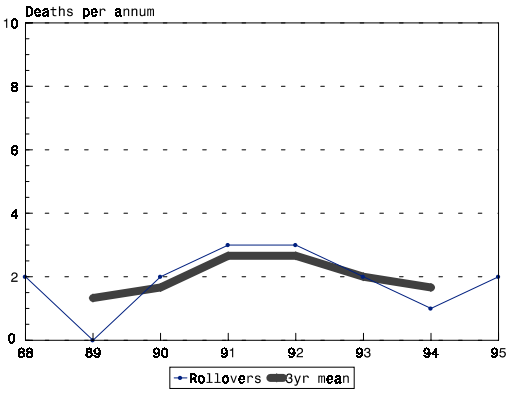
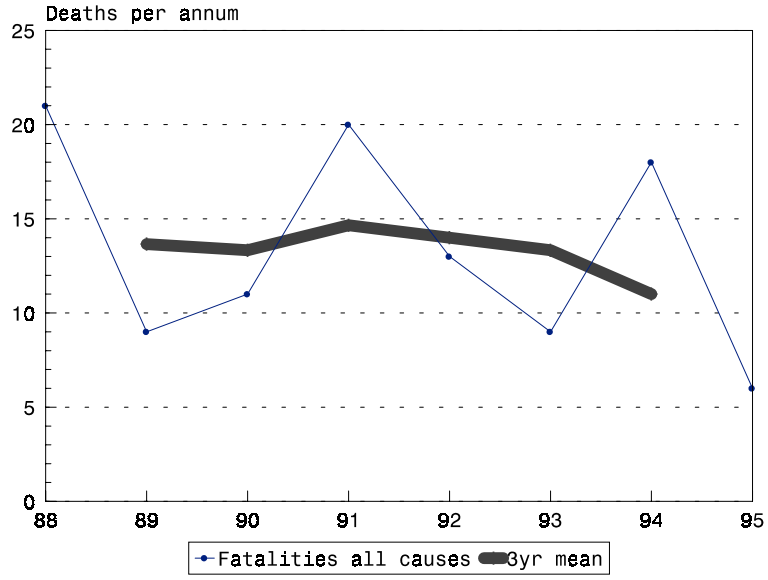


Figure 4.

Agricultural Fatalities (All Causes) in NSW 1988- 1995

Frequency and 3 year moving mean.



Source: NSW WorkCover Authority Surveillance System

Between 1989 and 1995 deaths from tractor roll overs and run overs have comprised 38% of all farm work related fatalities on NSW farms.

In South Australia, for the period June 1988 to April 1992 there were 18 work-related fatalities known to be associated with Agriculture, of which 33.3 percent were associated with tractors. (Farmsafe South Australia data).

A summary of deaths data held by the Queensland Division of Workplace Health and Safety, derived from Division records and Coroners Office records for the period 1985-1990 indicate 54 of 91 deaths were related to tractor operation (59 percent).

These data are summarised in table 5.

There were 37 tractor deaths in NSW between 1988 and 1992, and 51 in Queensland between 1985 and 1990, for which some further details are available.

Table 5

TRACTOR DEATHS - NATURE OF ACCIDENT

NSW AND QLD 1985-1990

CAUSE	NSW	QUEENSLAND	PERCENT
ROLLOVER	13	28	46.6
RUNOVER	14	17	35.2
FALLS FROM	5	3	9.1
OTHER	5	3	9.1
TOTAL	37	51	100

Of the 13 tractor roll overs resulting in death in NSW, 11 (85%) had no approved ROPS fitted.

Recent work by Moller (NISU 1994) has shown that both males amd females resident outside major urban areas and capital cities exhibit increased death rates due to injury. While this sudy did not look directly at farming populations, within the the rural and remote population there are a significant number of farming families. Moller has shown through the use of grouped external cause codes that generally relate to work a non-statistically significant elevation of machinery related injury death in 'rural other' and 'remote other' areas. This can be attributed to the presence of both farms and mines in these areas, production sites that have been shown to have high rates of work-related fatalities.

All available datasets that have evolved from the state and federal OHS authorities have ignored childhood drownings, due to them not being recognised as work related and no system being sensitive enough to identify farm as an injury location. This is unfortunate and is the subject of intense lobbying by Australian Agricultural Health Unit staff. NSW Coroners data for the period 1/1/90 - 31/12/93 reveals 13 childhood drownings that are likely to have occurred on farms.[2] These deaths are not reported in standard OHS surveillance systems and are a significant cause of farm related childhood injury mortality.

[2] Giles, P . Personal Communication National Water Safety Strategy Dec 1994

Table 6

CAUSE OF ON-FARM CHILD INJURY DEATHS, NSW AND VICTORIA

Cause of Death	NSW Oct 1988-Mar 1990	VIC 1988-1990
Drowning	6	9
MVA on-farm	1	3
Farm equipment	1	4
Poisoning	-	1
Horse	1	1
Gunshot	1	-
Other	2	1
Total	**12**	**19**

Drowning deaths were primarily in dams, creeks and rivers, and 10 of the 14 drowning deaths were of children under 5 years of age. (2)

In order to reduce injury deaths in agriculture Farmsafe Australia must address;

1. **Tractor rollovers and ROPS fitment**
2. **Tractor Runovers**
3. **Machine Guarding**
4. **Confined Space entry**
5. **Childhood drowning**

2.2 Death Rates Other Causes.

Mortality rates have been examined by the Northern Districts Public Health Unit (1994) by occupation for a range of causes of death in the North West Health Service. Standardised mortality ratios have been calculated for a range of occupations versus males 15-64 years in NSW. The results of this research is presented in the table below. Farmers are seen to be a group with a range of health needs, display statistically significant standardised mortality ratio's for all causes of mortality, motor vehicle accidents and colorectal cancers. Likewise agricultural workers display significantly elevated standardised mortality ratios for all causes, ischaemic heart disease, motor vehicle accidents and suicide.

Table 7

Summary of Standardised Mortality Ratio of Farmers / Farm Managers and Agricultural Labourers by cause of Death.

