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Occupational Health and Safety on Australian Farms:

3. Safety Climate, Safety Management Systems and the Control of Major Safety Hazards

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Abstract

The Australian Centre for Agricultural Health and Safety established a longitudinal study of 335 NSW farm enterprises to derive data on farm health and safety management and how it relates to farmer perceptions. The analysis reported in this paper benchmarked the perceptions of the study informants on the role and importance of health and safety on their farms and reviewed the safety performance of the study enterprises, focusing on management of safety systems and processes and control of major risks and hazards on their farms.

The results not only challenged some apparent misconceptions, such as older farmers having more negative attitudes towards farm safety than younger farmers, but it also identified industries from within the study population that are performing well in the management of safety and the possible reasons behind their success. Importantly, it also observed an area of disconnect between having a positive attitude towards farm safety and its role and importance, and actually implementing farm safety systems and management processes on the farm.

These findings provide evidence for the possible benefits of tailoring farm initiatives and interventions based on gender, age and industry. Set beside other analyses of the changes farmers had made on their farms, the prompts and drivers for making those changes, and the issues and risks that the farmers see as important on their own farms, a wealth of information is available to health and safety researchers, Farmsafe Australia, work safety authorities and industry bodies to direct and prioritise their research programs and policy initiatives.

Key words: Safety climate, safety management, OHS, farm, agriculture, hazard, risk, enterprise

Introduction

A thorough understanding of farmers' attitudes and perceptions to farm health and safety in Australia is essential to the design and evaluation of practical, relevant and successful farm health and safety initiatives and programs. However, there is a lack of comprehensive data on the topic, with most cross-sectional studies focusing on small sample populations (Australian Safety and Compensation Council, 2006; Day and Stathakis, 2004; Durey and Lower, 2004; Sandall and Reeve, 2000).

This paper reports analyses undertaken relating to one component of a broader, large-scale, longitudinal study of these issues undertaken by the Australian Centre for Agricultural Health and Safety. It focuses on the benchmarking of health and safety systems on NSW farms, assessing Safety Climate, Safety Management Systems and the Control of Major Hazards, and reports the responses from 335 baseline participants in the study. This paper complements two other studies undertaken on the same data set: the overall rationale for the study and a more detailed examination of data on farmers' perceptions is reported in Pollock, Fragar and Griffith (2014a), while an examination of changes made to farm safety management systems and practices and the factors and motivations behind these changes is reported in Pollock, Fragar and Griffith (2014b).

Literature Review

Benchmarking health and safety systems enables an organisation to compare its systems and processes with other organisations or with itself over time, with an aim to reduce accidents and ill health, improve compliance with government regulations and reduce compliance costs. It enables an organisation to determine its strengths and weaknesses and also to act on lessons learned (Health and Safety Executive, 2009). The expectation would be that "better" safety systems and control processes, and perceptions more closely aligned with best practice, would lead to fewer safety events and reduced costs.

Benchmarking, or measuring safety performance, can include a number of techniques, including direct observation of working conditions and employees' behaviour and practices, interviews and questionnaires to gauge experiences, perceptions and observations of employees and the review and examination of organisational reports, documents and records.

The health and safety climate and the culture of an organisation are important factors in ensuring the effectiveness of risk control. The health and safety management system is an important influence on the safety climate and culture, which in turn impacts on the effectiveness of the health and safety management system. Measuring facets of safety climate and culture therefore forms an integral part of the overall process of benchmarking or measuring health and safety performance (Health and Safety Executive, 2001).

Williamson et al. (1997) greatly enhanced the field of safety climate and culture research and the theories underpinning the development of benchmarking instruments, through their development of a measure for determining perceptions and attitudes about safety climate, as an indicator of safety culture, for use within working populations. Safety climate was defined as the safety ethic within an organisation or workplace which is reflected in employees' beliefs about safety and is

thought to predict the way employees behave with respect to safety in that workplace, while safety culture referred more to the overall organisational and company level beliefs and attitudes.

The strongest response in their study was personal motivation for safe behaviour, reflecting the widely held belief that there are issues within the workplace that prevent employees from working safely. Following on from this was risk justification, suggesting that workplace systems cause the unsafe behaviour to occur. Some of the concepts they put forward included positive safety practice, which reflects the perceptions of the role and commitment of management to safety; fatalism, which refers to the importance and controllability of safety; and optimism, which reflects the extent that the individual believes that their level of personal risk is favourable.

