NATIONAL FARM INJURY DATA CENTRE

Health and Safety Risks Associated with Cotton Production On-Farm

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Farm Health & Safety Joint Research Venture

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AUSTRALIAN CENTRE FOR AGRICULTURAL HEALTH AND SAFETY

National Farm Injury Data Centre

HEALTH AND SAFETY RISKS ASSOCIATED WITH COTTON PRODUCTION ON-FARM

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Foreword

While the different agricultural and horticultural industries share many occupational health and safety risks, their differing production processes are also associated with a range of risks that differ from each other.

This report is one of a series of profiles specific to a particular primary production industry that describe the OHS risks specific to that industry across Australia. It has been produced under the supervision of an industry Reference Group, convened by Farmsafe Australia to work with the National Farm Injury Data Centre to ensure that the profile addresses all known hazards associated with each phase of the production process, and that all relevant data is used.

These profiles are proving to be invaluable for the development of commodity specific guidance material for on-farm OHS risk management; for development of relevant guidance resources to control risks; for defining OHS training competencies and for defining information gaps that require further research.

The profile is a product of the National Farm Injury Data Collection project, funded by the Research and Development Corporations contributing to the Farm Health and Safety Joint Venture - Rural Industries Research and Development Corporation, Grains Research and Development Corporation, Australian Wool Innovation Limited, Cotton Research and Development Corporation, Sugar Research and Development Corporation and Meat and Livestock Australia. The Joint Venture is committed to improving well-being and productivity of the agricultural industries through careful investment in research and development programs that assist industry to manage OHS risk in a cost effective way. This Profile is a key document that brings together all available information in the interests of the Cotton industry.

Peter Core
Managing Director
Rural Industries Research and Development Corporation

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Queensland Division of Workplace Health and Safety
Farmsafe Queensland
Farmsafe Australia

Executive Summary

Title: Health and Safety Risks Associate with Cotton Production
Authors: Richard Franklin, Lyn Fragar, James Houlahan, Philip Brown, and Jacqui Burcham.
ISBN: 0 642 58347 1

This profile has been prepared for the cotton industry in Australia, with the aim to identify and assess the health and safety risks associated with work in the industry. This report will be useful for:

- Development of strategies and plans for reducing occupational health and safety (OHS) risk, and thence associated costs
- Development of guidance notes for producers and farm managers and supervisors responsible for ensuring the health and safety of workers
- Specification of OHS competency standards for guiding training activities.

The information will also be useful in the customisation of the Managing Farm Safety resource package or "tool" for the cotton grower to use in the process of managing health and safety. Components of the package include;

- On-farm hazard identification checklists
- Induction information for workers and contractors
- Templates for health and safety records
- Guidance notes for the implementation of a safety program

Introduction

An overview of health and safety in the cotton industry

Occupational health and safety within agriculture needs dramatic improvement. Agriculture is rated the second most dangerous occupation in Australia, with only the mining industry being above it. Statistics have shown that there is one work related fatality every four days in Australian agriculture. Also there were 1876 work related injury/diseases claimed on workers' compensation in the financial year of 1991/92. These statistics should alarm everyone within the industry and methods of control should be enforced on all agricultural employers.

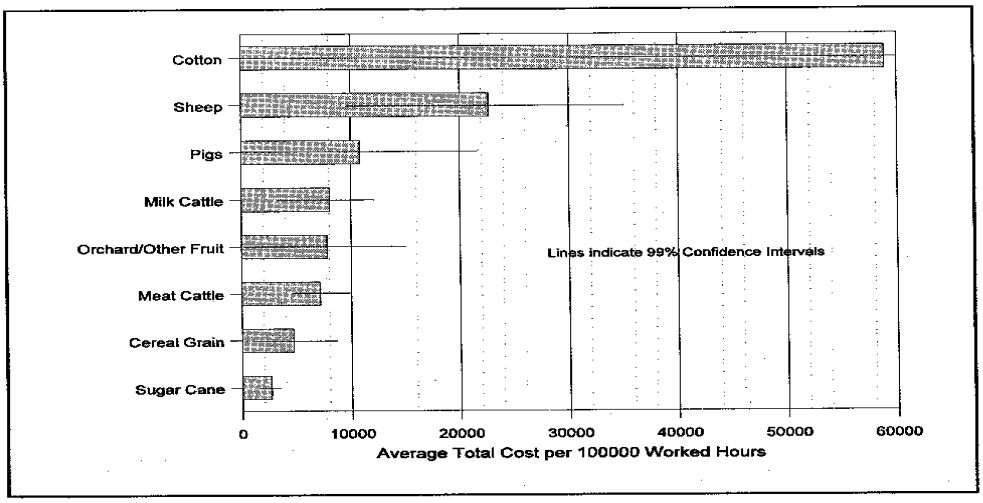
This profile report was developed in a very short period of time, thus the data was collected quickly and is incomplete. The range of resources used to compile the report was quite large, 17 different sources in total. The resources, although plentiful, were not exhaustive, and industry knowledge was heavily relied on. A reference list has been included to allow the reader to cross reference how Frequency ratings were established.

A recall study undertaken by the Australian Agricultural Health Unit in 1991 was one key report used when assessing the Severity Rating. The study outlined the agents that caused fatal injuries within the cotton industry. This information was sourced from cotton growers personal knowledge of accidents that they knew of or witnessed that resulted in death. This information was evidence that these injury agents have caused fatal injuries and an extremely **HIGH** risk rating has to be given when assessing these work phases.

Results of *FARM SURVEY*, by Keith Ferguson, Queensland Division of Workplace Health and Safety, 1996.

A report conducted by Mr Keith Ferguson of the Queensland Division of Workplace Health and Safety, ***FARM SURVEY***, in 1996, was used in assessing the relative cost of worker injuries on cotton farms. This report was a survey of farm work injury and operational procedure on farms in Queensland. This report has identified the actual cost of work injuries in a number of commodity groups. The report found that the cost of farmer injury within the cotton industry was almost triple of that in any other commodity group, as shown below. **It should be noted that compensable chronic injury is not adequately reflected in this data.** For example, shearer back injury would not be include into the sheep commodity figures.

Figure 13: Average total cost ($) of injury and illness per 100000 hours work exposure for different ASIC Industries.



Source: Keith Ferguson, Farm Survey, Queensland Government Division of Workplace Health and Safety, 1996.

Results from company records

The data, although incomplete, is the most comprehensive currently available. The information was obtained from larger cotton grower's farm injury records. This information was gathered to provide factual information and also to provide validity to the calculated Risk Rating's. This information pin pointed to where, how and when accidents were occurring, what was causing the accident, and the result of the accident. The worker injury records collected also include injuries obtained from working in on-farm Gins. These accidents resulted mainly in manual handling and RSI related injuries.

There are two sources of information missing from this report;
1. Contractors data. This includes cotton chippers, consultants and pesticide applicators services.
2. Long term impacts. This is data from the long term effects of pesticides, UV solar radiation, noise, etc.
Machinery equipment and maintenance resulted in the highest percentage of accidents (92: 28.4).

Table 1. Number and percentage of accidents that occur within each work / production phase.

Production Phase	Number of Accidents	Percent
Ground Preparation	19	5.9
Planting	15	4.6
Plant Growth	37	11.4
Picking and Carting	36	11.1
Machinery and Equipment Maintenance	92	28.4
Ginning	81	25
Unknown	44	13.6
Total	**324**	**100**

Agents associated with injury in each production phase.

The most common agent of injury was the workshop within the machinery and equipment maintenance phase (31) followed by fixed plant within the ginning phase (26).

Table 2. Agent of Injury by Work Phase

Production Phase	Animal	Chemical	Farm Structure	Vehicle	Fixed Plant	Hand Tools	Materials	Mobile Plant	Other Machinery	Motion / Posture	Environment	Workshop
Ground Preparation	1	0	0	0	0	0	0	11	1	0	2	1
Planting	0	0	0	1	1	1	0	6	1	2	2	0
Plant Growth	1	3	2	2	4	1	0	11	2	1	4	0
Picking and Carting	0	0	1	1	4	2	2	14	0	0	2	1
Machinery and Equipment Maintenance	1	2	3	5	7	18	9	11	2	5	3	31
Ginning	0	0	0	0	26	2	2	2	4	3	3	1
Unknown	1	1	2	8	3	4	3	5	5	1	6	2
Total	**4**	**6**	**8**	**17**	**45**	**28**	**16**	**60**	**15**	**12**	**22**	**36**

Common agents of injury within each broad category

The most common vehicles involved in injury were the utility (7: 41.1%), and the Motorcycle 4 wheel (5: 29.4%).

Table 3. Common vehicles involved in injury

Vehicle	Number of Injuries	Percent
Truck	1	5.9
Utility	7	41.1
Trailer	1	5.9
Motorcycle 2 wheel	1	5.9
Motorcycle 4 wheel	5	29.4
Not Specified	2	11.8
Total	**17**	**100**

Of the specified mobile farm machines involved in injury, tractors were the most common (9: 15%)

Table 4. Common mobile farm machines involved in injury

Mobile Farm Machinery	Number of Injuries	Percent
Tractor	9	15
Cultivator/Planter	3	5
Spray Equipment	1	1.7
Picker	3	5
Auger	1	1.7
Forklift	2	3.3
Earth moving implements	2	3.3
Grader	1	1.7
Not Specified	38	63.3
Total	**60**	**100**

The oxy welder was the most common of the specified workshop equipment involved in injury (10: 27.8%), followed by the angle grinder (4: 11.1%).