	Standardised Mortality Ratio, higher or lower than the standard population. (High / Low)	
Cause Of Death	Farmers / Farm managers	Agricultural Labourers
All Causes	High*	High*
Ischaemic Heart Disease	High	High*
Cerebrovascular Disease	Low	High
Lung Cancer	Low	High
Colo-rectal cancer	High*	High
Melanoma	High	High
Motor Vehicle Traffic Accidents	High*	High*
Suicide	High	High*

* Indicates statistical significance.

2.3 Suicide

The Standing Committee on Social Issues of the Legislative Council of NSW investigated suicides in rural NSW and presented its final report in November 1994. This report makes only limited reference to differentials in suicide rates by occupation, however, in quoting Burnley (1994) it notes significantly higher suicide rates in male farmers and farm workers in both the 25-39 age cohort and the 40-64 age cohort. Suicide in rural males 15-64 as at 1992 was noted to be at a rate 5.6 times that of women. However, it is further noted that the suicide attempt rate is higher for females than for males.

Certainly the differentials in rates of completed and attempted suicides between genders reflects the lethality of methods adopted by the respective genders. Males are likely to employ the highly lethal methods of gunshot and hanging while women tend to choose less lethal mechanisms, such as poisoning.

2.4. Non Fatal Farm Injury

2.4.1. Hospital Data

Analysis of NSW Hospital Separations data by Lyn Fragar (1994) has revealed that the total farm location subset of separations is not consistent with coding guidelines established under the International Classification of Diseases 9th edition (ICD-9). Several categories of disease including a number of medical misadventure cases, road traffic accidents and poisoning by therapeutic drugs were coded as occurring on farm. ICD-9 prevents coding of motor vehicle traffic accident as occurring on-farm. There are concerns about the accuracy of the poisoning and medical E-codes. The issue of coding of farm injury separations needs to be addressed. Coding at a centralised location away from the initial medical contact point may result in inaccurate coding, due to a lack of understanding of agricultural practice and inexperience in using codes in relation to on farm injury. Fragar has defined a subset of farm injury separations that we can be relatively confident about, these are listed in Table 6 with the counts of occurrence for 1989/90, 1990/91, 1991/92, 1992/93 & 1993/94.

The consistency of injury counts across the years both for the total injury burden and amongst the E-code groupings is startling. Once again the lack of adequate denominator data makes further analysis difficult.

Table 8

NSW Hospital Separations On Farm Injury 1989/90-1993/94
E-Code, Injury Description and Number of Occurrences

		Separations				
ECode	**Description**	**89/90**	**90/91**	**91/92**	**92/93**	**93/94**
E820-E825 E826-E829	Motor vehicle non traffic accidents &Other road vehicle accidents					
	Motor cycle	205	206	236	266	236
	Other vehicle	100	115	78	116	94
	Animal ridden	224	249	276	269	240
E862	Poisoning by petroleum products	*	*	5	*	
E863	Poisoning by agricultural chemicals	13	10	17	18	22
E864	Poisoning by corrosives & caustics	*		2	*	*
E866	Poisoning by gases and vapours		*	1	*	*
E890-899	Fire and flames	19	26	29	22	18
E905	Venomous animals and plants	17	32	75	43	41
E906.0	Dog bite	*	5	9	7	6
E906.8	Injury by other animal	147	130	135	140	137
E919.0	Agricultural machinery	123	120	117	114	129
E919.1-9	Other machinery	58	27	41	48	25
E920	Cutting and piercing	104	96	136	119	102
E922	Firearms	10	13	17	18	15
	TOTAL SUBSET	**1025**	**1030**	**1174**	**1186**	**1069**

As can be seen from Table 8 the E-code descriptions are of limited use for countermeasure development. However, the broad E-code groupings are important in priority setting and

will as states improve their coding systems and communicate separations data to the National Injury Surveillance Unit provide useful monitoring data. NSW separations data is already being used to set state farm injury prevention goals and targets. Separations data are already extremely useful for providing data to define target populations in relation to specific hazards. Farmsafe Australia has set goals and targets for prevention of horse injury, motorcycle injury and agricultural machinery injury based upon the age/sex distributions provided by hospital separations (Fragar LJ, 1996). It is important to note that these figures relate to counts not to rates and therefore probably reflect exposure patterns not risk. However, they are still useful in targeting prevention at the those groups who comprise the bulk of cases in each group. The National Injury Surveillance Unit currently collects hospital separations data for all states however there are wide differences in data quality between states. Queensland has provided details of hospital separations to the Australian Agricultural Health Unit and these will be presented in an upcoming report regarding the health and safety of Queensland agriculture.

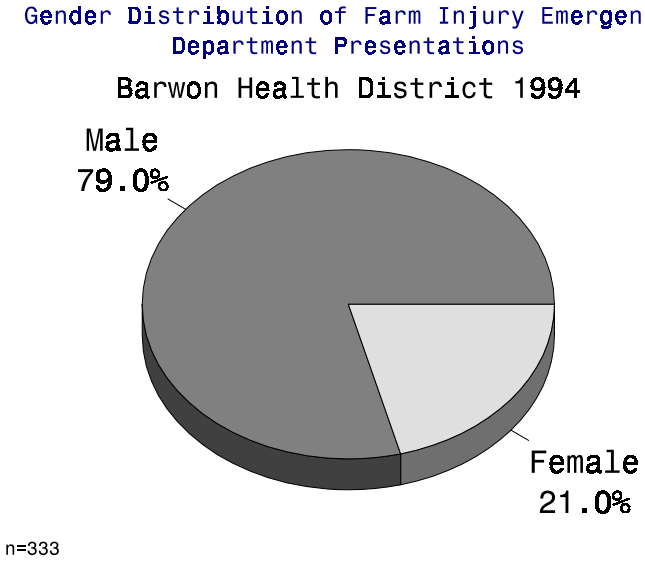
To prevent injuries requiring admission to hospital, Farmsafe needs to address;

1. **Farm motorcycle injury**
2. **Horse related injuries**
3. **Machinery Injury - Specifically Guarding**
4. **Animal handling related injury.**

Furthermore Farmsafe should encourage the State departments of Health to ensure data quality and consistency of hospital separations data.