Hodne et al. (1999) developed the *Farm Safety and Health Beliefs Scale* (FSHBS), a measure derived from the Health Beliefs Model, which focused on five constructs; susceptibility, benefits, barriers, self-efficacy and severity. They found that farmers' perceptions of their abilities to perform health behaviours in general were moderately correlated with their views on their abilities to perform farm health and safety behaviours. Farmers who performed better on general health behaviours also perceived more benefits and fewer barriers to practicing farm safety behaviours. They also felt less vulnerable to farm-related accidents and illnesses, and expected less severe consequences should one occur. Finally, farmers placing more value on their overall health also placed more value on the benefits of implementing farm safety practices.

When the scoring on individual elements were examined, farmers scored highest on the benefits factors, followed by self-efficacy, which is in line with research that farmers tend to acknowledge the importance of farm health and safety practices and have adequate knowledge and understanding on its implementation. Farmers scored lowest on susceptibility factors, implying their disagreement with the likelihood of farm injury or illness. Given the prevalence of farm accidents, this suggests an optimistic bias on the part of the farmers.

BOMEL Limited (2004) conducted a study into the understanding and influencing of farmer attitudes, though a series of interviews with 35 farmers in the south of England. Of the farmers interviewed, 31 were found to have overall positive attitudes, three negative attitudes and one had a neutral safety attitude. Just one farmer was reported to have an overall negative behavioural risk rating.

Whilst on the whole, behavioural risk ratings were positive, there were splits between negative and positive for the categories of health and guidance.

There were also demonstrated links between attitudes and behaviours for the core safety issues of training, personal protective equipment and guidance. This was particularly evident in training and personal protective equipment, with all but one farmer having positive attitudes and positive behaviours. In contrast, there were no apparent links between attitudes and behaviours for productivity versus safety and health.

A common concern among farmers is that they are implementing changes to their management systems, machinery and day-to-day farm management, but they have no feel for how well they are performing from a farm health and safety perspective, nor whether they would be seen by work

safety authorities to have taken all reasonable steps to minimise risk, should the Authority conduct an inspection on their property.

In 2001, the NSW WorkCover Workers' Compensation scheme instigated a Premium Discount Scheme, which offered an incentive of reduced workers' compensation premiums to employers implementing programs to improve workplace safety and return-to-work strategies for injured workers. The employer would receive up to a maximum of 15% discount in year one, 10% in year two and 5% in the final year of the scheme, on the successful completion of an audit of their occupational health and safety and injury management systems (WorkCover NSW, 2001). Different programs were established for small business and larger companies.

The WorkCover NSW Premium Discount Scheme Small Business Strategy was delivered to cotton enterprises in NSW by the Australian Centre for Agricultural Health and Safety, with support from the Australian cotton industry. Of the 156 cotton growers with less than 20 employees registered to participate in the program in 2001, 131 met the benchmarks and successfully completed the program. In the first year of the program, participants completed Farmsafe Australia's Managing Farm Safety training, to assist in gaining the skills, knowledge and resources to manage safety systems (Temperley, 2005).

In the final year of the scheme, the safety and injury management systems were audited, using a series of farm benchmarks. The benchmarks were a combination of validated safety climate and safety culture questions from Williamson et al. (1997), with additional questions on major hazards identified as key priorities by Farmsafe Australia.

The development of the Cotton Premium Discount Scheme resulted in 40% of cotton enterprises in NSW actively participating in a recognised safety management program. This resulted in significant changes to safety systems in all participating enterprises. Growers reported that the program provided a financial incentive to formalise farm safety systems within their businesses at an opportune time, particularly as the program coincided with the introduction of the Occupational Health and Safety Act 2000 and Occupational Health and Safety Act Regulation 2001 in NSW.

The benchmarking program was considered to be a useful process by the cotton growers involved. The approach and resources were specifically tailored to their needs as farmers and cotton growers, it was delivered by their industry and not WorkCover or external providers with little experience or understanding of cotton growing and its risk, and the delivery itself was in a non-litigious and practical manner. Furthermore, the audit process established a deadline, provided feedback and identified areas where further improvement to farm health and safety was required (Fragar et al., 2009; Temperley, 2005).

So while there is some valuable information available relating to the perceptions and attitudes of farmers to health and safety and its management, there are still many gaps in the literature. This research aims to address some of these information gaps, and through greater understanding of farmer behaviour, improve the effectiveness of Australian farm health and safety interventions and initiatives. The specific objective was to develop scores for measures of Safety Climate, Safety Management Systems and Control of Major Hazards, and to try and explain the determinants of those scores.

Methodology

The overall survey rationale and methodology is explained in the companion paper (Pollock et al., 2014a).