Table 5. Common workshop equipment involved in injury

Workshop Equipment	Number of Injuries	Percent
Angle grinder	4	11.1
Ladder	3	8.3
Air compressor	3	8.3
Oxy welder	10	27.8
Not Specified	16	44.4
Total	**36**	**100**

The most common specified components of the physical environment involved in injury were dust particles (3: 13.6), fire/smoke (3: 13.6) and ground/rock/stump (3: 13.6).

Table 6. Common components of the physical environment involved in injury

Component of the Physical Environment	Number of injuries	Percent
Dust Particle	3	13.6
Vegetation	2	9.1
Water	1	4.5
Fire/Smoke	3	13.6
Ground/Rock/Stump	3	13.6
Not Specified	10	45.5
Total	**22**	**100**

Of the fixed plant specified, Pump (5: 11.1%) and module builder (5: 11.1%) were the most common involved in injury.

Table 7. Common items of fixed plant involved in injury

Item of Fixed Plant	Number of Injuries	Percent
Pump	5	11.1
Generator	1	2.2
Module Builder	5	11.1
Not Specified	34	75.6
Total	**45**	**100**

Number of days off work associated with the groups of agents of injury.

Mobile plant was the agent of injury that resulted in the greatest number of days off work from 1 to 5 days (10) and 21 + days (3). Fixed plant was the agent of injury that resulted in the greatest number of absences from 6 to 10 days (3) and 11 to 20 days (3).

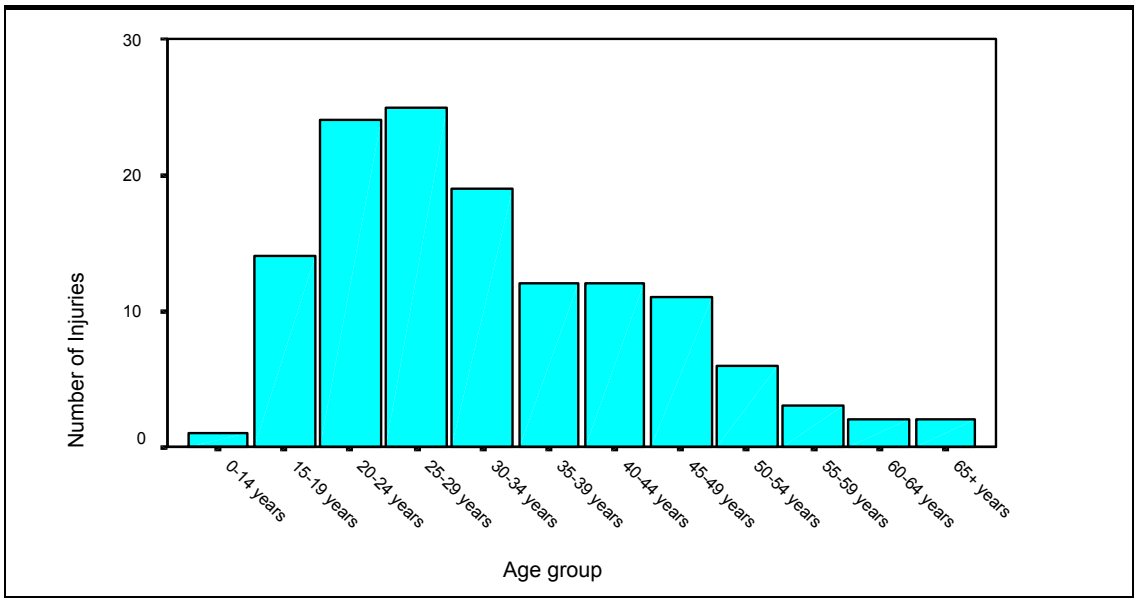
Table 8. Number of days off work associated with groups of agents of injury

Broad Agent	0 days	1 to 5 days	6 to 10 days	11 to 20 days	21 + days
Farm Chemicals	4	2	0	0	0
Farm Structure	5	2	0	0	1
Farm Vehicle	11	2	1	1	2
Fixed Plant	29	9	3	3	1
Hand Tools	22	3	2	1	0
Materials	14	2	0	0	0
Mobile Plant	44	10	2	2	3
Other	11	1	2	1	0
Work Motion/Position	10	1	0	1	0
Work Environment	20	2	0	0	0
Workshop equipment	27	7	1	1	0
Total	**203**	**41**	**11**	**10**	**7**

Queensland Workers' Compensation information July 1992- June 1998 for Cotton Production

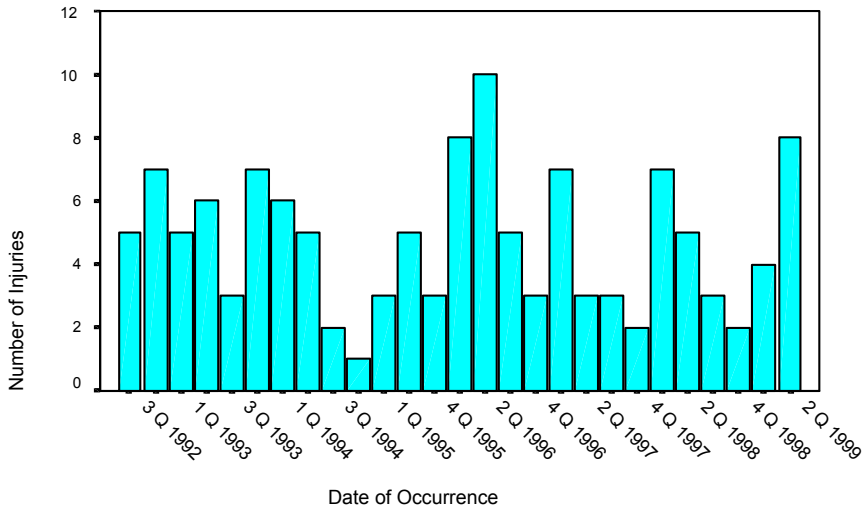
The following is a summary of Queensland Cotton Industry workers' compensation information over a seven-year period from July 1992 till June 1999. During this period there was 131 compensated injuries / disease. Of the 131 compensated injuries over half (63.4%) were aged less than 35 years (Figure 1.)

Figure 1. Age groups of compensated injuries/diseases to people employed in the Queensland cotton industry, July 1992 - June 1999. (N=131)



There has not been a change in the number of compensated injuries in the cotton industry from July 1992 to December 1995 on a quarterly basis (Figure 2.). There were 3 injuries where the date of occurrence was unknown or prior to 1 July 1992.

Figure 2. Date of occurrence of injury by quarters for compensated injuries/diseases to people employed in the Queensland cotton industry, July 1992 - June 1999. (N=131)



There were 121 (92.4%) injuries during the period July 1992 to June 1999 and 10 (7.6%) diseases that were compensated. In table 1 the nature of injury / disease is displayed, the most

common injuries / diseases were *sprains and strains of joints and adjacent muscles* (32.8%), *fracture* (22.1%) and *open wound not involving traumatic amputation* (14.5%).

Table 1. Nature of Injury / Disease of compensated injuries/diseases to people employed in the Queensland Cotton industry, July 1992 - June 1999.

Nature of Injury/Disease	**Frequency**	**Percent**
Fractures	29	22.1
Fracture of vertebral column with or without mention of spinal cord lesion	2	1.5
Dislocation	1	.8
Sprains and strains of joints and adjacent muscles	43	32.8
Traumatic amputation including enucleation of eye (loss of e	1	.8
Open wound not involving traumatic amputation	19	14.5
Superficial injury	1	.8
Contusion with intact skin surface and crushing injury	13	9.9
Foreign body on external eye, in ear or nose or in respiratory, digestive or reproductive systems	6	4.6
Burns	4	3.1
Poisoning and toxic effects of substances	1	.8
Multiple injuries	1	.8
Disorders of the conjunctiva and cornea	1	.8
Deafness	2	1.5
Other and unspecified dermatitis or eczema	2	1.5
Hernia	1	.8
Viral diseases excluding hepatitis, sexually transmitted dis	1	.8
Ischaemic heart disease	1	.8
Other diseases	2	1.5
Total	**131**	**100.0**

The most common body locations for injuries / disease were *lower limbs* (36.6%), *trunk* (23.7%) and *upper limbs* (22.9%) (Figure 3).

