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# EVALUATION OF THE TRACTOR ROLLOVER PROTECTIVE STRUCTURE REBATE SCHEME 1997/98

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# EVALUATION OF THE TRACTOR ROLLOVER PROTECTIVE STRUCTURE REBATE SCHEME 1997/98

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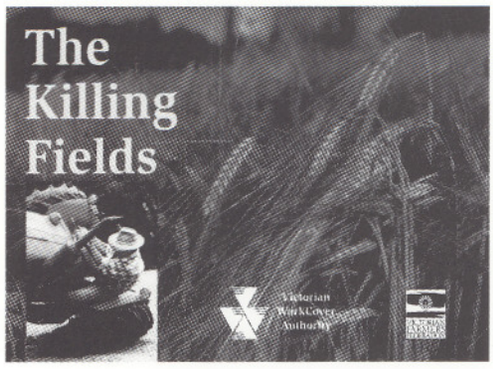
**Abstract:**





This report documents the results of an evaluation of the 1997/98 tractor rollover protective structure (ROPS) rebate scheme, funded by the Victorian WorkCover Authority (VWA). The evaluation objectives included describing the historical context of the current scheme, documenting the scheme uptake and tractors involved, and assessing the costs, the short and long term benefits, and the dollar savings of the scheme.

A combination of methods was used to gather the wide range of data necessary. The cost outcome analysis was conducted using the approach suggested by Miller and Levy, 1997. Two perspectives were provided: the societal perspective, and that of the VWA. Published injury mortality costs based on both the human capital and the willingness-to-pay methods were used to provide an estimate of the cost of each tractor rollover death to society, whereas the costs to VWA were determined from records. Published and unpublished data were used to estimate the number of deaths expected to be prevented by the 12,129 ROPS installed during the scheme.

The 1997/98 scheme was extremely successful when measured against a number of criteria. The scheme reduced the number of unprotected tractors in Victoria by 70% from an estimated 17,420 to 5,290. The proportion of unprotected tractors in Victoria is now approximately 7%, compared with an estimated 24% at the commencement of the scheme. The demand for the ROPS rebates was substantially higher than in any previous scheme.

An estimated 2 deaths per year will be prevented by the 12,129 ROPS fitted, for a period of at least 10 years. The total cost of the rebate scheme was $7,877,344. If 20 deaths are prevented, $393,867 will have been spent per life saved. The lifetime cost per rollover death is estimated at $571,535 and $1,646,482 for the human capital and willingess-to-pay approaches respectively. These figures provide data on which to base comparisons of different preventive strategies.

The societal benefits go beyond these economic considerations. Psychological trauma, pain and suffering associated with tractor rollover deaths will be considerably reduced in Victoria. In addition, improvements in other areas of farm safety may occur due to the scheme publicity. The combination of increased farm safety awareness, and the strengthened partnerships between key organisations, may facilitate further farm safety initiatives.

The success of the scheme appears to be founded on a number of equally important and inter-related factors including prior partnership development, increasing impetus for farm safety, a good pre-existing level of ROPS fitment, ROPS regulatory amendments, publicity, and the rebate itself. This approach to tractor rollover prevention is unique to Victoria. General principles arising from this scheme that could be transferred to other initiatives are described and recommendations made for further activities.



**Key Words: (IRRD except when marked*)**





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# Executive Summary

## Introduction

As a result of the prominence of tractor rollover incidents in work related deaths in Victoria, and the demonstrated effectiveness of rollover protective structures (ROPS), the Health and Safety Organisation (HSO) initially, and the Victorian WorkCover Authority (VWA) subsequently, undertook to increase the level of ROPS fitment to tractors in Victoria. This involved a considerable period of collaborative work with industry partners. The strategy developed included a combination of regulatory amendments, a ROPS rebate scheme and widespread publicity.

The regulatory amendments involved a change from a requirement for ROPS on all tractors manufactured or imported on or after 1 July 1981 (with some limited exemptions such as operation in an orchard), and for ROPS to be fitted where practicable to all tractors used by employees, to a requirement for ROPS to be fitted on all tractors (including pre-1981 tractors), (with some limited exemptions) (Victorian WorkCover Authority, 1998).