The benchmarking questions had three dimensions; Safety Climate questions (n=20) covered the perceptions of the informant completing the questionnaire as a representative of the farm enterprise; while the Safety Management Systems (n=35) and Control of Major Hazard questions (n=20) were related to actual processes and practices on the farm enterprise. Respondents were able to answer 'Yes', 'To some extent', 'No' or 'Not sure'. A copy of the questionnaire can be found in Pollock (2010), together with details of data collection mechanisms, ethics clearances, etc.

Safety Climate

The perceptions of safety within an organisation or business are commonly referred to as the safety climate, of which there are five recognised dimensions:

- *Personal motivation for safety*: factors that would promote safer behaviour,
- *Positive safety practices*: reflecting safety activity within the workplace,
- *Risk justification*: instances or reasons why an individual worked unsafely or took known risks,
- *Fatalism*: the concept that accidents are natural consequence of the working environment, and
- *Optimism*: reflecting a favourable view of personal accident or safety risk (Williamson et al., 1997).

The 20 questions around these dimensions were based on Williamson et al. (1997), but slightly reworded, in order to reflect the farming nature of the workplace and also to ensure that a response of 'Yes' was not always the correct answer. There was no change to the intent or outcome of the original Williamson questions.

Safety Management Systems

Temperley (2005) developed a series of questions relating to safety management systems on farms that were validated and included in the audit process for participants in the WorkCover NSW Cotton Premium Discount Scheme. These 35 questions reflected the key dimensions of managing farm safety, including:

- The engagement of workers and management in safety on the farm,
- Assessment of hazards and risks,
- Safety plans and actions,
- Information, training and resources on workplace safety and systems, and
- Monitoring and recording of health and safety incidents, situations and processes (Temperley, 2005).

Control of Major Safety Hazards

The final set of questions related to major safety hazards and their control. The major safety hazards selected were all the subject of media and industry campaigns, having been identified by Farmsafe Australia as key priorities in their safety promotion and awareness activities, due to the potential high risk of serious injury and/or death stemming from their use. Each hazard also has a control measure available, to reduce the level of risk associated with its use. These 15 questions were also validated and included as part of the audit process for the WorkCover NSW Cotton Premium Discount Scheme.

Calculating the Scales

The 20 questions within the Safety Climate section were each weighted equally to be out of five points, with a section total of one hundred. The statements were worded in such a way that the correct answer was not always 'Yes'. In fact, of the 20 questions, there were only six that scored full marks with an answer of 'Yes'. The most correct response was worth five points; a partially correct response was worth 2.5 points; while the most incorrect response or a 'Not sure' received a score of zero. To ensure reliability of the questionnaire, Cronbach's Alpha was applied to the farm enterprise scores using the statistics package, SPSS (Graduate Package 16.0). Cronbach's Alpha is a statistic that investigates the internal consistency of a questionnaire. If the scale shows poor reliability, then individual items within the scale must be re-examined and modified or completely changed. The generally accepted value of reliability is 0.7 (Santos, 1999). The alpha value (α) for this data was estimated to be 0.73, and therefore a reliable measure of Safety Climate.

The scoring system for Safety Management Systems was a little more complex, as there were 35 statements involved that still must total one hundred. Each statement was therefore given a weighting, based on its relative importance in farm safety management and systems. Fifteen of the statements judged to be most important were given a score out of four, with the remaining 20 statements awarded two points. In all cases, a response of 'Yes' was the most correct answer, 'To some extent' was half points, whilst a 'No' or 'Not sure' response was worth zero points. Cronbach's Alpha was calculated using farm enterprise scores; with this set of questions found to be a reliable measure of Safety Management Systems ($\alpha=0.93$).

The calculation of the Control of Major Safety Hazards scale also uses a weighting system to achieve a total score of one hundred. Five statements of the 15 are priority farm safety initiatives and therefore, have been weighted to be worth 10 points. The remaining ten statements have been scored out of five points. An answer of 'Yes' to any of the statements results in full marks, half marks are awarded to a 'To some extent' response, with 'No' or 'Not sure' again being worth a zero score. This section also has the additional response of 'Not Applicable'. In these cases, a value of zero was recorded. Cronbach's Alpha was calculated using enterprise scoring; with this set of questions found to be a reliable measure of Control of Major Safety Hazards ($\alpha=0.73$).

Influencing Variables

Data were also collected on the sex of the informant, the age of the informant (grouped as under 25 years, 25-34 years, etc, up to over 65 years, but later collapsed to under 55 and over 55), location of

the farm (one of five NSW Statistical Divisions: Northern, North Western, Richmond Tweed, Mid-North Coast and Central West), and agricultural industry (one of the following: grains, beef cattle, sheep and wool, and cotton production).