Data is also available from limited emergency department studies. Coleman and Wetherspoon (1995) analysed Barwon Health District Emergency Department presentations for the calender year 1994. Figure 6 displays the gender distribution of these presentations. Males are by far the largest group suffering farm injury.

Figure 5



Within the Barwon Health District approximately 50% of farm injuries in the 0-14yr and the 15-25yr ages group requiring attendance at an emergency department are caused by either motorcycles or horses.

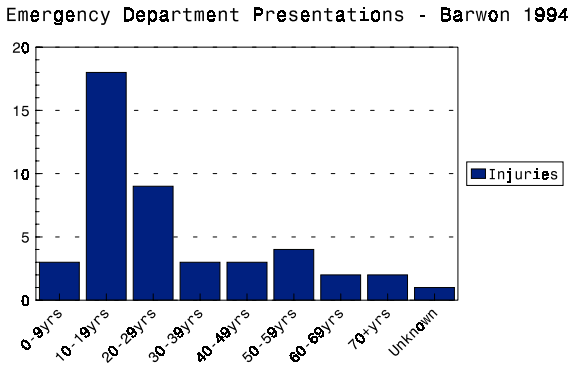
Interestingly farm injuries appear to require admission to ward or intensive care unit more frequently (16.8%) than all other emergency department presentations (11.57%). Extrapolating from the known numbers of hospital separations using the admittance rate identified in Coleman and Wetherspoon gives a total number of NSW emergency department farm injury presentations of 18480 per annum.

Figure 6 displays the age distribution of the four largest classes of injury present in the Barwon dataset, agricultural motorcycle injuries, machinery accidents, falls from animals and falls.

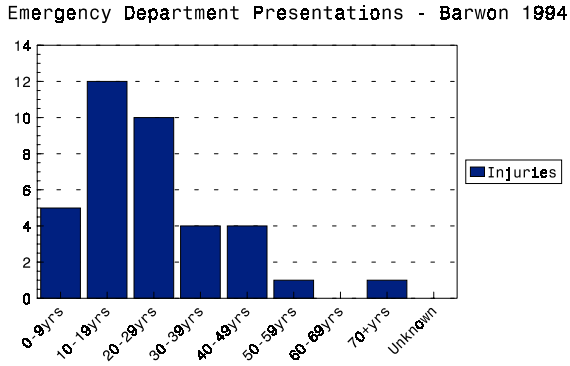
Figure 6

Age Distribution of Four Main Injury Classes

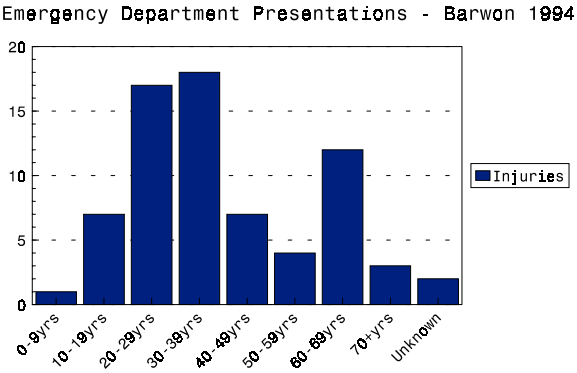
Agricultural Motorcycle Injuries



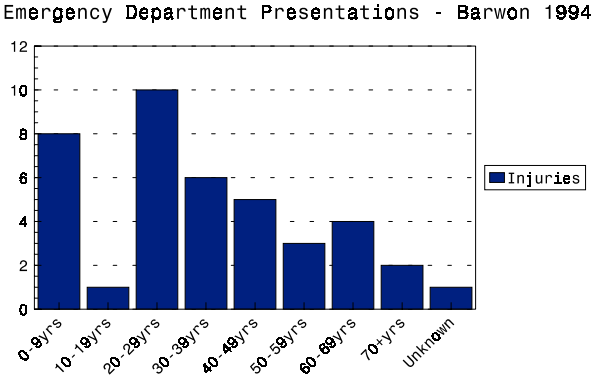
Falls from Animals



Machinery accidents



Falls



2.4.2 Workers Compensation Data

Workers Compensation Statistics are also used to define the extent of farm injury in Australia. However, only an estimated 15% of work related injury on farms are the subject of workers compensation claims, as the large proportion of the agricultural work force is owner farmer and farm family member (Ferguson K, 1995). It should be noted that the workers compensation sample is fundamentally biased towards persons in a strict employee relationship and is therefore not representative of the farm work force. The vast amount of data collected by the workers compensation systems in operation around the country make them rich sources of farm injury information. As such they have provided the basis for the majority of programmes developed to date.

Worksafe Australia have calculated injury and disease incidence rates for the employed workforce by ASIC class for the period 1992-93. The results are presented below in table 9.

Workers compensation statistics tend to be dominated by those industries in which the proportion of total employment made up by employees is large.

Table 9

Gross Cost of Workers Compensation Claims by Industry - NSW Workers Compensation Data 1992/93

Industry	Total $'000	Rank	Average $	Rank	Median $	Rank
Agriculture						
Sheep	5683	1	12572	1	3506	1
Other Agriculture	4498	2	8164	4	2289	4
Meat Cattle	1779	3	10984	2	3292	2
Fruit	1603	4	10684	3	1783	6
Cereal Grains	883	5	7614	5	2108	5
Poultry	691	6	6641	8	1722	9
Milk Cattle	630	7	6707	7	1765	7
Other animal	345	8	5941	9	2350	3
Vegetables	238	9	6992	6	1233	11
Cotton	148	10	3079	11	1335	10
Nurseries	122	11	4223	10	1751	8
Total	**16621**		**9423**		**2356**	
Services to Agriculture						
Sheep shearing services	1494	1	106777	1	2393	1
Aerial Ag Services	251	3	35907	2	1643	3
Other Services to Ag	476	2	11068	3	1956	2
Total	**16621**		**9423**		**2356**	

The large sheep group reflects not only the risk of manual handling injury during sheep shearing but also the large number of employed shearers. Body stressing injuries to

shearers comprise 27% of all body stressing claims. Live animals, environmental agencies and non-powered hand tools together are involved in 59% of compensable injuries in NSW.