Figure 3. Body location of compensated injuries/diseases to people employed in the Queensland Cotton industry, July 1992 - June 1999. (N=131)

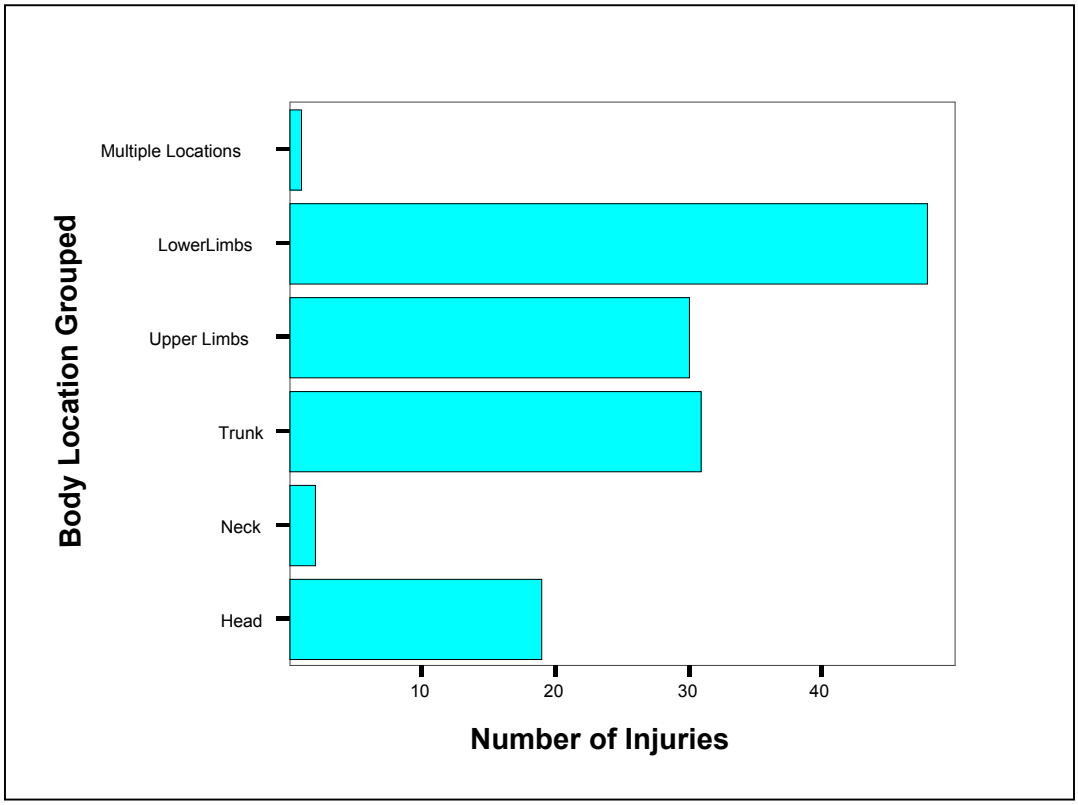


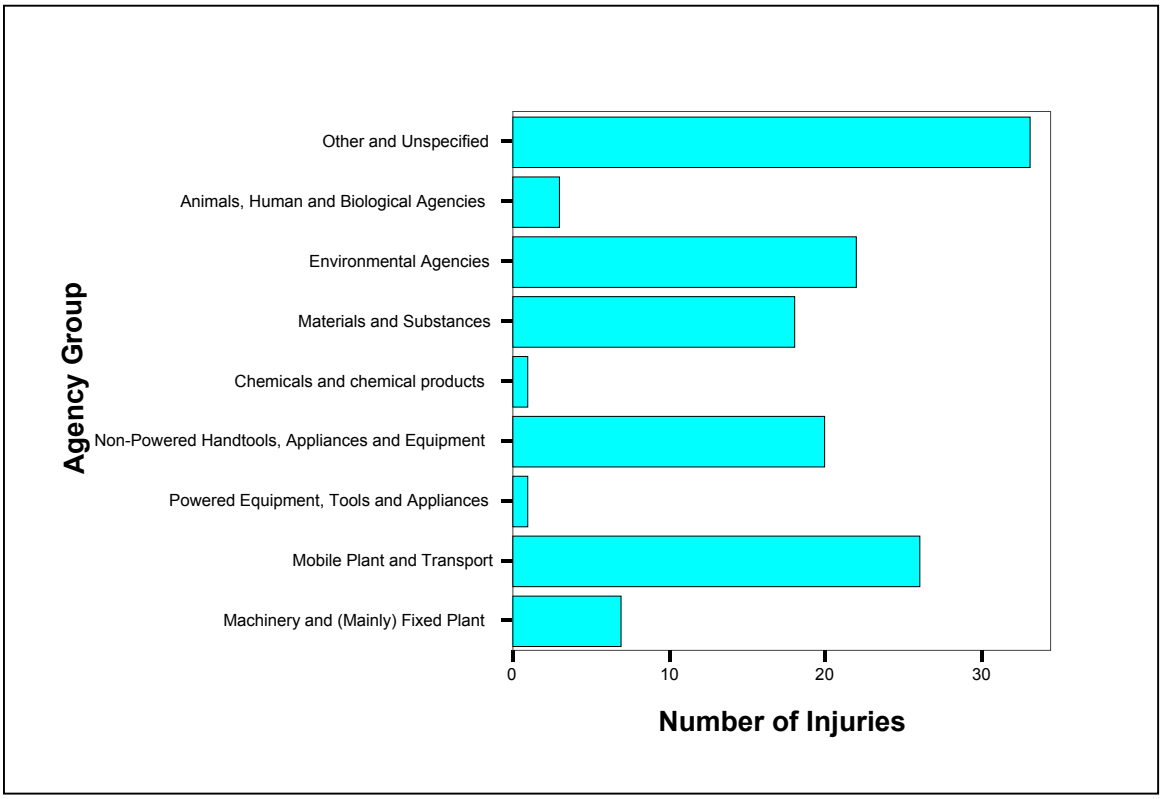
Table 2 displays information about the mechanism of the compensated injury / disease to people employed in the Queensland Cotton industry between July 1992 and June 1999. The three most common mechanisms were; *muscular stress while lifting, carrying, or putting down object* and *fall on the same level* (12.2% each), *hitting moving objects* (10.7%) and *being hit by moving objectives* (9.9%).

Table 2. Mechanism of compensated injuries/diseases to people employed in the Queensland cotton industry, July 1992 - June 1999.

Mechanism	**Frequency**	**Percent**
Falls from a height	7	5.3
Falls on the same level	16	12.2
Hitting stationary objects	8	6.1
Hitting moving objects	14	10.7
Being hit by falling objects	4	3.1
Being hit by an animal	1	.8
Being trapped by moving machinery	5	3.8
Being trapped between stationary and moving objects	3	2.3
Being hit by moving objects	13	9.9
Long term exposure to sounds	2	1.5
Muscular stress while lifting, carrying, or putting down objects	6	4.6
Muscular stress while handling objects other than lifting, c	16	12.2
Muscular stress with no objects being handled	5	3.8
Contact with hot objects	1	.8
Exposure to non-ionising radiation	1	.8
Long term contact with chemicals or substances	4	3.1
Insect and spider bites and stings	1	.8
Vehicle accident	12	9.2
Unspecified mechanisms of injury	12	9.2
Total	**131**	**100.0**

The most common grouped type of agent was non powered hand tools, appliances and equipment and the three most common agents were *self propelled* harvesters and vegetation (6.9% each), and *tractors, agricultural or otherwise* (5.3%) (Figure 4.).

Figure 4. Grouped agency of Injury / Disease of compensated injuries/diseases to people employed in the Queensland cotton industry, July 1992 - June 1999. (N= 131)



Of the 131 compensated injuries / disease to people employed in the Queensland Cotton industry between July 1992 and June 1999, the mean payment was $4,090 and the highest payment was $94,975 and the total cost of compensated injuries was $535,795 (Table 3.).

Table 3. Total payments of compensated injuries/diseases to people employed in the Queensland Cotton industry, July 1992 - June 1999.

Total Payments Grouped	Frequency	Percent
$0-$999	68	51.9
$1000-$4999	41	31.3
$10000-$49999	8	6.1
$5000-$9999	11	8.4
$50000+	3	2.3
Total	**131**	**100.0**

For the 131 compensated injuries to people employed in the Queensland cotton industry between July 1992 and June 1999, there was a total of 2,844 days off work, ranging from zero days to 254 days off. The mean number of day off work for an injury in the Queensland Cotton industry is 21.7 days (Table 4).

Table 4. Number of days off work for a compensated injuries/diseases to people employed in the Queensland Cotton industry, July 1992 - June 1999.

Total days absent grouped	**Frequency**	**Percent**
<1 Day	43	32.8
1-5 Days	24	18.3
11-20 Days	16	12.2
21-40 Days	17	13.0
41+ Days	21	16.0
6-10 Days	10	7.6
Total	**131**	**100.0**

Other Data Area

As work is done by the National Farm Injury Data Centre to collect and collate farm health and safety information from around Australia, additional information will be added to this profile.

The profile

The document aims to list the full range of potential hazards to human health and safety on cotton properties, and to provide information to assist producers, workers and the industry in assessing the degree of risk associated with identified hazards.