Quantitative analysis

The questionnaire results were entered into a Microsoft Access database form, the table of which was then imported into Microsoft Excel. A series of IF statements were used to convert the responses to numerical values, and to establish the scores, adjusted totals and percentages for each of the sections. The numerical values were then imported into SPSS (Graduate Package 16.0) for manipulation and statistical analyses using a general linear model to determine the significance of age group, gender, enterprise and location variables on section scores. First order interactions were also assessed, with non-significant interactions sequentially deleted. Main effects were all retained in the model as the degrees of freedom consumed were only small. Correlation of section scores were also analysed to determine significant relationships between sections.

Results

There were 335 enterprises recruited into the study. The informants were majority male (n=263, 78.5%), ranged in age from less than 25 years, though to 65 years plus, with the most common age grouping being 45–54 years. The vast majority of informants nominated their role on farm as Owner and/or Manager (70.1%), with a further 12.8% nominating their role as a Partner of the farming enterprise.

The farm enterprises recruited were involved in a range of agricultural industries; 65.4% (n=219) were involved in more than one industry, with 31.9% involved in a single industry. Grains and livestock were the most frequently reported industry mix (n=63, 18.8%), followed by cattle (n=58, 17.3%) and cattle and sheep farmers (n=49, 14.6%).

The following section provides a summary of the Safety Climate, Safety Management Systems and Control of Major Hazards results. More detailed statistics and analysis can be found in Pollock (2010).

Safety Climate

Safety climate refers to an individual's perception of the safety consciousness within their business or organisation. A higher score was associated with a positive perspective on farm health and safety, while a lower score demonstrated a lack of commitment and belief in on-farm OHS management. The percentage scores for this section had an average of 65.2 and a range of 28 to 93 (Table 1). It must be emphasised that these scores are related to the informants completing the questionnaire and may not be indicative of other parties involved in the farming operation.

Significant relationships were found between gender and enterprise and average Safety Climate scores, with female informants scoring significantly higher than male informants and enterprises not involved in sheep production scoring significantly higher than sheep production enterprises (Table 2).

Table 1: Descriptive statistics for the dimensions

	N	Range	Minimum	Maximum	Mean	Standard Error	Standard Deviation
Safety Climate	335	65	28	93	65.2	0.8	14.4
Safety Management Systems	332	95	5	100	54.6	1.2	21.8
Control of Major Hazards	334	95	5	100	65.3	1.1	20.2

First order interactions were observed between age/grain enterprises and between sheep/cattle. Informants aged 55 years and over scored significantly higher when not involved in grain production. For non-grain enterprises, informants aged 55 years and over scored significantly higher than those aged under 55. Informants not involved in either cattle or sheep scored significantly higher, while the lowest mean from this interaction came from enterprises running sheep, but not cattle.

Safety Management Systems

Safety management referred to the systems and processes in place to manage health and safety on farms. Enterprises were assessed on how they engage workers and management on farm health and safety, their appraisal of hazards and risks, the implementation of safety plans and actions, the provision of information, training and resources on workplace safety and systems, and the systems in place for the monitoring and recording of health and safety incidents, situations and processes.

Safety Management Systems had an average percentage score of 54.6; the lowest of the three sections. Scores ranged from a low of five to a perfect score of 100 (Table 1).

Relationships were found between enterprise and Safety Management Systems, with cotton enterprises scoring significantly higher than non-cotton producers. First order interactions were observed between age/sheep and age/grains (Table 2). Informants aged under 55 years and involved in sheep production scored significantly lower than other age group and sheep interactions. Additionally, grain informants aged under 55 years scored significantly higher than grain informants aged 55 years and over, while informants aged under 55 years, not involved in grains production, scored lower than other age group/grains enterprise interactions.

Control of Major Safety Hazards

The Control of Major Safety Hazards section refers to how enterprises actively manage the key priorities identified by Farmsafe Australia, relating to tractors, PTOs, augers, residual current devices (RCDs), chemicals, silos, safe play areas for children, vehicle safety, helmets and personal protective equipment (PPE).

The average percentage score for the Control of Major Safety Hazards section was 65.3, with scores ranging from five to a perfect score of 100 (Table 1).