Worksafe Australia (1996) has identified the following health and safety issues as priorities for agricultural health and safety;

- **Plant,**
- **Handtools and equipment,**
- **Manual Handling Practices,**
- **The Work Environment,**
- **Livestock.**

Worksafe estimates the total cost of injury and disease in agriculture to be between $0.52 billion and $1.29billion.

Special Purpose Surveys

Keith Ferguson's Farm Survey of Workplace Injury/Illness Factors To Support Activity Planning Of Six Queensland Farm Safety Action Groups is the largest single special purpose farm health and safety survey completed to date in Australia (Ferguson KH, 1996). Data is presented regarding self-reported injury and illness rates across a range of agricultural types. It is noted that the annual average illness/injury rate was 20.2 per 100 farms and 2.99 per 100,000 hours worked. The average total cost of an injury or illness in this study was $4449.

3. Health Issues

3.1 Noise Induced Hearing Loss.

In the early 1980's, Nurse Audiometrists working in rural communities, recognised that farmers, due to the nature of their work were likely to have significant hearing loss. It was also evident from Community Health Records, that this client group did not access hearing health services for testing, prevention, education and support services. As the majority of farmers are self employed, the true incidence of Noise Induced Hearing Loss (NIHL) is not reflected in compensation claims made through the various state compensation bodies.

Definition of a noise induced hearing loss

The definitions of NIHL for the Rural Hearing Conservation Program are:-

- Normal hearing: hearing thresholds between 0 & 20dB (no high frequency dip present)
- Mild NIHL: a high frequency hearing loss (above 2K) noted between 20&40dB
- Moderate NIHL: a high frequency hearing loss (above 2K) noted between 40&60dB
- Severe NIHL : a high frequency hearing loss (above 2K) noted between 60&80dB
- Profound NIHL: a high frequency hearing loss (above 2K) greater than 80dB
- Other loss: hearing loss greater than 20dB (no high frequency dip present)

The NSW Rural Hearing Conservation Program holds data regarding free hearing screening results obtained from farmers and farm workers at NSW Farm Field days. There are a total of 1890 individuals for whom full details where recorded.

Of these persons 65% were males who identified themselves as full time farmers, 19.6% males who were part time or hobby farmers, 9.6% were full time female farmers and 6% were female part time farmers.

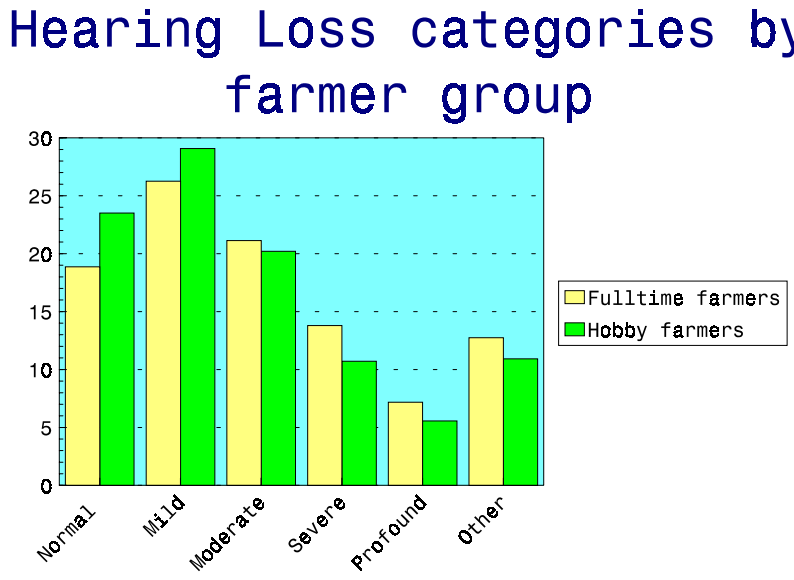
Table 10

Gender and Farmer Type of NSW Rural Hearing Conservation Program Clients

Gender	Full Time Farmers	Part Time / Hobby Farmers	Total
Male	1223	371	1595
Female	182	114	296
Total	1405	485	1890

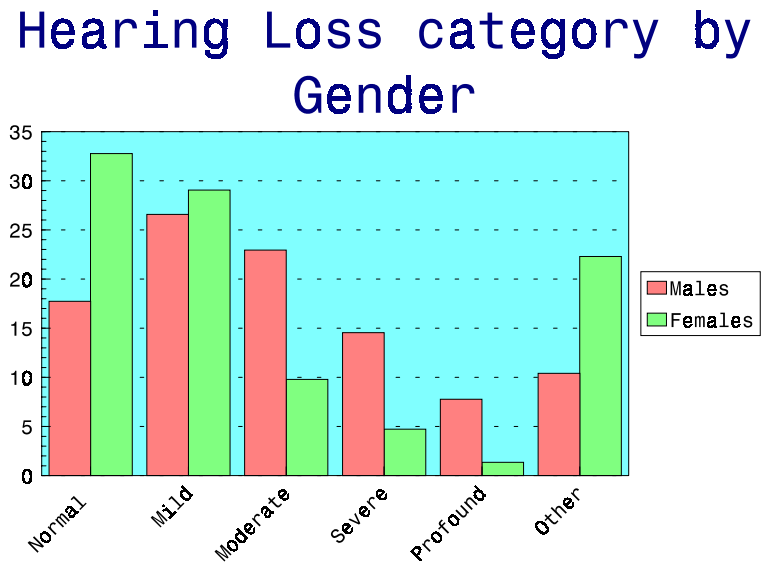
Years involved in farming is the primary predictive variable for Noise Induced Hearing Loss among NSW farmers, with a noted decrease in hearing thresholds as the number of years involved increases. This decrease in hearing threshold is evident across all frequencies screened. A difference between the hearing thresholds of the two ears is noted with the left ear being more affected by rural noise exposure (Figure 10). Across all years involved in farming the right ear has significantly lower hearing threshold levels. This is a result of the postures adopted during noisy agricultural work. Driving tractors and checking towed implements by looking over the right shoulder, operating workshop equipment and discharging firearms with the right hand all contribute to left ear / right ear differences by exposing the left ear to the largest noise dose.