The information has taken account of;

- Identified hazards to health and safety in all production phases of cotton production
- The severity of injury or illness as indicated by risk of death and permanent disability
- The frequency of injury or illness (how often is the worker exposed to the hazard)
- The cost associated with injury and illness
- The requirement to meet relevant occupational health and safety Regulations in relation to controlling physical risks

The information has been derived from;

- Cotton growers Incident / Accident reports
- AAHU knowledge of the work procedures associated with cotton production
- The Australian Cotton Foundation, Mr Harvey Baker
- Cotton industry information

The **Severity Rating** is derived from consideration of the severity, duration and cost of the most severe injury or illness caused by that hazard. Each identified procedure has a rating ranging from 1 to 5, 5 being extremely severe, eg 2 = ■■□□□

The **Frequency Rating** is a composite rating, taking into account both the typical frequency of exposure of workers and others to the hazard and the frequency of reported injury or illness. As above, is rated 1 to 5, 5 being very frequent exposure, eg 2 = ■■□□□

Specific references used in determining the Frequency Rating are as listed:

1. Health and Safety Risk Assessment from the Cotton Industry Records (1992 - 97)
2. Australian Centre for Agricultural Health and Safety. *Combined RIPP and VISS Dataset*.
3. Ferguson K. *Farm Survey 1996*. Queensland Government Division of Workplace Health and Safety. 1996
4. Ferguson K. *Farm Survey 1994*. Queensland Government Division of Workplace Health and Safety. 1994
5. Australian Agricultural Health Unit. *Cotton Farm Safety Checklist, 1991*
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13.
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18. Queensland Workers' Compensation. *Cotton.*
19. Queensland Workers' Compensation. *Cotton Ginning.*

K. ***Industry Knowledge***

The **Risk Rating** is derived from both of the above ratings, eg. 5 = ☠☠☠☠☠ (extremely hazardous, causing death and/or frequently causing disabling injury)

Hazards and Risks Associated with Cotton Production On-Farm

A. GROUND PREPARATION

Production phase	Associated physical hazards	Who is at risk	Nature of risk	Severity rating	Frequency rating (Reference)	Risk rating	Associated risk factors
Slashing, pulling, raking & burning stubble	Tractor & PTO assembly	Operator, passengers, bystanders	Death/crush injury from rollover, runover Entanglement with PTO Back injury and body strain	■■■■■	■■□□□ **(5,12,18)**	☠ ☠ ☠ ☠	
	Slasher / stalk puller / rake	Operator during operation, interruption and routine maintenance	Death, crush injury, lacerations, contusions Clearing blockages, flying objects	■■■■■	■□□□□ **(K)**	☠ ☠ ☠ ☠	
	Hitching	Operator, assistant	Crush injury to fingers, hands Serious injury, back strain	■■■□□	■■■■□ **(K)**	☠ ☠ ☠	
	Clearing blockages / routine servicing	Operator during operational interruptions	Crush injury to fingers, hands, arms Lacerations, contusions	■■□□□	■■■□□ **(K)**	☠ ☠ ☠	
	Slips / trips / falls	Operator	Sprains, strains, fractures to ankles, feet, backs, wrists	■□□□□	■■■■□ **(2,K)**	☠ ☠ ☠	Fractures more likely in older people
	Fire and smoke	Operator, assistant, bystander	Burns, eye & respiratory effects	■□□□□	■■■■□ **(K)**	☠ ☠	
	Flying particles / dust	Operator, bystander	Foreign body in eye Respiratory effects	■■□□□	■■■■□ **(K)**	☠ ☠	Greater problem for workers with hypersensitivity
	Noise	Operator	Noise induced hearing loss	■■□□□	■■■■■ **(14,K)**	☠ ☠ ☠ ☠	
	UV / solar radiation	Operator	Sunburn, skin cancer, dehydration	■■■□□	■■■■■ **(12,K)**	☠ ☠ ☠ ☠	Greater risk, middle of the day - children & young adults
Ploughing/ Ripping	Tractor & PTO assembly	Operator, passengers, bystanders	Death/crush injury from rollover, runover Entanglement with PTO Back injury and body strain	■■■■■	■■□□□ **(5,12,18)**	☠ ☠ ☠ ☠	
	Hitching	Operator, assistant	Crush injury to fingers, hands Serious injury, back strain	■■■□□	■■■■□ **(K)**	☠ ☠ ☠	

Production phase	Associated physical hazards	Who is at risk	Nature of risk	Severity rating	Frequency rating (Reference)	Risk rating	Associated risk factors
	Primary tillage equipment	Operator during operation, interruption and routine maintenance	Death Crush injury, lacerations, contusions	■■■■■	■■■□□ **(1,5,18)**	☠ ☠ ☠ ☠	
	Slips / trips / falls	Operator	Sprains, strains, fractures to ankles, feet, backs, wrists	■■□□□	■■■■□ **(2,K)**	☠ ☠ ☠	Fractures more likely in older people
	Flying particles / dust	Operator, bystander	Foreign body in eye Respiratory effects	■■□□□	■■■■□ **(K)**	☠ ☠	Greater problem for workers with hypersensitivity
	Noise	Operator	Noise induced hearing loss	■■□□□	■■■■■ **(14)**	☠ ☠ ☠ ☠	
	UV / solar radiation	Operator	Sunburn, skin cancer, dehydration	■■■□□	■■■■■ **(12,K)**	☠ ☠ ☠ ☠	Greater risk, middle of the day - children & young adults
Levelling / Re-levelling	Tractor	Operator, passengers, bystanders	Death/crush injury from rollover, runover Back injury and body strain	■■■■■	■□□□□ **(5,18,K)**	☠ ☠ ☠ ☠	
	Laser plane / land plane	Operator during operation, interruption and routine maintenance	Crush injury, lacerations, contusions	■■■□□	■□□□□ **(K)**	☠ ☠	
	Clearing blockages / routine servicing	Operator during operational interruptions	Crush injury to fingers, hands, arms Lacerations, contusions	■■□□□	■■■□□ **(K)**	☠ ☠ ☠	
	Hitching	Operator, assistant	Crush injury to fingers, hands Serious injury, back strain	■■■□□	■■■■□ **(K)**	☠ ☠ ☠	
	Towing to site	Operator, bystander	Crush injury from rollover / runover	■■■□□	■□□□□ **(K)**	☠ ☠	
	Slips / trips / falls	Operator	Sprains, strains, fractures to ankles, feet, backs, wrists	■■□□□	■■■■□ **(2,K)**	☠ ☠ ☠	Fractures more likely in older people
	Dust / particles	Operator, bystander	Foreign body in eye Respiratory effects	■■□□□	■■■■□ **(K)**	☠ ☠	Greater problem for workers with hypersensitivity
	Noise	Operator	Noise induced hearing loss	■■□□□	■■■■■ **(14)**	☠ ☠ ☠ ☠	

Production phase	Associated physical hazards	Who is at risk	Nature of risk	Severity rating	Frequency rating (Reference)	Risk rating	Associated risk factors
	UV / solar radiation	Operator	Sunburn, skin cancer, dehydration	■■■□□	■■■■■ **(12,K)**	☠ ☠ ☠ ☠	Greater risk, middle of the day - children & young adults
Channel maintenance	Tractor / Grader / Excavator	Operator, bystanders	Death/crush injury from rollover, runover Back injury and body strain	■■■■■	■■■□□ **(5,18,K)**	☠ ☠ ☠ ☠ ☠	
	Grader Blade / Drag Scraper	Operator during operation, interruption and routine maintenance	Crush injury, lacerations, contusions	■■■□□	■□□□□ **(K)**	☠ ☠	
	Herbicide exposure	Worker, bystander	Acute toxicity, depending on chemical used	■■□□□	■■■□□ **(15,K)**	☠ ☠ ☠	
	Manual handling - materials used for erosion control	Worker	Back injury, lacerations, body sprain / strain	■■■□□	■■□□□ **(1,6,7,18)**	☠ ☠ ☠	
	ATV's	Operator	Death, crush injury Back, neck, upper and lower limb injury	■■■■■	■■■□□ **(1,16)**	☠ ☠ ☠ ☠ ☠	
	Clearing blockages / routine servicing	Operator during operational interruptions	Crush injury to fingers, hands, arms Lacerations, contusions	■■□□□	■■■□□ **(K)**	☠ ☠ ☠	
	Hitching	Operator, assistant	Crush injury to fingers, hands Serious injury	■■■□□	■■■■□ **(K)**	☠ ☠ ☠	
	Slips / trips / falls	Operator	Sprains, strains, fractures to ankles, feet, backs, wrists	■■□□□	■■■■□ **(2,18,K)**	☠ ☠ ☠	Fractures more likely in older people
	Snake bite	Worker	Death, serious illness, poisoning	■■■■■	■■□□□ **(1,5,K)**	☠ ☠ ☠ ☠	
	Weed Trimmer / Whipper Snipper	Worker	Foreign body in eye, lacerations, contusions	■■■□□	**?** **(K)**		
	Weed burner	Worker	Burns		**?** **(K)**		