The ROPS rebate scheme facilitated fitment of ROPS to previously unprotected tractors, via a rebate of $150 for each pre-1981 tractor fitted with a ROPS meeting the Australian Standard 1636. The fitment was required to be carried out by a member of the Farm Machinery Dealers Association (FMDA), or a qualified engineer or mechanic. Tractor owners could fit the ROPS themselves on the condition that a signed indemnity form was provided with the application.

The rebate scheme was supported by (1) a range of promotional activities including a television advertising campaign mounted by the Public Affairs section of the VWA, (2) a mail out of information and application forms to Victorian farmers, and (3) the provision of information and application forms at farm field days by VWA field officers, and through other organisations including the Victorian Farmers Federation (VFF) and the FMDA.

Monash University Accident Research Centre was contracted to undertake an evaluation of the 1997/98 rebate scheme, the results of which are reported here. The evaluation did not extend to include the costs and benefits of the new regulations mandating ROPS. The objectives of the study were:

1. To describe the historical context of the current ROPS scheme
2. To document the uptake of the scheme and the characteristics of the tractors protected
3. To assess the costs of the ROPS scheme, including costs to the Authority, farmers and the rural community
4. To assess the short and long term benefits of the ROPS scheme in terms of potential lives saved, psychological trauma averted, effects on general farm safety, and other aspects which may arise
5. To assess the dollar savings of the ROPS scheme to the Authority and the community
6. To identify any general principles of the approach used in implementing the scheme that would have the potential to be transferred to other workplace safety issues.

## Methods

A combination of methods was used to gather the wide range of data necessary to meet the study objectives. Existing documents from the HSO, VWA, VFF and Farmsafe Victoria were referred to for historical data. A series of interviews with key individuals and organisations were held to gather information relating to the scheme itself, opinions regarding the proposed regulatory amendments, intangible benefits of the scheme, and the perceived effect of the scheme on general farm safety. The key groups included the FMDA, the VFF (Industrial and Legal Department), participating and non-participating farmers, farm machinery dealers, a rural psychologist and a farm family who have experience a rollover death (scheduled 17.12.98).

Rebate application forms provided information on the applicant (type of farmer, post-code), the tractor (make and model) and the ROPS (manufacturer, price and cost of installation). Characteristics of applicants

and tractors involved in the scheme were defined from a random sample of 1212 rebate applications.

The cost outcome analysis was conducted using the approach suggested by Miller and Levy, 1997. Two perspectives are provided: societal and that of the VWA. Incidence data on tractor rollover deaths and serious injuries were obtained from VWA, the Victorian Coroners' Relational Database, and the Victorian Inpatient Minimum Dataset. Other published data were used to further facilitate the estimation of the tractor rollover toll in Victoria.

The cost of fitting the ROPS was derived from data provided in the sampled applications, and the farmer interviews. The cost of implementing the scheme was gathered from VWA records.

Published data from a study of the cost of injury in Victoria was used to provide an estimate of the cost of each tractor rollover death (Watson and Ozanne-Smith, 1997). Estimates based on both the human capital (direct costs plus lost productivity) and the willingness-to-pay (includes pain and suffering) methods were used. The costs of tractor rollover deaths to the VWA were derived from VWA records. Costs were not estimated for tractor rollover serious injury as the number of these each year is very small, and the impact of ROPS is mostly on prevention of death.

Two different approaches were used to estimate the number of deaths expected to be prevented by the 12,129 ROPS. First, published and unpublished data on the rate of rollover deaths per 100,000 tractors not protected by ROPS (unprotected tractors) were used in conjunction with estimates of the number of unprotected tractors remaining in Victoria to estimate the number of deaths expected to be prevented. Second, published data from Sweden on the tractor rollover death rate at varying levels of ROPS fitment was used to estimate the effect of decreasing the proportion of unprotected tractors by that attained with the fitment of 12,129 frames.

The effect of the scheme was assumed to be constant for at least the first 10 years, after which time the effect was assumed to diminish over a period of some 25 years, due to disposal of the tractors fitted under the scheme.

Since all intervention costs occurred in 1997/98, the published estimated costs of rollover deaths were adjusted where necessary by the consumer price index (obtained from the Australian Bureau of Statistics on line service) to reflect 1998 values. In addition future benefits were discounted by 7%.