Figure 7



Fulltime farmers have significantly worse hearing than part time farmers ($p<0.001$). Though this is likely to be partially explained by age. The full time farmers had a mean age significantly older (48.415yrs) than the hobby farmers (46.496yrs, $p<0.05$).

Figure 8



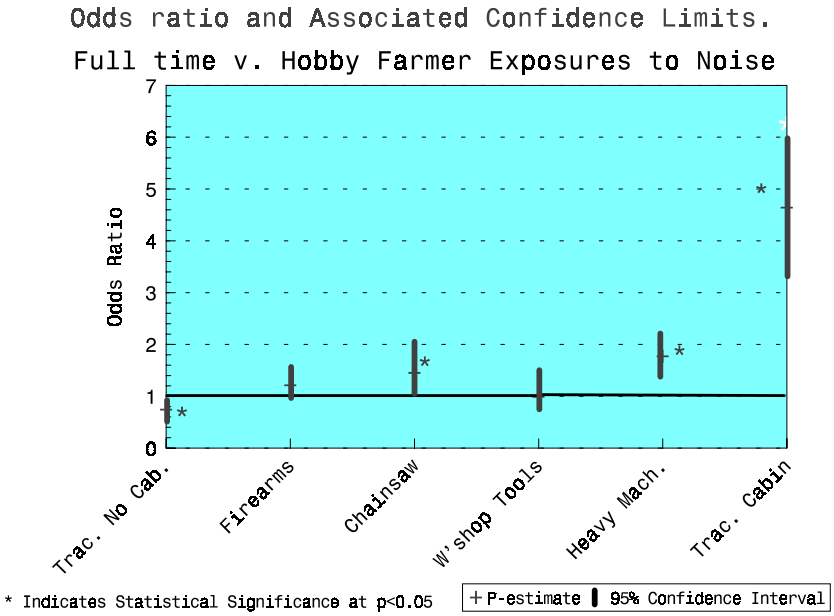
The males have worse hearing than the females though not significantly so. The women are also marginally older than the men (. 48.128 v 47.973) though once again not significantly so.

The differentials between groups relates both to the intensity and duration of noise exposure. This next slide indicates the differences in specific noise exposures between full time and part time farmers. Full time farmers are more likely to have a cabined tractor, drive heavy machinery such as bulldozers, graders etc and to operate chainsaws. Hobby farmers and those farming on a part time basis are more likely to drive uncabined tractors.

While we have no specific information regarding frequency and duration of exposure of individuals we do know that at peak periods in agriculture shifts can be 12-16hrs in length and that a working week for full time farmers is often in excess of 60hrs per week[3].

Figure 9

[3] KH Ferguson (1996) Farm Survey to Support Activity Planning of Queensland Farmsafe.



There is a notable increase in hearing thresholds across all frequencies screened in the left ear. From observation this is as a result of the postures adopted during noisy agricultural work. Driving tractors and checking towed implements by looking over the right shoulder, operating workshop equipment and discharging firearms with the right hand all contribute to left ear / right ear differences by exposing the left ear to the largest noise dose. Assymetrical NIHL with the left ear having the highest thresholds is experienced by 58.7% of those with NIHL.

The next slide displays the mean hearing loss across the range of thresholds screened. Significantly higher thresholds are noted in the left ear at 2000-6000Hz.

Figure 10

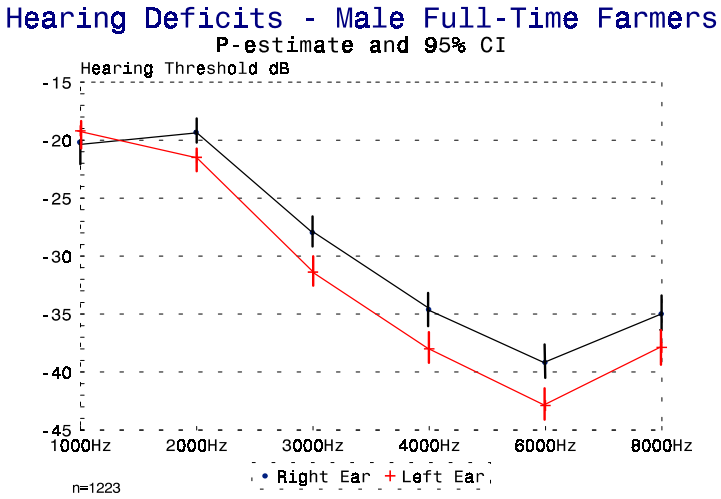
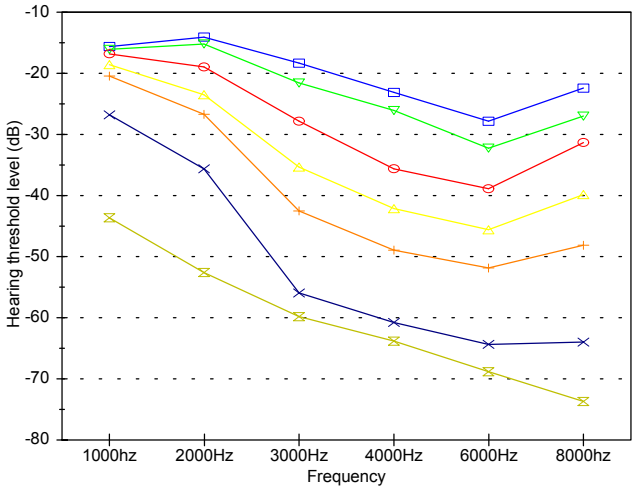


Figure 11

Male Full Time Farmers, Hearing Threshold Levels.

By Years Involved in Farming.