Production phase	Associated physical hazards	Who is at risk	Nature of risk	Severity rating	Frequency rating (Reference)	Risk rating	Associated risk factors
	Dust / particles / Insects	Operator, bystander	Foreign body in eye Respiratory effects. Trauma associated from lost control of vehicle	■■□□□	■■■■□ **(K)**	☠ ☠	Greater problem for workers with hypersensitivity
	Noise	Operator	Noise induced hearing loss	■■□□□	■■■■■ **(14)**	☠ ☠ ☠ ☠	
	UV / solar radiation	Operator	Sunburn, skin cancer, dehydration	■■■□□	■■■■■ **(12,K)**	☠ ☠ ☠ ☠	Greater risk, middle of the day - children & young adults
Hilling-up / Rotabuck	Tractor	Operator, passengers, bystanders	Death/crush injury from rollover, runover Entanglement with PTO Back injury and body strain	■■■■■	■■■□□ **(5,12,18)**	☠ ☠ ☠ ☠ ☠	
	Listing rig Rotabuck	Operator & assistant during operation, interruption and routine maintenance	Death Crush injury, lacerations, contusions Body strain / sprain	■■■■■	■■■□□ **(K)**	☠ ☠ ☠ ☠ ☠	
	Hitching	Operator, assistant	Crush injury to fingers, hands Serious injury, back strain	■■■□□	■■■■□ **(K)**	☠ ☠ ☠	
	Clearing blockages / routine servicing	Operator during operational interruptions	Crush injury to fingers, hands, arms Lacerations, contusions	■■□□□	■■■□□ **(K)**	☠ ☠ ☠	
	Slips / trips / falls	Operator	Sprains, strains, fractures to ankles, feet, backs, wrists	■■□□□	■■■■□ **(2,K)**	☠ ☠ ☠	Fractures more likely in older people
	Dust / particles	Operator, bystander	Foreign body in eye Respiratory effects	■■□□□	■■■■□ **(K)**	☠ ☠	Greater problem for workers with hypersensitivity
	Noise	Operator	Noise induced hearing loss	■■□□□	■■■■■ **(1,14)**	☠ ☠ ☠ ☠	
Fertilising / Gassing	Tractor	Operator, passengers, bystanders	Death/crush injury from rollover, runover Back injury and body strain	■■■■■	■■□□□ **(5,12,18)**	☠ ☠ ☠ ☠	
	Gas rig / Fertiliser rig	Operator during operation, interruption and routine maintenance	Death Crush injury, lacerations, contusions	■■■■■	■■■□□ **(1,5,K)**	☠ ☠ ☠ ☠	
	Hitching	Operator, assistant	Crush injury to fingers, hands Serious injury	■■■□□	■■■■□ **(K)**	☠ ☠ ☠	

Production phase	Associated physical hazards	Who is at risk	Nature of risk	Severity rating	Frequency rating (Reference)	Risk rating	Associated risk factors
	Anhydrous storage tanks	Operator, bystander, during transfer of NH3	Death / Explosion / Asphyxiation Burns, internal, skin and eyes	■■■■■	■■■□□ **(1,5,K)**	☠ ☠ ☠ ☠ ☠	
	Other fertiliser handling	Operator	Crush injury to fingers, hands, toes, feet, legs Back injury, strain / sprain	■■■□□	■■■□□ **(1,K)**	☠ ☠ ☠	
	Clearing blockages / routine servicing	Operator during operational interruptions	Crush injury to fingers, hands, arms Lacerations, contusions	■■□□□	■■■□□ **(K)**	☠ ☠ ☠	
	Dust / particles	Operator, bystander	Foreign body in eye Respiratory effects	■■□□□	■■■■□ **(K)**	☠ ☠	Greater problem for workers with hypersensitivity
	Slips / trips / falls	Operator	Sprains, strains, fractures to ankles, feet, backs, wrists	■■□□□	■■■■□ **(2,K)**	☠ ☠ ☠	Fractures more likely in older people
	Fertiliser store / silos / fertiliser bins	Operator	Rhinitis in hypersensitive people Crush injury from falls of unstable structures. Suffocation in silo	■■■■□	■■□□□ **(12,K)**	☠ ☠ ☠ ☠	
	Noise	Operator	Noise induced hearing loss	■■□□□	■■■■■ **(1,14)**	☠ ☠ ☠ ☠	
	UV / solar radiation	Operator	Sunburn, skin cancer, dehydration	■■■□□	■■■■■ **(12,K)**	☠ ☠ ☠ ☠	Greater risk, middle of the day - children & young adults
Herbicide Application	Exposure to herbicides	Operator during mixing, spraying Bystanders during spraying	Acute toxicity, depending on chemical used Unknown long term affects	■■□□□	■■■□□ **(10,12,15,K)**	☠ ☠ ☠	Subject to Hazardous Substances regulation
	Tractor	Operator, passengers, bystanders	Death/crush injury from rollover, runover Entanglement with PTO Back injury and body strain	■■■■■	■■□□□ **(5,12,18)**	☠ ☠ ☠ ☠	
	Hitching	Operator, assistant	Crush injury to fingers, hands Serious injury	■■■□□	■■■■□ **(K)**	☠ ☠ ☠	
	Clearing blockages / routine servicing	Operator during operational interruptions	Crush injury to fingers, hands, arms Lacerations, contusions	■■□□□	■■■□□ **(K)**	☠ ☠ ☠	
	Slips / trips / falls	Operator	Sprains, strains, fractures to ankles, feet, backs, wrists	■■□□□	■■■■□ **(2,K)**	☠ ☠ ☠	Fractures more likely in older people

Production phase	Associated physical hazards	Who is at risk	Nature of risk	Severity rating	Frequency rating (Reference)	Risk rating	Associated risk factors
	Bending / lifting of chemical containers	Operator	Back injury, musculoskeletal strain/sprain	■■■□□	■■□□□ (1,6)	☠ ☠ ☠	
Pre-Irrigation	Water in channels, culverts and storage	Irrigator, visitors, others	Death / Drowning Possibility of infection from contaminated water Infection from cuts	■■■■■	■■□□□ (5,K)	☠ ☠ ☠ ☠	
	Debris in channel	Irrigator	Lacerations, puncture wounds	■■□□□	? (K)	?	
	Exposure to pesticides	Irrigator	Acute toxicity from contaminated water	?	?	?	Subject to Hazardous Substances regulation
	Bending / Lifting / moving siphons	Irrigator	Back injury, musculoskeletal strain / sprain	■■■□□	■■■■□ (1,6,7,K)	☠ ☠ ☠	
	Pumping equipment	Irrigator, servicing team	Entanglement with exposed drive shafts, pump impellers	■■■■■	■■■■□ (1,5,6,K)	☠ ☠ ☠ ☠ ☠	
	Trash racks	Irrigator	Pinch points, crush injury to fingers, hands, arms and legs	■■■□□	■■□□□ (K)	☠ ☠	
	Shovelling	Irrigator	Manual handling, back strain / sprain, Lacerations to below the knee	■■■□□	■■■□□ (1,6,7,K)	☠ ☠ ☠	
	Snake bite	Irrigator	Death, serious illness, poisoning	■■■■■	■■□□□ (1,5,K)	☠ ☠ ☠ ☠	
	UV / solar radiation	Irrigator	Sunburn, skin cancer, dehydration	■■■□□	■■■■■ (12,K)	☠ ☠ ☠ ☠	Greater risk, middle of the day - children & young adults
Soil / Moisture testing	Neutron Probe tube installation	Agronomist	Back strain / sprain Lacerations, bruising	■■■□□	■■■□□ (K)	☠ ☠ ☠	Subject to Hazardous Substances reg's
	Neutron probe	Agronomist	Radiation ?	?	?	?	
	UV / solar radiation	Agronomist	Sunburn, skin cancer, dehydration	■■■□□	■■■■■ (12,K)	☠ ☠ ☠ ☠	

Production phase	Associated physical hazards	Who is at risk	Nature of risk	Severity rating	Frequency rating (Reference)	Risk rating	Associated risk factors
	Snake bite	Agronomist	Death, serious illness, poisoning	■■■■■	■■□□□ **(1,5,K)**	☠ ☠ ☠ ☠	
Infield service & maintenance	Fuel spills	Operator, servicing team	Burns, external, skin conditions	■■■□□	■■■□□ **(12,15,K)**	☠ ☠ ☠	
	Fire	Operator, servicing team	Burns, eye and respiratory effects	■■■□□	■■□□□ **(1,K)**	☠ ☠	
Traffic (workers / maintenance / supervisors)	Utility / Truck - collisions	Driver, passenger(s)	Death, crush injury Back & neck injury	■■■■■	■■■■□ **(1,3,5,18,K)**	☠ ☠ ☠ ☠ ☠	Young or new drivers / workers. Fatigue
	Motorbike - collisions	Rider	Death, crush injury Back, neck, upper and lower limb injury	■■■■■	■■■■□ **(1,5,12,16,18)**	☠ ☠ ☠ ☠ ☠	“ “
	Roads - loose, damaged road surface	Driver / rider / passenger	Death, crush injury / drowning Back & neck injury	■■■■■	■■■■□ **(1,5,6,18,K)**	☠ ☠ ☠ ☠ ☠	“ “
	Dust	Driver / rider / passenger	Death, crush injury / drowning Back & neck injury	■■■■■	**?** **(K)**	**?**	
	Public roads	Road users	Public liability Death, crush injury Back & neck injury	■■■■■	■■■■□ **(1,5,K)**	☠ ☠ ☠ ☠ ☠	“ “
	Channel crossings	Driver / rider / passenger	Death, crush injury / drowning Back & neck injury	■■■■■	■■■■□ **(5,6,K)**	☠ ☠ ☠ ☠ ☠	“ “