## Results

The 1997/98 ROPS rebate scheme is one of a number of strategies adopted initially by the HSO, and subsequently by the VWA, since around 1987 as part of an integrated approach to addressing the issue of tractor rollover deaths specifically, and farm safety more generally. The approach has included information and awareness programs, education, and regulation (Victorian WorkCover Authority, 1998). The promotion of ROPS has featured strongly within the farm safety program, and has included three previous rebate schemes. The development of partnerships with key organisations including the VFF, FMDA, and the Department of Natural Resources and Environment, was an important foundation for the 1997/98 rebate scheme. The work of the HSO and VWA on farm safety and tractor rollover deaths has occurred during a time of increasing impetus in farm safety in Victoria, with the scope of awareness raising, implementation and research activities rapidly expanding.

The 1997/98 scheme was funded by the VWA and administered, under contract, by the VFF, with advice provided by a Steering Committee. The VWA appointed a project co-ordinator to develop an integrated strategy. The scheme was launched in April 1997 at Lardner, Victoria. A series of television advertisements and press releases developed and co-ordinated by the Public Relations section of the VWA formed the foundation for the scheme publicity.

The 1997/98 ROPS rebate scheme was extremely successful when measured against a number of criteria. This study found that the 1997/98 ROPS scheme reduced the number of unprotected tractors in Victoria by 70% from an estimated 17,420 to 5,290. The proportion of unprotected tractors in Victoria is now approximately 7%, compared with an estimated 24% at the commencement of the scheme.

The demand for the ROPS rebates was substantially higher than in any previous scheme, with the uptake rate for the 1997/98 scheme being four times that of the last rebate scheme in 1994. Penetration of the scheme extended well beyond the membership of the VFF, with 73% of applicants being non-members, and 21% being self-nominated hobby farmers. All participant groups and organisations (farmers, farm machinery dealers, the VFF and the FMDA) were satisfied with the scheme, and problems of obtaining ROPS for the older model tractors were not overwhelming.

An estimated 2 deaths per year will be prevented by the 12,129 ROPS fitted, for a period of at least 10 years. The total cost of the rebate scheme was $7,877,344. If 20 deaths are prevented, $393,867 will have been spent per life saved. The lifetime economic cost per roll over death is estimated at $571,735 and $1,646,482 for the human capital and "willingness-to-pay" approaches respectively. This cost outcome analysis should only be used as a tool to guide selection of effective interventions. It is not intended to be used as a justification for the prevention of rollover deaths.

The societal benefits go beyond economic considerations. Psychological trauma, pain and suffering associated with tractor rollover deaths will be considerably reduced in Victoria. In addition, improvements in other areas of farm safety may occur due to the scheme publicity. More importantly, the combination of increased awareness of the importance of farm safety, and the strengthened partnerships between key organisations, may provide a springboard from which further farm safety initiatives can be launched.

## Discussion

The success of the scheme appears to be founded on a number of equally important and inter-related factors. The combination of regulatory amendments, publicity, and the rebate clearly provided the impetus to action required to increase ROPS fitment. While the regulations themselves, and the perceived threat of subsequent enforcement, were significant factors, the effect would not have been as dramatic had these strategies been used in isolation. There had been considerable development of the necessary partnerships over previous years, and the scheme was implemented at a time of increasing impetus in farm safety in Victoria. Previous schemes had familiarised the community with the principle of rebate schemes, and had in effect served as pilots for this largest effort. Further, the scheme, and especially the regulatory amendments, was implemented at a time when the proportion of tractors fitted with ROPS was already more than 50%. Most importantly, there had been a change in the acceptance of compulsory ROPS fitment within the VFF, prior to the move made by the VWA towards regulatory change. This approach to tractor rollover prevention has been unique to Victoria.

The benefits arising as a result of the ROPS scheme appear to far outweigh any potential disbenefits. Potential disbenefits include the possibility of some increase in non-fatal tractor rollover injuries, and predicted minimal risk of widespread resistance to further farm safety initiatives.

The current ROPS scheme has not addressed two factors contributing to the effectiveness of ROPS as an intervention for tractor rollover deaths. First, different types of ROPS have varying degrees of effectiveness eg, a cabin meeting the rollover standard will be more effective than a four post or two post ROPS in keeping the tractor operator within the safety zone during a rollover incident (Springfeldt, 1993). The vast majority of ROPS fitted under the scheme were two post ROPS. Second, the effectiveness of ROPS, particularly four and two post ROPS, is greatly enhanced by the use of seat belts. Interviews with the farmers conducted in this study indicated that the proportion of tractors with seat belts in Victoria is low, and that even if it was high, the potential benefits of seat belts are not well recognised and the predicted use is extremely low.