Relationships were found between location and control of Major Hazards, with enterprises based in the Central West and Richmond Tweed scoring significantly higher than other regions, with the North West averaging the lowest of all regions (Table 2). First order interactions were observed

Table 2: Significance of influencing variables

	Variable	Df ¹	Sums Squares	F ratio	P value	Significance
Safety Climate						
Main effects	Location	5	749.03	0.81	0.545	
	Gender	1	1186.37	6.39	0.012	*
	Age Group	1	582.42	3.14	0.077	
	Horticulture	1	18.69	0.10	0.751	
	Cattle	1	95.41	0.51	0.474	
	Sheep	1	3693.03	19.90	0.000	***
	Grains	1	585.04	3.15	0.077	
	Cotton	1	422.86	2.28	0.132	
	Other	1	486.32	2.62	0.106	
1st Order Interactions	Age Group*Grains	1	1349.15	7.27	0.007	**
	Cattle*Sheep	1	981.54	5.29	0.022	*
Safety Management Systems						
Main effects	Location	5	2308.82	1.08	0.372	
	Gender	1	780.97	1.82	0.178	
	Age Group	1	1100.33	2.57	0.110	
	Horticulture	1	77.71	0.18	0.670	
	Cattle	1	43.43	0.10	0.750	
	Sheep	1	1158.35	2.70	0.101	
	Grains	1	137.56	0.32	0.571	
	Cotton	1	2448.09	5.72	0.017	*
	Other	1	342.22	0.80	0.372	
1st Order Interactions	Gender*Horticulture	1	2563.22	5.98	0.015	*
	Age Group*Sheep	1	1684.45	3.93	0.048	*
	Age Group*Grains	1	3598.75	8.40	0.004	**
Control of Major Hazards						
Main effects	Location	5	4513.01	2.44	0.034	*
	Gender	1	17.32	0.05	0.829	
	Age Group	1	570.69	1.54	0.215	
	Horticulture	1	4.45	0.01	0.913	
	Cattle	1	346.51	0.94	0.334	
	Sheep	1	581.17	1.57	0.211	
	Grains	1	1075.68	2.91	0.089	
	Cotton	1	184.70	0.50	0.480	
	Other	1	595.24	1.61	0.206	
1st Order Interactions	Gender*Cattle	1	1430.43	3.87	0.050	*
	Gender*Grains	1	2663.04	7.20	0.008	**
	Age Group*Grains	1	2208.91	5.97	0.015	*
	Horticulture*Sheep	1	1681.25	4.55	0.034	*
	Cattle*Sheep	1	2964.46	8.02	0.005	**
	Sheep*Cotton	1	1439.53	3.89	0.049	*
	Grains*Cotton	1	1368.49	3.70	0.055	*

¹ Degrees of freedom

Significance: *p<0.05, **p<0.01, *** p<0.001

between gender/cattle, gender/grains, age/grains, horticulture/sheep, cattle/sheep, sheep/cotton and grains/cotton.

Interactions Between the Dimensions

An analysis was undertaken to determine if there was a significant relationship between scores for the three separate dimensions. For example, does a high score in Safety Climate transpose to a high score in Safety Management Systems? There was found to be moderate positive linear correlation between Safety Climate and Safety Management Systems ($r=0.58, p<0.001$), Safety Climate and Control of Major Safety Hazards ($r=0.49, p<0.001$) and Safety Management Systems and Control of Major Safety Hazards ($r=0.56, p<0.001$). This implies that, as each section score increases, so too does the section score it was correlated with.

Discussion

Safety Climate

From a gender perspective, it may be suggested that women are more cautious in their nature and therefore, are more likely to have a positive attitude towards farm safety, while males are more likely to accept the risks and hazards as part of the job and as a consequence, score lower in these areas.

Gustafson (1998) refers to three key areas where risk perceptions differ between gender; males and females often express different levels of concern about the same risks; they differ in their ideas of what constitutes a risk; and they differ in the meaning and interpretation that they apply to the same risks.

The explanation as to why these gender differences occur has been debated by Davidson and Freudenburg (1996). The explanation that receives the most consistent support is related to social roles and everyday activities. It implies that the role as nurturer and care provider, a role largely performed by women, is associated with a greater concern about health and safety issues in general.

Durey and Lower (2004) also observed significant gender differences in the perception of risks and hazards on Australian farms, with women focusing more on home, family and environmental risks.

This raises the question of how can women be more actively targeted in farm safety initiatives? Their scoring in Safety Climate suggested health and safety was an important feature of their farming life and business. Therefore, can this positive attitude be capitalised upon to introduce ideas and in time, implement systems that improve safety on farms? An obvious approach would be hazards associated with children. As women are generally the primary caregivers, initiatives targeting the major hazards of helmets, restraints in vehicles, safe play areas and road safety, that are promoted directly to women, in their roles as mothers and grandmothers, may result in some positive safety practices.

The emotional commitment of women to farm safety suggests that they do not need to be convinced of its role and importance. However, they may need assistance in understanding and developing practical approaches, systems and management to minimise risks on their farms. The

development of a '*women's safety workshop*' may be a viable means for introducing these ideas and demonstrating simple, cost efficient, effective systems and processes that can be readily implemented on their farms.