B. PLANTING

Production phase	Associated physical hazards	Who is at risk	Nature of risk	Severity rating	Frequency rating (Reference)	Risk rating	Associated risk factors
Sowing	Tractor	Operator, passengers, bystanders	Death/crush injury from rollover, runover Back injury and body strain	■■■■■	■■□□□ **(5,12,18)**	☠☠☠☠	
	Planter	Operator during operation, interruption and routine maintenance	Crush injury, lacerations, contusions	■■■■■	■■□□□ **(2,12,K)**	☠☠☠☠	
	Hitching	Operator, assistant	Crush injury to fingers, hands Serious injury	■■■□□	■■■■□ **(K)**	☠☠☠	
	Seed handling (25kg bags)	Operator	Back injury, strain / sprain Pesticide exposure from seed dressing	■■■□□	■■■□□ **(1,K)**	☠☠☠	
	Clearing blockages / routine servicing	Operator during operational interruptions	Crush injury to fingers, hands, arms Lacerations, contusions	■■□□□	■■■□□ **(K)**	☠☠☠	
	Slips / trips / falls	Operator	Sprains, strains, fractures to ankles, feet, backs, wrists	■■□□□	■■■■□ **(2,K)**	☠☠☠	Fractures more likely in older people
	Dust / particles	Operator, bystander	Foreign body in eye Respiratory effects	■■□□□	■■■■□ **(K)**	☠☠	Greater problem for workers with hypersensitivity
	Noise	Operator	Noise induced hearing loss	■■□□□	■■■■■ **(1,14)**	☠☠☠☠	
	UV / solar radiation	Operator	Sunburn, skin cancer, dehydration	■■■□□	■■■■■ **(12,K)**	☠☠☠☠	Greater risk, middle of the day - children & young adults
	Organic dusts / particles	Operator, bystander	Respiratory effects	■■■■□	■■□□□ **(K)**	☠☠☠	Greater risk for workers with hypersensitivity
Pesticide Application	Exposure to pesticides	Operator during mixing, spraying Bystanders during spraying	Acute toxicity, depending on chemical used Unknown long term affects	■■□□□	■■■□□ **(10,12,15,K)**	☠☠☠	Subject to Hazardous Substances regulation
	Drum disposal / triple rinse / drum crushing	Operator / worker / bystander	Skin contact with pesticides, poisoning, back strain / sprain	■■□□□	■■■□□ **(15,K)**	☠☠	
	Tractor, PTO and spray rig assembly	Operator	Death/crush injury from rollover, runover	■■■■■	■■□□□ **(5,12)**	☠☠☠☠	

Production phase	Associated physical hazards	Who is at risk	Nature of risk	Severity rating	Frequency rating (Reference)	Risk rating	Associated risk factors
			Entanglement with PTO Back injury and body strain				
	Hitching	Operator, assistant	Crush injury to fingers, hands Serious injury	■■■□□	■■■■□ **(K)**	☠☠☠	
	Aeroplane	Pilot, ground crew	Death Serious crush injury	■■■■■	■■■□□ **(5,12,K)**	☠☠☠☠☠	
	Clearing blockages / routine servicing	Operator during operational interruptions	Crush injury to fingers, hands, arms Lacerations, contusions	■■□□□	■■■□□ **(K)**	☠☠☠	
	Slips / trips / falls	Operator	Sprains, strains, fractures to ankles, feet, backs, wrists	■■□□□	■■■■□ **(2,K)**	☠☠☠	Fractures more likely in older people
	Bending / lifting chemical containers	Operator	Back injury, musculoskeletal strain/sprain	■■■□□	■■■□□ **(1,K)**	☠☠☠	
Traffic (workers / maintenance / supervisors)	Utility / Truck - collisions	Driver, passenger(s)	Death, crush injury Back & neck injury	■■■■■	■■■■□ **(1,3,5,18,K)**	☠☠☠☠☠	Young or new drivers / workers. Fatigue
	Motorbike - collisions	Rider	Death, crush injury Back, neck, upper and lower limb injury	■■■■■	■■■■□ **(1,5,12,16,18)**	☠☠☠☠☠	“ “
	Roads - loose, damaged road surface	Driver / rider / passenger	Death, crush injury / drowning Back & neck injury	■■■■■	■■■■□ **(1,5 6,18,K)**	☠☠☠☠☠	“ “
	Dust	Driver / rider / passenger	Death, crush injury / drowning Back & neck injury	■■■■■	**?** **(K)**	**?**	
	Public roads	Road users	Public liability Death, crush injury Back & neck injury	■■■■■	■■■■□ **(1,5,K)**	☠☠☠☠☠	“ “
	Channel crossings	Driver / rider / passenger	Death, crush injury / drowning Back & neck injury	■■■■■	■■■■□ **(5,6,K)**	☠☠☠☠☠	“ “

C. PLANT GROWTH

Production phase	Associated physical hazards	Who is at risk	Nature of risk	Severity Rating	Frequency Rating (Reference)	Risk Rating	Associated risk factors
Watering	Water	Irrigator	Death / Drowning Possibility of infection from contaminated water	■■■■■	■■□□□ **(5,K)**	☠☠☠☠☠	
	Exposure to pesticides	Irrigator	Acute toxicity from contaminated water	**?**	**?**	**?**	Subject to Hazardous Substances regulation
	Bending / Lifting / moving siphons	Irrigator	Back injury, musculoskeletal strain / sprain	■■■□□	■■■□□ **(1,6,7,K)**	☠☠☠	
	Pumping equipment	Irrigator, servicing team	Entanglement with exposed drive shafts, pump impeller	■■■■■	■■■■□ **(1,6,7,K)**	☠☠☠☠☠	
	Shovelling	Irrigator	Manual handling, back strain / sprain Lacerations to below the knee	■■■□□	■■■□□ **(1,6,7,K)**	☠☠☠	
	Snake bite	Irrigator	Death, poisoning	■■■■■	■■□□□ **(1,5, K)**	☠☠☠☠	
	UV / solar radiation	Irrigator	Sunburn, skin cancer, dehydration	■■■□□	■■■■■ **(12,K)**	☠☠☠☠	Greater risk, middle of the day - children & young adults
	Syphons	Irrigator	Burns to hands, blisters	■■□□□	**?** **(K)**	**?**	
Pesticide Application	Exposure to pesticides	Operator during mixing, spraying Bystanders during spraying	Acute toxicity, depending on chemical used Unknown long term affects	■■□□□	■■■□□ **(10,12,15,K)**	☠☠☠	Subject to Hazardous Substances regulation
	Tractor, PTO and spray rig assembly	Operator	Death/crush injury from rollover, runover Entanglement with PTO Back injury and body strain	■■■■■	■■□□□ **(5,12,18)**	☠☠☠☠	
	Aeroplane	Pilot, ground crew	Death Serious crush injury	■■■■■	■■■□□ **(5,12,K)**	☠☠☠☠☠	
	Hitching	Operator, assistant	Crush injury to fingers, hands Serious injury	■■■□□	■■■■□ **(K)**	☠☠☠	

Production phase	Associated physical hazards	Who is at risk	Nature of risk	Severity Rating	Frequency Rating (Reference)	Risk Rating	Associated risk factors
	Clearing blockages / routine servicing	Operator during operational interruptions	Crush injury to fingers, hands, arms Lacerations, contusions	■■□□□	■■■□□ **(K)**	☠☠☠	
	Slips / trips / falls	Operator	Sprains, strains, fractures to ankles, feet, backs, wrists	■■□□□	■■■■□ **(2,K)**	☠☠☠	Fractures more likely in older people
	Bending / lifting chemical containers	Operator	Back injury, musculoskeletal strain/sprain	■■■□□	■■□□□ **(1,6)**	☠☠☠	Level of fitness
Crop inspection	Exposure to pesticides	Agronomist / Crop checker	Acute toxicity from pesticide residues on the plant	■■□□□	■■■□□ **(10,12,15,K)**	☠☠☠	***Re-entry requirements***
	UV / solar radiation	Agronomist / Crop checker	Sunburn, skin cancer, dehydration	■■■□□	■■■■■ **(12,K)**	☠☠☠☠	Greater risk, middle of the day - children & young adults
	Snake bite	Agronomist / Crop checker	Death, poisoning	■■■■■	■■□□□ **(1,5,K)**	☠☠☠☠	
Fertilising / Gassing	Tractor	Operator, bystanders	Death/crush injury from rollover, runover Back injury and body strain	■■■■■	■■□□□ **(5,12,18)**	☠☠☠☠	
	Gas rig / fertilising rig	Operator during operation, interruption and routine maintenance	Death Crush injury, lacerations, contusions	■■■■■	■■□□□ **(5,12)**	☠☠☠☠	
	Hitching	Operator, assistant	Crush injury to fingers, hands Serious injury	■■■□□	■■■■□ **(K)**	☠☠☠	
	Clearing blockages / routine servicing	Operator during operational interruptions	Crush injury to fingers, hands, arms Lacerations, contusions	■■□□□	■■■□□ **(K)**	☠☠☠	
	Dust / particles	Operator, bystander	Foreign body in eye Respiratory effects	■■□□□	■■■■□ **(K)**	☠☠	Greater problem for workers with hypersensitivity
	Slips / trips / falls	Operator	Sprains, strains, fractures to ankles, feet, backs, wrists	■■□□□	■■■■□ **(2,K)**	☠☠☠	Fractures more likely in older people
	UV / solar radiation	Operator	Sunburn, skin cancer, dehydration	■■■□□	■■■■■ **(12,K)**	☠☠☠☠	
	Fertiliser store / silos / fertiliser bins	Operator	Asthma in hypersensitive people Crush injury from falls of unstable structures. Suffocation in silo	■■■■□	■■□□□ **(12,K)**	☠☠☠	