Governments have traditionally found difficulty in forming working partnerships on health and safety with the agricultural industry. Consequently, there is merit in examining the principles arising from the rebate scheme that could be transferred to other farm safety initiatives, and possibly more broadly to other work related injury prevention programs. These principles include:

- Involvement of key players from the early planning stages
- Recognising and using opportunities
- Developing acceptance of the proposed intervention prior to implementation
- Creation of a receptive environment for the intervention
- Using a combination of strategies (regulatory amendment, publicity and education, an financial incentive, and perceived enforcement)
- The need to thoroughly review implementation plans for potential difficulties and barriers and then to address these prior to implementation
- Provision of frequent updates on all aspects of progress to the key players and to the intervention target audience
- Close monitoring of implementation so that the target audience can be quickly alerted to any arising issues

The following further activities are recommended on the basis of this study:

- Implementation of a public communication strategy regarding the impact of the rebate scheme and the new ROPS regulation
- Issuing of a hazard alert regarding potential impact of the altered clearance height of tractors retrofitted with ROPS
- Continued surveillance of tractor rollover deaths to confirm the anticipated decrease
- Continued surveillance of tractor rollover serious injuries to monitor for any increase
- Capitalising on the combination of increased awareness of the importance of farm safety, and the strengthened organisational partnerships, by developing and implementing a comprehensive farm safety strategy

[1] *This statement is not intended to provide a full explanation of the new regulations, but rather to indicate the degree of change.*

# 1. Introduction

For the period from January 1985 to July 1995, there were 417 work place fatalities investigated by the then Health and Safety Organisation of Victoria. A total of 116 of these occurred in agriculture (27.8%), and 102 occurred on farms (Health and Safety Organisation of Victoria, unpublished data). The significance of these figures becomes obvious when considered in the light of labour force data. For example, in 1996, persons employed in agriculture comprised 4.1% of the Victorian labour force, making them substantially over-represented in the work related fatality statistics (Australian Bureau of Statistics, 1996a).

Tractors are a prominent agency of farm work related deaths in Victoria, as elsewhere in Australia (Day, 1998, Day and McGrath, 1998, Harrison et al., 1989, Davidson 1994/95). During the period 1992-1996, tractors accounted for 61% of farm work related fatalities among adults in Victoria. Rollover events accounted for 33% of these tractor related fatalities (Day 1998).

The effectiveness of rollover protective structures (ROPS) in preventing death in the event of a tractor rollover has been demonstrated in Sweden, Great Britain and Norway (Springfeldt, 1993). For example, in Sweden the tractor rollover fatality rate decreased from 15 per 100,000 tractors to less than 1 per 100,000 tractors as the legal requirements for ROPS moved from ROPS on new tractors to safety cabins on all tractors (Springfeldt, 1993). Until recently, this intervention had been partly implemented in Victoria by regulations requiring ROPS on tractors manufactured or imported into Victoria since July 1981, and for ROPS to be fitted where practicable to all tractors used by employees (Victorian WorkCover Authority, 1998). By 1996, there were an estimated 17,420 tractors without ROPS in Victoria (Day et al., 1999).

After a considerable period of collaborative work with industry partners, the Health and Safety Organisation (HSO) initially, and the VWA subsequently, undertook to increase the coverage of ROPS on tractors in Victoria with a combination of regulatory amendments, publicity and a widespread ROPS rebate scheme run during 1997-98. The regulatory amendment involved a change to a requirement for ROPS to be fitted on all tractors (including pre-1981 tractors), with some limited exemptions (Victorian WorkCover Authority, 1998).[1]

The 1997/98 ROPS rebate scheme facilitated fitment of ROPS to previously unprotected tractors, via a rebate of $150 rebate to farmers for each pre-1981 tractor fitted with a ROPS meeting the Australian Standard 1636. The fitment was required to be carried out by a member of the Farm Machinery Dealers Association, or a qualified engineer or mechanic. Tractor owners could fit the ROPS themselves on the condition that a signed indemnity form was provided with the application. The rebate was claimed by the submission of an application form and supporting documentation. The rebate scheme was supported by (1) a range of promotional activities including a television advertising campaign mounted by the Public Affairs section of the VWA, (2) a mail out of information and application forms to Victorian farmers, and (3) the provision of information and application forms at farm field days by VWA field officers. Other organisations, including the Victorian Farmers Federation (VFF) and the Farm Machinery Dealers Association (FMDA) also supported the scheme by providing information to members and promotion in publications and the media. A more detailed description of the scheme can be found in later sections of this report.