The first order age/enterprise interactions were unexpected. Many have assumed that the younger farmers are more progressive in their management, open to new ideas, practices and mechanisation, more likely to have higher education and safety training and to have spent some time working off-farm, and therefore would be more familiar and committed to the idea of health and safety in the workplace (Macfarlane et al., 2008; Reisenberg and Bear, 1980; Schenker et al., 2002). This theory would therefore suggest older farmers are more set in their ways, unwilling to make changes and accepting that the risks and hazards are just part of the job (Fiedler et al., 1998).

These differences in age-related scoring suggest that future initiatives may need to take different approaches to the two groups. For younger farmers aged under 55 years, the safety message needs to initially focus on improving the attitudes of this group towards farm health and safety. Approaches that can challenge the notions of risk justification (instances or reasons why an individual may have worked unsafely); and fatalism (that accidents are a natural consequence of the working environment) need to be developed. These can then be integrated with initiatives aimed at fostering greater personal motivation for safety, positive safety practices, and a general perception of optimism towards health and safety on their farm.

While lower scores from sheep enterprises were not entirely unexpected, the anticipated reasoning does not hold. Sheep informants were amongst the highest average age of all informants surveyed, and based on what the data suggests now may be a misconception; it was therefore assumed this would transpose to a lower Safety Climate score.

The sheep industry is a hazardous industry; the annual number of workers' compensation claims that arise among sheep shearers is almost six times higher than any other industry at a rate of 150 claims per 100,000 workers, compared with 26 per 100,000 workers in all other industries (WorkCover NSW, 2003). The most common injuries associated with shearing and crutching are manual handling related, for example, back injuries from sheep handling and chronic muscular and skeletal conditions of the hands and arms from the shearing equipment (WorkCover NSW, 2002).

One reason for the lower scores in Safety Climate by sheep informants may be the impact of low productivity gains by the industry. Total factor productivity (TFP), a measure which enables productivity to be compared across agricultural industries and regions, clearly demonstrates that over the period 1977–78 to 2006–07, the sheep industry had the lowest TFP of any industry, at just 0.3% per annum. Dairy was the next closest industry with an annual TFP of 1.2%, while beef was 1.5%. Cropping was the most progressive of all industries, gaining 2.5% per annum. An analysis of the use of farm inputs on sheep enterprises, from which TFP is partially derived, reveals a decline of 1.8% over the same period (Australian Bureau of Agricultural and Resource Economics, 2009).

This decline suggests financial constraints may prevent sheep farmers making necessary changes to on-farm practices and systems. This may then lead to a prevalence of fatalism and risk justification. Furthermore, the issue relating to the costs of improving farm safety may have impacted on the

personal motivation for safety. All three of these factors would combine to result in a lower Safety Climate score.

The high numbers of claims within the sheep industry, coupled with practices such as manual handling in yards, shearing and crutching, may also result in a degree of fatalism and risk justification by farmers. The small size of sheep relative to cattle means that farmers will lift, drag and manoeuvre the animals physically themselves, which invariably leads to musculoskeletal injuries.

Cattle farmers, on the other hand, are not subjected to this level of risk, as once their stock gets to weaning age, it is no longer possible to manhandle them in the same manner, due to the sheer weight and bulk of the animal. Therefore, whilst a farmer may recognise that manual handling of sheep is hazardous, they may continue the practice because they physically can, and because they feel they have to. These issues may have a substantial impact on the perceptions of informants and their Safety Climate score.

Sheep enterprises have a unique set of risks, therefore a farm safety initiative directly aimed at sheep enterprises, acknowledging the difficulties involved in the enterprise, both from production and capacity for change perspectives, and promoting cost effective, time efficient systems and processes, may assist in the realisation that there are farm health and safety changes that can be made, that do not require significant capital or labour outlay, and that can bring about significant improvements in the safety and operation of the farm enterprise.

There was also an interaction between age category of informants and grain farming. Informants aged 55 years and over who did *not* grow grain crops on their properties scored significantly higher than those informants aged 55 years and over who did run a grain enterprise. This result was unexpected, as grain growers are generally quite progressive in their management, particularly in regard to technology (as shown by high levels of industry TFP). A potential reason may be that farmers associate newer machinery such as tractors with cabins with a reduction in their exposure to risk, and may therefore view farm safety as a lower priority on their farms.

Safety Management Systems

The strong performance of cotton and horticultural enterprises in Safety Management Systems was an interesting observation of the study, although given their quality assurance systems; it was not an entirely unexpected result.