Production phase	Associated physical hazards	Who is at risk	Nature of risk	Severity Rating	Frequency Rating (Reference)	Risk Rating	Associated risk factors
	Anhydrous Ammonia	Operator, bystander	Death, internal burning when inhaled. External burning to eyes and skin	■■■■■	■■■□□ **(1,5,K)**	☠☠☠☠	
	Noise	Operator	Noise induced hearing loss	■■□□□	■■■■■ **(1,14)**	☠☠☠☠	
	UV / solar radiation	Operator	Sunburn, skin cancer, dehydration	■■■□□	■■■■■ **(12,K)**	☠☠☠☠	Greater risk, middle of the day - children & young adults
Cotton Chipping / Weeding	Exposure to pesticides/weeds	Chippers	Acute toxicity, depending on chemical used. Rashes, boils Unknown long term affects	■■□□□	■■■□□ **(8,9,15,18,K)**	☠☠☠	Subject to Hazardous Substances regulation
	Hoes	Chippers	Lacerations and bruising to below the knee	■■□□□	■■■□□ **(2,8,18,K)**	☠☠	
	Chipping bike	Operator	Death, crush injury, drown, burn from exhaust	■■■■■	**?** **(K)**	**?**	
	Spot sprayers / Row weeders	Operators / Workers	Falls, back injury, musculoskeletal strain/sprain	■■□□□	**?** **(K)**	**?**	
	Bending / Pulling	Chippers	Back injury, musculoskeletal strain/sprain	■■□□□	■■■□□ **(2,18,K)**	☠☠☠	
	Snake bite	Chippers	Death, poisoning	■■■■■	■■□□□ **(1,5,K)**	☠☠☠☠	Species of snake
	UV / solar radiation	Chippers	Sun burn, skin cancer and dehydration	■■■□□	■■■■■ **(12,K)**	☠☠☠☠	Greater risk, middle of the day - children & young adults
Traffic (workers / maintenance / supervisors)	Utility / Truck - collisions	Driver, passenger(s)	Death, crush injury Back & neck injury	■■■■■	■■■■□ **(1,3,5,18,K)**	☠☠☠☠☠	Young or new drivers Fatigue
	Motorbike - collisions	Rider	Death, crush injury Back, neck, upper and lower limb injury	■■■■■	■■■■□ **(1,5,12,16,18)**	☠☠☠☠☠	“ “
	Roads - loose, damaged road surface	Driver / rider / passenger	Death, crush injury / drowning Back & neck injury	■■■■■	■■■■□ **(1,5,6,18,K)**	☠☠☠☠☠	“ “
	Public roads	Road users	Public liability Death, crush injury Back & neck injury	■■■■■	■■■■□ **(1,5,K)**	☠☠☠☠☠	“ “
	Channel crossings	Driver / rider / passenger	Death, crush injury / drowning Back & neck injury	■■■■■	■■■■□ **(5,6,K)**	☠☠☠☠☠	“ “

D. PICKING AND CARTING

Production phase	Associated physical hazards	Who is at risk	Nature of risk	Severity Rating	Frequency Rating (Reference)	Risk Rating	Associated risk factors
Defoliant application	Tractor, PTO and spray rig assembly	Operator	Death/crush injury from rollover, runover Entanglement with PTO Back injury and body strain	■■■■■	■■□□□ **(5,12,18)**	☠ ☠ ☠ ☠	
	Exposure to defoliant	Mixers, markers and applicators Bystanders during spraying	Acute toxicity, depending on chemical used Unknown long term affects	■■□□□	■■■□□ **(10,12,15,K)**	☠ ☠ ☠	
	Aeroplanes	Pilot, ground crew, bystanders	Death, crush injury	■■■■■	■■■□□ **(5,12,K)**	☠ ☠ ☠ ☠ ☠	
	Hitching	Operator, assistant	Crush injury to fingers, hands Serious injury	■■■□□	■■■■□ **(K)**	☠ ☠ ☠	
	Clearing blockages / routine servicing	Operator during operational interruptions	Crush injury to fingers, hands, arms Lacerations, contusions	■■□□□	■■■□□ **(K)**	☠ ☠ ☠	
	Slips / trips / falls	Operator	Sprains, strains, fractures to ankles, feet, backs, wrists	■■□□□	■■■■□ **(2,K)**	☠ ☠ ☠	Fractures more likely in older people
	Bending / lifting chemical containers	Operator / mixer	Back injury, musculoskeletal strain/sprain	■■■□□	■■□□□ **(1,6)**	☠ ☠ ☠	
Picking / stripping	Cotton Picker	Operator / bystander	Crush injury, lacerations, contusions, amputation of limbs Death, severe entanglement injury Picker rollover / runover	■■■■■	■■■■□ **(1,2,5,6,18,K)**	☠ ☠ ☠ ☠ ☠	
	Flying particles / Dust	Operator, servicing team, bystander	Foreign body in eye, respiratory effects	■■□□□	■■■■□ **(K)**	☠ ☠	
	Clearing blockages / routine servicing	Operator during operational interruptions	Crush injury to fingers, hands, arms Lacerations, contusions	■■□□□	■■■□□ **(K)**	☠ ☠ ☠	
	Slips, trips and falls	Operator, servicing team	Sprains, strains, fractures to ankles, feet, backs, wrists	■■□□□	■■■■□ **(2,K)**	☠ ☠ ☠	Fractures more likely in older people
	Fire	Operator / workers	Burns, eye and respiratory effects	■■■□□	■■■□□ **(12,K)**	☠ ☠ ☠	
	Power lines	Operator / bystander	Electrocution, picker coming in contact with power lines	■■■■■	■■■□□ **(5,K)**	☠ ☠ ☠ ☠ ☠	

Production phase	Associated physical hazards	Who is at risk	Nature of risk	Severity Rating	Frequency Rating (Reference)	Risk Rating	Associated risk factors
	Boll buggy	Operator	Noise induced hearing loss	■■□□□	? (K)	?	
	Bending / lifting	Operator	Back injury, musculoskeletal strain / sprain	■■■□□	■■□□□ (1,6)	☠ ☠ ☠	
	Noise	Operator, servicing team	Noise induced hearing loss	■■□□□	■■■■■ (1,14)	☠ ☠ ☠ ☠	
	UV / solar radiation	Operator	Sunburn, skin cancer, dehydration	■■■□□	■■■■■ (12,K)	☠ ☠ ☠ ☠	Greater risk, middle of the day - children & young adults
Transporting module builders	Tractor	Operator	Death / crush injury from rollover, runover Entanglement with PTO Back injury and body strain	■■■■■	■■□□□ (5,12,18)	☠ ☠ ☠ ☠ ☠	
	Module builder	Operator, bystander	Crush injury from moving builder	■■■■□	■■□□□ (K)	☠ ☠ ☠	
	Hitching	Operator, assistant	Crush injury to fingers, hands, Serious injury	■■■□□	■■■■□ (K)	☠ ☠ ☠	
	Power lines	Operator	Death, electric shock	■■■■■	■■■□□ (5,K)	☠ ☠ ☠ ☠ ☠	
	Clearing blockages / routine servicing	Operator during operational interruptions	Crush injury to fingers, hands, arms Lacerations, contusions	■■□□□	■■■□□ (K)	☠ ☠ ☠	
	Roads & channel crossings	Operator	Death, crush injury / drowning Back & neck injury	■■■■■	■■■□□ (K)	☠ ☠ ☠ ☠	
	Tramper	Operator	Death, crush injury when lowering	■■■■■	? (K)	?	
Module building	Tractor & PTO assembly	Operator	Death / crush injury from rollover, runover Entanglement with PTO Back injury and body strain	■■■■■	■■□□□ (5,12,18)	☠ ☠ ☠ ☠ ☠	
	Power lines	Operator	Death / electrocution, m/builder trampling ram coming in contact with power lines	■■■■■	■■■□□ (5,K)	☠ ☠ ☠ ☠ ☠	
	Slips, trips, falls	Operator	Sprains, strains, fractures to ankles,	■■□□□	■■■■□	☠ ☠ ☠	Fractures more likely