Left Ear

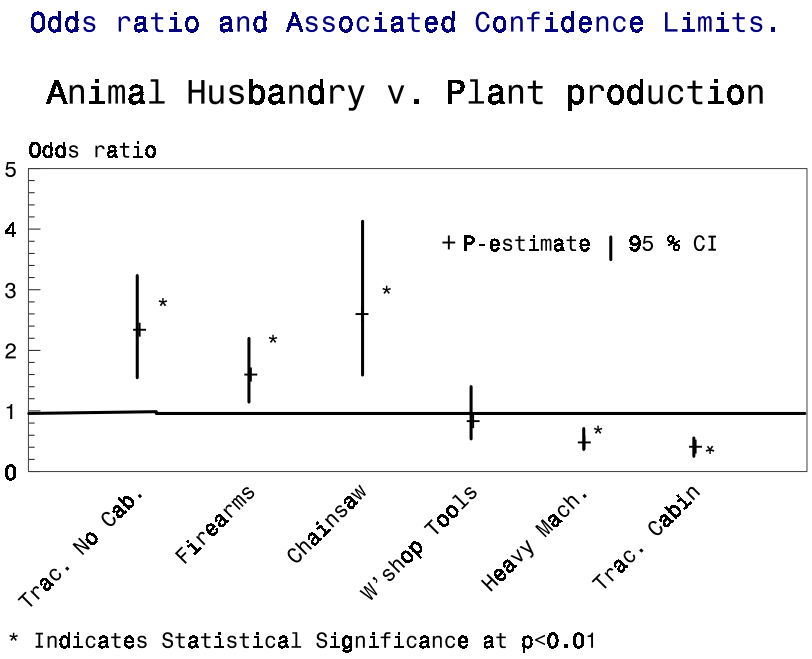


To some extent the confounding effect of presbycusis has been controlled for by only selecting those cases where a nihl was identified by the audiometrist on site.

Importantly in terms of the development of preventative strategies there is no observable and statistically significant differences between the levels of NIHL across commodity groups. However, there is some evidence of differential hearing loss at the highest level of aggregation of industry groups. In the younger groups 15-34, cropping industries performed worse than animal industries. Animal husbandry activities, somewhat surprisingly had higher mean hearing thresholds across all screened frequencies for the older age groups >35yrs.

The most important determinant is actually the current noise exposures. Individuals in animal husbandry are more likely to drive uncabined tractors, use firearms and operate chainsaws. There is a similar likelihood of both groups using workshop tools. While the plant production group are more likely to be exposed to heavy machinery such as bulldozers & harvesters. Simarily this group is more likely to drive cabined tractors.

Figure 12



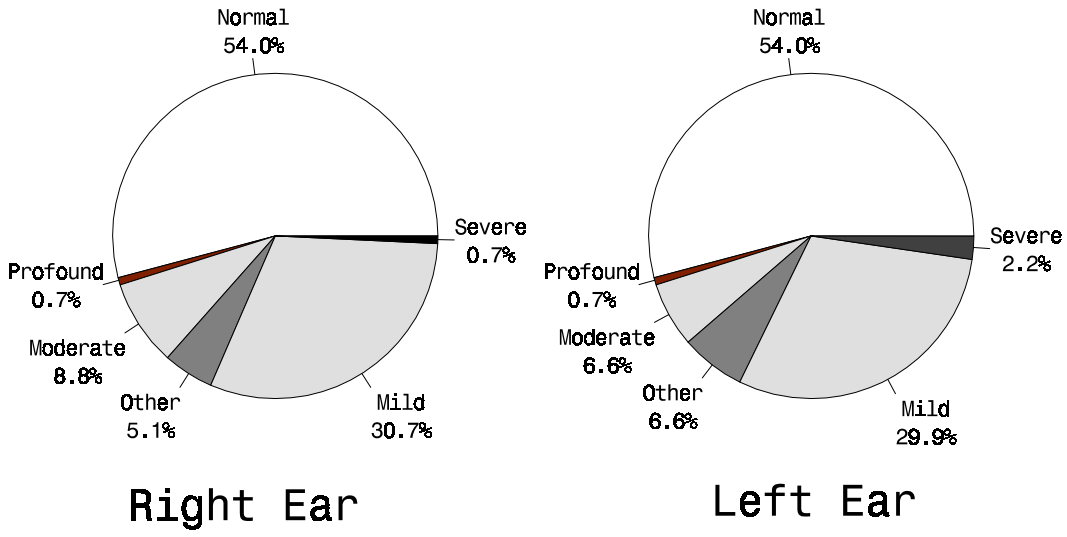
Farmsafe Australia have included a reduction in the NIHL in young farmers within their Goals and Targets for the year 2001(Fragar LJ, 1996). Specifically, the target is to reduce NIHL in farmers aged 15-24 by 15% by the year 2001. While NIHL is often considered an old man's disease, it is obvious that damage commences early in a farmers career and is irreversible. Figure 13 shows that for the 15-24 year age group mild noise induced hearing loss is already present in 30% of those screened. Hearing loss from exposure to noise is progressive, permanent and entirely preventable. In order that the next generation of farmers do not have the horrific levels of noise induced hearing loss experienced by today's farmers, young people must be encouraged to wear hearing protection at all times in noisy environments.

There are a range of potential reasons for the extent of noise induced hearing loss in farmers, farm machinery, including tractors, workshop tools and chainsaws, certain animal handling tasks such as feeding in piggeries and shooting all create damaging noise levels. There is potential for NIHL to be a farming epidemic given increases in mechanisation and the long hours necessary to operate a successful farm.

Figure 13

Distribution of Hearing Loss Catergories by Ear.

15-24 yr old farmers & farm workers



Right Ear Left Ear

NSW Rural Hearing Conservation Program Data - AAHU 1996

3.2 Pesticides and Human Health

Pesticides are defined as substances used to destroy, prevent, control, attract or repel pests or to regulate plant growth. They include insecticides, herbicides, fungicides, bactericides, plant growth regulators, defoliants, rodenticides and biological control agents.

The body routes of human exposure include:

1. the skin (dermal)
2. the lungs (inhalation)
3. the mouth (ingestion)
4. the eyes.

The skin is the most common route of entry into the body, and different body surfaces will have various absorption rates for different chemicals. Serious damage to the eyes can also occur with contact with many pesticides.

Inhalation of pesticides can result in rapid transfer across lung surface to blood supply, and can occur from dusts, vapours, or very small spray droplets.

Oral ingestion may result from splashes, keeping chemicals in unlabelled bottles, poor hygiene, intentional or unintentional swallowing.