Cotton production requires a high level of inputs, including fertilisers, herbicides and insecticides and specific harvesting equipment. The industry has a reputation for the rapid adoption of new technologies; it was the first major Australian agriculture industry to move successfully to the commercial use of biotechnology (Cotton CRC, 2005). In 1996, the cotton industry developed its first Best Management Practice manual. While originally devised to guide farmers in sustainable cotton production, with a strong focus on pesticide management, it has evolved to include all aspects of production, including water and chemical use, soil health, accountability, traceability, ethical employment and farm safety.

While it is a voluntary program, it has achieved widespread adoption as farmers seek to ensure the sustainability of their farms, and protect themselves against the risks associated with chemical use

and its effects, particularly drift and residues. This aspect of the program is critical to its success, the benefit to the grower of participation is demonstrable, and therefore adoption of the program is high. The Best Management Practice model of the cotton industry may be an excellent starting point for other industries, and may result in an increase in the priority and management of safety on farms, as a by-product of program compliance.

The farm safety component of Best Management Practice includes the correct and safe storage and application of chemicals, the use of protective equipment and safe handling technology, safety information and training, safe ladders and handholds for any climbing, and emergency procedures in place and well understood (Cotton Australia, 2010).

Horticulture, meanwhile, has a large number of food safety and quality assurance programs in place. Some of these are tied in with major resellers (Coles, Woolworths and McDonalds), while others are overseen by commodity groups (Freshcare) or the Department of Agriculture Forestry and Fisheries (EUREPGAP® – accreditation to international certification principles for Good Agricultural Practice).

An essential component of these programs is record keeping, training and occupational health and safety principles, which feature heavily in the Safety Management Systems section of the questionnaire. For example, EUREGAP® requires compliance in the following areas: record keeping, risk assessments and action plans, employee training, hazard warnings and emergency plans, crop protection and product handling, protective clothing, employee welfare, and visitor safety (McBride, 2004).

Cattlecare and Flockcare, quality assurance programs for the livestock industry, were devised with a view of being able to market a differentiated, higher quality product. However, producer involvement and accreditation never really took hold, as the market was not prepared to pay higher prices for a quality assured product, and as a result, there was no incentive for participation in the program.

In horticulture, on the other hand, accreditation in a registered food safety and quality assurance program is demanded by the market. It is not about being paid a premium price for an accredited product, rather if you do not have compliance; it is very difficult to sell a product in any market. This market demand has been the key to the successful adoption of accreditation programs.

Therefore, for other industries to establish health and safety as part of a quality assurance program, they would first have to get commitment and action from the market that they are either willing to pay a premium for a compliant product or they are unwilling to continue to purchase a product unless it is accredited. This is a challenging and difficult obstacle to overcome, but without it, quality assurance programs will not see widespread adoption in agriculture.

There were also some interactions between the age of the informant and their enterprise industry. While older grain informants scored higher than younger grain informants in their perceptions and attitudes to farm health and safety (Safety Climate), this did not carry through to their Safety Management Systems, with younger informants aged under 55 scoring higher than their older counterparts.

This was one of the more significant findings of the study, as it raises the question of why do older informants who have a positive commitment to and belief in health and safety on farm not necessarily put systems and management processes in place to actually improve health and safety on their farm enterprises? It effectively means the health and safety message has been accepted and there is a level of awareness and safety consciousness, but they have failed to act on and implement their own beliefs. This is a key challenge to developing future farm health and safety intervention approaches.

Therefore, it is clear that within the baseline longitudinal study population, age and industry impact upon the presence of adequate management systems and processes to improve the health and safety on farms.

Control of Major Safety Hazards

The lower scoring of cattle enterprises in the Control of Major Safety Hazards section of the questionnaire demonstrates that there needs to be considerable improvements to tractors, machinery guarding, workshop safety, chemical safety, vehicle and road safety, helmets, working from heights and child safety in the beef sector. These are all priority hazards for Farmsafe Australia.

Tractors and augers are an essential part of a cropping system. The high workload demand placed on machinery during peak periods has resulted in farmers upgrading machinery, seeking higher throughput, improved automation, and an ability to sow or spray larger areas in less time. The cattle industry, on the other hand, has a different level of demand, with tractors more likely to be used for moving products and equipment, such as hay bales and feed bins, and for powering augers and other machinery. Likewise augers are used for delivery and access to stock feed, as opposed to storage and transportation of large volumes of harvested grain yields.

The cattle industry have also seen lower total factor productivity gains than the cropping industry, and as discussed previously, the financial constraints resulting from these lower productivity gains inhibit the ability of the farmer to upgrade machinery and increase their asset base.