Production phase	Associated physical hazards	Who is at risk	Nature of risk	Severity Rating	Frequency Rating (Reference)	Risk Rating	Associated risk factors
			feet, backs, wrists		**(2,K)**		in older people
	Module builder	Operator / bystander	Death, serious crush injury, lacerations, contusions	■■■■■	■■■□□ **(1,2,5,6,12,K)**	☠ ☠ ☠ ☠ ☠	
	Back door of module builder	Bystander	Crush injury	■■■□□	**?** **(K)**	**?**	
	Fire	Operator / workers	Burns, eye and respiratory effects	■■■□□	■■■□□ **(12,K)**	☠ ☠ ☠	
	Ruptured hydraulic hoses	Operator / mechanic	Hot oil burns to the skin and eyes	■■□□□	■■□□□ **(5,K)**	☠ ☠	
	Bending / lifting / seating	Operator	Back injury, musculoskeletal strain / sprain	■■■□□	■■□□□ **(K)**	☠ ☠	
	Noise	Operator, servicing team	Noise induced hearing loss	■■□□□	■■■■■ **(14)**	☠ ☠ ☠ ☠	
	Dust	Operator, driver, bystander	Eye and respiratory effects	■■□□□	■■■■□ **(K)**	☠ ☠	Greater problem for workers with hypersensitivity
	UV / solar radiation	Operator	Sunburn, skin cancer, dehydration	■■■□□	■■■■■ **(12,K)**	☠ ☠ ☠ ☠	Higher risk: middle day, children & young adults
Tarping Modules	Tarp spears	Operators / workers	Lacerations, puncture injury Body strain / sprain	■■■□□	■■■□□ **(K)**	☠ ☠ ☠	
Carting modules	Loading tray	Operator	Crush injury, pinch points	■■■□□	■■■□□ **(K)**	☠ ☠ ☠	
	Fire	Operator / workers	Burns, eye and respiratory effects	■■■□□	■■■□□ **(12,K)**	☠ ☠ ☠	
Traffic (workers / maintenance / supervisors)	Utility / Truck - collisions	Driver, passenger(s)	Death, crush injury Back & neck injury	■■■■■	■■■■□ **(1,3,5,18,K)**	☠ ☠ ☠ ☠ ☠	Young or new drivers / workers. Fatigue
	Motorbike - collisions	Rider	Death, crush injury Back, neck, upper and lower limb injury	■■■■■	■■■■□ **(1,5,12,16,18)**	☠ ☠ ☠ ☠ ☠	“ “
	Roads - loose, damaged road surface	Driver / rider / passenger	Death, crush injury Back & neck injury	■■■■■	■■■■□ **(1,5,6,18,K)**	☠ ☠ ☠ ☠ ☠	

Production phase	Associated physical hazards	Who is at risk	Nature of risk	Severity Rating	Frequency Rating (Reference)	Risk Rating	Associated risk factors
	Dust	Driver / rider / passenger	Death, crush injury / drowning Back & neck injury	■■■■■	**?** **(K)**	**?**	
	Public roads	Road users	Public liability Death, crush injury Back & neck injury	■■■■■	■■■■□ **(1,5,K)**	☠ ☠ ☠ ☠ ☠	
	Channel crossings	Driver / rider / passenger	Death, crush injury / drowning Back & neck injury	■■■■■	■■■■□ **(5,6,K)**	☠ ☠ ☠ ☠ ☠	“ “

E. MACHINERY, EQUIPMENT, AND STORAGE MAINTENANCE

Production phase	Associated physical hazards	Who is at risk	Nature of risk	Severity Rating	Frequency Rating (Reference)	Risk Rating	Associated risk factors
Traffic (workers / maintenance / supervisors)	Utility / Truck - collisions	Driver, passenger(s)	Death, crush injury Back & neck injury	■■■■■	■■■■□ **(1,3,5,18,K)**	☠☠☠☠☠	Young or new drivers / workers. Fatigue
	Motorbike - collisions	Rider	Death, crush injury Back, neck, upper and lower limb injury	■■■■■	■■■■□ **(1,5,12,16,18)**	☠☠☠☠☠	“ “
	Roads - loose, damaged road surface	Driver / rider / passenger	Death, crush injury / drowning Back & neck injury	■■■■■	■■■■□ **(1,5,6,18,K)**	☠☠☠☠☠	“ “
	Public roads	Road users	Public liability Death, crush injury Back & neck injury	■■■■■	■■■■□ **(1,5,6,K)**	☠☠☠☠☠	“ “
	Channel crossings	Driver / rider / passenger	Death, crush injury / drowning Back & neck injury	■■■■■	■■■■□ **(1,5,6,K)**	☠☠☠☠☠	“ “
Pesticide storage	Exposure to pesticide	Farm community / workers	Acute toxicity, depending on chemical stored Unknown long term affects	■■□□□	■■■□□ **(10,12,15,K)**	☠☠☠	Subject to Hazardous Substances regulation
	Solvents	Farm community	Skin conditions Toxicity	■■□□□	■■■□□ **(10,12,15,K)**	☠☠☠	
	Slips, trips, falls	Workers	Back injury, sprains, strains, fractures of ankles, wrists, feet	■■□□□	■■■■□ **(2,18)**	☠☠☠	Fractures more likely in older people
	Bending / lift chemical drums	Workers	Back injury, strain	■■■□□	■■□□□ **(1,6)**	☠☠☠	
General Storage	Paint solvents / cleaning agents	Workers	Skin conditions Toxicity	■■□□□	■■■□□ **(10,12,15,K)**	☠☠☠	
	Bending / lifting	Workers	Back injury, strain	■■■□□	■■■■□ **(1,3,5,6,7,K)**	☠☠☠	
	Slips, trips, falls	Workers	Back injury, sprains, strains, fractures of ankles, wrists, feet	■■■□□	■■■■□ **(1,3,5,6,7,18,K)**	☠☠☠	Fractures more likely in older people

Production phase	Associated physical hazards	Who is at risk	Nature of risk	Severity Rating	Frequency Rating (Reference)	Risk Rating	Associated risk factors
	Spiders	Workers	Severe illness	■■■■□	■□□□□ (18)	☠ ☠	
Power Tools	Electricity	Worker, assistant	Death, electrocution	■■■□□	■■■■■ (1,2,K)	☠ ☠ ☠ ☠ ☠	
	Steel fragments from grinders and drills	Worker, assistant	Steel fragments in eye Minor skin burns	■■■□□	■■■■■ (1,2,18,K)	☠ ☠ ☠ ☠	
	Saws - bench, portable	Worker	Lacerations, contusions	■■■□□	■■■■■ (1,2,K)	☠ ☠ ☠	
	Grinders	Worker	Laceration, contusions, burns	■■■□□	■■■■■ (1,2,K)	☠ ☠ ☠	
	Air compressor (compressed air)	Workers, bystanders	Penetrating injury, particles into eye, entanglement with belt drive	■■■□□	■■■□□ (1,3,5,6,7,K)	☠ ☠ ☠	
	Noise	Worker, assistant, bystanders	Noise induced hearing loss	■■□□□	■■■■■ (1,14)	☠ ☠ ☠ ☠	
Hand tools	Contact with hands and fingers	Worker	Crush injury hands, fingers	■■■□□	■■■■■ (1,2,18,K)	☠ ☠ ☠	
Hoists	Failure - due to poor maintenance / lifting incorrect weights	Worker, assistant, bystander	Crush injury, death	■■■■■	■■■□□ (K)	☠ ☠ ☠ ☠ ☠	
Welding	Oxyacetylene explosion	Worker, bystanders	Burns, penetrating injury	■■■■■	■■□□□ (K)	☠ ☠ ☠ ☠	
	Welding arc	Worker, bystanders	Flash burns to eyes and skin	■■■□□	■■■■□ (1,2,5,6,12,18,K)	☠ ☠ ☠ ☠	
	Welding fumes	Worker, bystanders	Respiratory toxicity	■■□□□	■■■□□ (1,2,5,6,12,K)	☠ ☠	
Tyre repairs	Explosion	Worker, bystanders	Penetrating injury	■■■■■	■■□□□ (K)	☠ ☠ ☠ ☠	
	Falling tyres	Worker, bystander	Crush injury, sprains / strains Multiply limb fractures	■■■■□	■■□□□ (K)	☠ ☠ ☠	

Production phase	Associated physical hazards	Who is at risk	Nature of risk	Severity Rating	Frequency Rating (Reference)	Risk Rating	Associated risk factors
	Manual handling	Worker	Back injury, musculoskeletal strain/sprain	■■■□□	■□□□□ **(18)**	☠ ☠	
General hazards	Slips / trips / falls	Operator	Sprains, strains, fractures to ankles, feet, backs, wrists	■■□□□	■■■■□ **(2,18,K)**	☠ ☠ ☠	Fractures more likely in older people
	Bending / lifting, bench areas	Operator	Back injury, musculoskeletal strain/sprain	■■■□□	■■□□□ **(1,6)**	☠ ☠ ☠	
	Noise	Worker, assistant, bystanders	Noise induced hearing loss	■■□□□	■■■■■ **(1,14)**	☠ ☠ ☠ ☠	
	Solvents / petroleum products	Worker / handler	Skin conditions Toxicity	■■□□□	■■■□□ **(K)**	☠ ☠ ☠	
	Fuel tank explosions / fires	All workshop employees	Death Burns to the body and eyes Eye and respiratory effects	■■■■■	■■□□□ **(K)**	☠ ☠ ☠ ☠	
	Fires, combustible materials	All workshop employees	Burns to the body and eyes Eye and respiratory effects	■■■□□	■■■□□ **(K)**	☠ ☠ ☠	

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