The hazard level of any pesticide will depend on the pesticide's toxicity, the concentration of the chemical, the duration of exposure and the route of entry or absorption into the body. The human toxicity of a chemical is generally extrapolated from test animal experiments and can be expressed dermally or orally. Toxicity tests evaluate the following health effects:

1. Acute effects - the immediate effects of single, short term exposure
2. Chronic effects - multiple or long-term exposure effects
3. Reproductive effects - potential impairment of reproductive function
4. Teratogenic effects - effects on foetal development
5. Mutagenic effects - structural or functional impairment to genetic material
6. Carcinogenic effects - potential to cause tumours and cancer.

The data to describe the full extent of human health effects from exposure to pesticides is not available. There are a number of reasons for this including the potential long latency periods for chronic illness, the difficulty in diagnosing acute health effects, the non-specific nature of pesticide health effects and the lack of an effective monitoring system.

A number of studies have shown that repeated acute exposure to organophosphate pesticides is associated with neurological damage including delayed neuropathy. More recent research has suggested that low level chronic exposure may result in more subtle damage to the nervous system, affecting mental health, and difficulties with memory and concentration (Stephens R et al, 1995).

Overseas studies have indicated that farmers may have an increased risk of developing certain forms of cancer (particularly leukemia's and lymphomas) and concerns have been expressed about the role of pesticides. To date there is little direct evidence of pesticides as causal agents in increase rate of cancer in agriculture. A number of Swedish studies (Alexson O, 1974 & Hardell L, 1981) and one American study (Hoar S, 1986) in the 1970-80's have suggested a link between phenoxyacetic acid herbicides (specifically 2,4-D) and lymphomas and soft-tissue sarcoma's. However other studies have shown no effect (Pearce NE, 1985). Despite accumulative findings in some areas, there remains inconclusive evidence as to the long term effects of human exposure to most pesticides.

A number of pesticides where evidence of health effects have been shown have been withdrawn from sale in recent years. The potential of arsenical pesticides to cause respiratory cancers has been well established. Monitoring of the incidence of bladder cancer is being undertaken in NSW in those exposed to the now banned cotton chemical chlordimeform. Other pesticides such as the organochlorines and the insect growth regulator chlorfluazuron have been withdrawn because of environmental bio-accumulation and persistence.

Research conducted by the Australian Agricultural Health Unit indicates that certain groups of farm workers in NSW may be at increased risk of exposure to pesticides due to industry work practices and volume of chemical used.
Industries associated with high pesticide use include:

Vegetable production - insecticides

Stone fruit production -	insecticides/herbicides/fungicides
Pome fruit production -	insecticides/herbicides/fungicides
Cotton production -	insecticides/herbicides
Rice production -	insecticides/herbicides
Banana production -	nematacides/fungicides
Greenhouse culture -	fungicides, insecticides
Sheep husbandry -	insecticides for lice/fly/worms.

A number of studies in NSW have assessed pesticide exposure in agricultural workers using blood cholinesterase screening and surveys of work practices as a marker of exposure. The 1995 NSW WorkCover Authority survey found that 9% of North Coast rural workers had significant levels of exposure to organophosphate chemicals indicated by blood cholinesterase levels (NSW WorkCover News, 1995). Other WorkCover surveys conducted throughout NSW indicate that a significant number of farmers report ill health effects from pesticides used and that many are not wearing appropriate personal protective equipment. A wine industry survey conducted in the Hunter Valley Region during 1994 found 13% of tested vineyard workers had cholinesterase levels depressed below 15% (Galvin J et al, 1994).

The Australian Agricultural Health Unit Blood Cholinesterase Screening Program for agricultural workers in North West NSW has found that less than 5% of test results indicate significant exposure to organophosphate chemicals. The majority of those tested work in the cotton industry. Problems remain with establishment of baseline cholinesterase levels and interpretation of low test results, particularly in females.

Studies conducted within the cottonand horticultural industries have identified the need for improved safe work practices, decontamination facilities, re-entry periods and chemical handling training (Clarke LJ & Churches T, 1992 & McMullen, 1993).

Groups of agricultural workers identified as those being at risk of pesticide exposure include:

Ground and aerial spray operators - mixers/sprayers/pilots/markers
Pest control operators
Vegetable growers and orchardists
Workers entering sprayed fields
Those involved in sheep dipping/jetting
Those using pesticides in closed environments eg glasshouses
Those involved in the production and processing of pesticides.

While pesticide users are at greatest risk of exposure, families of farmers and farm workers may be exposed to pesticide residues on equipment, garments, containers and in their homes. Children may be at risk because of their body size and eating and dressing habits, and are at particular risk of accidental poisoning caused by pesticides.

While there is doubt over the long term health effects of pesticides the overriding principle must be the minimisation of exposure.

Training programs in the safe and effective use of pesticides for farmers and agricultural chemical users are currently being conducted in several states through the Rural Training network. The training courses have been developed with the joint effort of the National Farmers Federation and the Rural Training Council of Australia. Over 7000 people have completed the course in NSW since 1991, however only a third of those participating are farmers (National Farm Chemical User Training Program Newsletter, 1995). It is anticipated that voluntary accreditation systems for pesticides users will result in improved safe practices in pesticide application and reduced risk of exposure and ill health effects.

Regular monitoring of blood cholinesterase levels of employees using organophosphates has been recommended by Worksafe Australia in new Health Surveillance Guidelines under Regulations for the Control of Workplace Hazardous Substances (NOHSC). However access to blood or urine testing facilities, standardisation of pathology results, and information for medical and health services regarding toxicity management and pesticide screening remains a problem in many rural areas of NSW.

Research undertaken investigating the training needs of rural health practitioners in farm health and safety has identified that recognition and management of pesticide poisoning is an important training need for doctors and rural health workers. The Australian Agricultural Health Unit has developed pesticide and human health training packages targeted at these groups.