The purpose of machinery and equipment and the financial position of the farmer will govern the level of risk involved. If efficiency and throughput are paramount, and the financial situation allows, then newer, more updated machinery is likely to be in place. A newer tractor will have a cabin, which reduces the risk of rollovers to the farmer as it effectively serves as a rollover protective structure. Newer machinery is less likely to have damaged guarding, again reducing the risk to the farmer. Additionally, improvements to design and technology may mean that throughput is no longer restricted by guarding, reducing the temptation of the farmer to remove or adapt the guarding to improve efficiency.

However, it is not just older machinery and therefore increased risk exposure that has resulted in cattle farmers having fewer systems in place to manage major hazards. There are many changes that will improve performance in Safety Management at relatively low cost. Workshop safety, chemical safety, vehicle and road safety, helmets, working from heights and child safety can all be improved with little financial and labour outlay.

Administrative controls relating to policies about personal protective equipment, seatbelts, speed limits and helmets are simple to implement, albeit at times difficult to enforce. Many simple equipment guards are relatively inexpensive, and, while setting up correct chemical storage areas and ensuring there is a secure, safe play area for children may require some adaptation and modification to current arrangements, they are still by no means a significant capital outlay.

A more targeted approach to cattle enterprises that demonstrates, with actual examples, that improvements to safety systems for the major hazards on their farms are not complicated, expensive nor time consuming, may result in significant improvements to the management of major hazards on cattle enterprises.

The potential to improve health and safety is clearly evident by the interaction horticulture or cotton enterprises have on sheep production. If sheep enterprises were also involved in cotton or horticultural production, then their Control of Major Hazards Score was, on average, higher than enterprises just running sheep. Presumably, the requirements to participate in BMP and quality assurance programs, discussed in the previous section, have resulted in a carry on effect to the sheep enterprises, due to the reporting and management systems required for accreditation.

An interesting interaction occurred between cotton and sheep enterprises. If a sheep enterprise was also involved in cotton production, then this appeared to counteract the base result of sheep enterprises having lower Control of Major Hazards scores. The same applied to a sheep enterprise also involved in horticulture. This is most likely due to the modernisation of machinery involved in the production of cotton and horticulture, and the elimination of key hazards as a result of the technology improvements.

A common element to both Safety Management Systems and the Control of Major Safety Hazards sections of the questionnaire revealed a critical finding relating to the implementation of farm safety systems. While older grain informants (aged 55 years plus) were, on average, more positive and committed to the idea and consciousness of farm safety, this did not carry through to the management of farm health and safety systems or major hazards on their farms. The reverse applied to grain informants aged under 55 years, who on average had more negative attitudes towards their commitment to farm safety, and yet, had more effective systems in place for the management of farm safety and major hazards.

Essentially, this suggests that older grain farmers, on average, have good safety intentions, but poor follow through and implementation, while younger farmers are more dismissive in their attitudes towards safety, and yet have more robust systems in place for the management of major hazards.

From an intervention perspective, this raises the question of what needs to be done to encourage older farmers to take the step from a belief and theoretical commitment to farm safety to an actual management action.

Fragar et al. (2009) devised a model of safety behaviour change for Australian farms. To achieve behavioural change, there must be modifying variables in place. There must firstly be a positive attitude and a desire for change, and this desire must sit within their own values and importance, and it must be achievable under different circumstances.

There must also be support, commitment and promotion by industry associations to change the social norms about farm safety. Once this has occurred, there needs to be necessary and sufficient initiatives to instigate behavioural change. While the farmer may have the positive attitude and belief in farm safety, this must be stepped up to forming intent to change practice or behaviour.

The third issue in instigating behavioural change is barriers to adoption. To overcome these barriers, they must first be identified for each specific risk or hazard, and there must also be practical information, guidelines and templates about how to implement the solution into the farm setting, with an estimate of cost and sourcing of key items. Furthermore, when the cost of improving farm safety using the most effective level of control is high, lower cost alternatives should be provided, where possible.

The final element required to encourage behavioural change is to ensure farmers have the necessary information, skills and capacity to take the recommended action.

Future initiatives in farm safety need to re-examine necessary and sufficient variables to instigate behavioural change in older farmers. The attitudes and beliefs are already present, but there is a disconnect between this point and practice change. Drivers for intent to change need to be assessed and incorporated into future initiatives, the barriers for change for the particular hazard need to be identified and managed, and skills must be provided to the farmer to ensure they are in the best position to be able to implement change.

Conclusions

The results of the study not only challenged some apparent misconceptions, such as older farmers having more negative attitudes towards farm safety than younger farmers, but it also identified industries from within the study population that are performing well in the management of safety and the possible reasons behind their success. Importantly, it also observed an area of disconnect between having a positive attitude towards farm safety and its role and importance, and actually implementing farm safety systems and management processes on the farm. These findings provide evidence for the possible benefits of tailoring farm initiatives and interventions based on gender, age and industry.

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