3.3 Zoonosis

Farmers and their families are at risk of contracting a range of zoonotic diseases. The most common include;

- Brucellosis - The major source of human exposure to brucella bacteria is via cattle. The bacteria can be spread through inhalation of dusts, particularly in abattoirs, direct contact with infected materials such as mucous membrane or skin and by ingestion of large quantities of unpasteurised milk.
- Hydatid infection - Humans become infected with hydatid tapeworm by ingestion of eggs passed in faeces of infected dogs.
- Leptospirosis - Transmitted to humans via contact with skin, eyes or nose with the urine of infected animals. Leptospirosis can be found in pigs, dairy cattle, beef cattle, sheep and rats. People at risk of leptospirosis include meat workers, dairy farmers, veterinarians, piggery workers, cane farmers, banana growers and bush walkers.
- Q Fever - Transmitted to humans via inhalation of aerosols or dusts of contaminated birth products of infected animals. Q-fever infects cattle, sheep, goats, bandicoots, kangaroos & wallabies. Ticks are responsible for transporting the organism between animals and across species. People at risk of Q-fever include farmers, veterinarians, abattoir workers, meat inspectors, biological researchers working with pregnant animals and shearers

The Communicable Diseases Network of Australia (1994) report notifiable cases of these zoonoses.

There were 20 cases of brucellosis notified during 1993. The NSW cases arose primarily in the North East of the state. The reported rate for the north eastern statistical divisions of NSW was 0.1 to <1 per 100,000 population.

During 1993, leptospirosis occurred at an annual rate of 1.0 per 100,000 population. The male to female ratio was 15.2 / 1. Seasonal variations exist with the majority of cases arising in the spring and summer. The southern NSW statistical divisions reported a rate of 2 to <5 per 100,000 population.

NSW and QLD have the highest number of notified cases of Q fever. North Western NSW has a rate of Q-fever of 73.8 per 100,000 population.

Hydatid infection occurs predominantly in the eastern half of the state, along the great dividing range. There is an increasing trend for cases to arise on the north eastern and south eastern tablelands. The mean annual prevalence of hydatidosis in rural NSW = 2.6 cases per 100 000 population. Between 1987 - 1992 there were 195 new cases of hydatidosis in NSW and the ACT (Jenkins DJ & Power K, 1996).

Bibliography

ABS (1994) Agstats, Agricultural Statistics on Disk,

Axelson, O., *et al* (1974). Herbicide exposure and tumour mortality an updated epidemiologic investigation on Swedish railroad workers. *Scandinavian Journal of Work, Environment and Health*; 11:21-8.

Challinor K & Coleman R. (1995) NSW Rural Hearing Conservation Program - A Field Day Approach. *Proceedings of the Asia-Pacific Conference on Occupational Health*, ICOH, Brisbane

Clarke, LJ. & Churches, T. (1992). Pesticide Exposure in Cotton Chippers in the Gwydir Valley. *Australian Agricultural Health Unit. Occasional Paper*, Moree.

Coleman R (1994) Farm Injury Optimal Dataset. *Australian Agricultural Health Unit Occasional Paper*, Moree.

Coleman R. & Wetherspoon D (1996) Farm Injury Presentations to Barwon District Emergency Departments in 1994. *Australian Agricultural Health Unit. Occasional Paper*, Moree

Davidson A, Fragar LJ, Houlahan JB & Coleman R (1996). National Tractor Safety Project - Final Report. *Australian Agricultural Health Unit. Occasional Paper*, Moree

Erlich SM, Driscoll TR, Harrison JE, Frommer MS & Leigh J (1993) Work-related agricultural fatalities in Australia, 1982-84. *Scandinavian Journal of Work Environment & Health*. 19:162-7

Ferguson KH (1994): Farm Survey of Workplace Injury/Illness Factors To Support Activity Planning Of Six Queensland Farm Safety Action Groups. *QLD Division of Workplace Health and Safety - National Injury Surveillance Unit*

Fragar LJ (1994) On-Farm Injuries Presenting to New South Wales Hospitals - Hospital Separations 1991-1992 *Australian Agricultural Health Unit. Occasional Paper*, Moree

Fragar LJ (1996) Goals targets and Strategies 1996-2001. *Farmsafe Australia.*

Galvin, J. *et al* (1994). Health Surveillance Program for Vineyard Workers. Winecare, Hunter Valley.

Hardell, L., *et al* (1981). Malignant lymphoma and exposure to chemicals especially organic solvents, chlorophenols, and phenoxy acids. *British Journal of Cancer*; 43: 169-76.

Harrison JE, Frommer MS, Ruck EA, Blyth FM. (1989) Deaths as a result of work-related injury in Australia, 1982-1984. *Medical Journal of Australia*. Vol 50, 118-125.

Hartigan CL (1994): Farm Injury in Australian Adolescents and Young Adults: A Literature Review. *Australian Agricultural Health Unit*, *Occasional Paper*

Hoar, S., *et al* (1986). Agricultural herbicide use and risk of lymphoma and soft-tissue sarcoma. *Journal of the American Medical Association*; 256:11431-7.

International Classification of Diseases 9th edition (ICD-9). World Health Organisation. Geneva, Switzerland.

Jenkins DJ & Power K, (1996) Human hydatidosis in New South Wales and the Australian Capital Territory, 1987-1992. *Medical Journal of Australia* Vol. 164 No. 1

Longbottom H (ed) (1994) Communicable Diseases Intelligence. *Commonwealth Department of Human Services and Health*. AGPS Canberra. 18;22:518- 566

McMullen *et al* (1993). Pesticide Exposure in Horticultural Industries in Central, South East & South West NSW. Australian Agricultural Health Unit, Moree.

National Farm Chemical User Training Program (1995) Newsletter December
Northern Districts Public Health Unit (1994) Mortality in the North West Health Service. *North West Health Service*, Tamworth

NSW WorkCover News No 25 - Sept/Nov 1995

NSW WorkCover Authority (1993) Employment Injuries in Agriculture and Forestry. Workers Compensation Statistics. New South Wales 1991/92

NSW WorkCover Surveillance System (1995). *Data Provided to the Australian Agricultural Health Unit National Farm Injury Data Collection Project*

Pearce, N.E., *et al* (1985). Malignant lymphoma and multiple myeloma linked with agricultural occupations in a New Zealand cancer registry study. *American Journal of Epidemiology*; 121:225-37.

Stephens, R., *et al* (1995). Neuropsychological effects of long-term exposure to organophoshates in sheep dip. *The Lancet*; 345:1135-1139

The Standing Committee on Social Issues of the Legislative Council of NSW (1994). Suicide in Rural NSW. *Parliament of NSW*.