Monash University Accident Research Centre was contracted to undertake an evaluation of the 1997/98 rebate scheme, the results of which are reported here. The objectives of the study are listed below.

## 1.1 Objectives

1. To describe the historical context of the current ROPS scheme
2. To document the uptake of the scheme and the characteristics of the tractors protected
3. To assess the costs of the ROPS scheme, including costs to the Authority, farmers and the rural community
4. To assess the short and long term benefits of the ROPS scheme in terms of potential lives saved, psychological trauma averted, effects on general farm safety, and other aspects which may arise
5. To assess the dollar savings of the ROPS scheme to the Authority and the community
6. To identify any general principles of the approach used in implementing the scheme that would have the potential to be transferred to other workplace safety issues.

# 2. Methods

A combination of methods was used to gather the wide range of data necessary to meet the study objectives.

## 2.1 Reference to existing documents

Reference to HSO, VWA, VFF and Farmsafe Victoria documents and reports on the current and previous ROPS schemes was undertaken to provide information on the history of the rebate scheme, its features, supporting activities and publicity and budget.

## 2.2 Interviews

A series of interviews was conducted with key individuals and organisations including:

- 18 farmers who participated in the scheme, 1 farmer who did not participate in the scheme
- 4 farm machinery dealers who supplied and fitted rollover frames in the scheme
- the Farm Machinery Dealers Association
- staff of the VFF Industrial Department
- rural psychologist experienced with communities suffering effects of traumatic injury death
- 1 farm family who have experienced a rollover death

The farmer interviews were conducted with individuals in three representative areas of Victoria, chosen to provide a range of commodity groups. The three areas, defined by postcode boundaries, were the Western, North Central and South Eastern regions of Victoria. In order to identify farmers for interview, 51 names were randomly selected from those who had completed rebate application forms. Two attempts were made to telephone each selected farmer. Of these 51, there was no answer from 27. Two people were not available at the suggested interview time or day, and three declined to participate. Of the 19 who agreed to participate, there was one cancellation. Non-participating farmers were recruited through networks and contacts in the agricultural sector.

Information gathered in these interviews included:

- reasons for participating, or not participating in the scheme
- the process of fitting ROPS to the tractor(s)
- an indication of costs to farmers
- any resulting changes to tractor operations
- opinions regarding the regulatory amendments
- intangible benefits
- perceived effect of the ROPS rebate scheme on general farm safety

Farm machinery dealers were identified through the Farm Machinery Dealers Association and through the Yellow Pages. Farm families were identified with the assistance of the VWA and invited to participate by letter.

## 2.3 Analysis of Rebate scheme data

In order to obtain the ROPS rebate, applicants submitted a form that provided information on the applicant (type of farmer, post-code), the tractor (make and model) and the ROPS (manufacturer, price and cost of installation). From the 12,129 applications processed, a random sample of 1212 rebate applications was selected, coded and the information entered on a database. Sixty-four applications were randomly selected from each of the 19 months of the scheme, up to October 1998, to remove any potential bias associated with applying at different stages of the scheme. This data was used to define the characteristics of applicants and tractors involved in the scheme.

## 2.4 Determination of Costs and benefits

### 2.4.1 Definition and perspectives

The purpose of the cost outcome analysis was not to justify the scheme or to characterise it as an economic imperative. Rather, the cost outcome analysis provides data for the comparison of the impact of this particular approach to reducing tractor rollover deaths with other alternative approaches.

The cost outcome analysis was conducted using the approach suggested by Miller and Levy, 1997. The intervention being evaluated was the fitment of some 12,129 ROPS to previously unprotected tractors in Victoria, via a rebate scheme. The evaluation did not extend to include the costs and benefits of the new regulations mandating ROPS.

Overall, the analysis takes the societal perspective ie, taking into account the costs and benefits to all members of society. However, a second analysis was undertaken from the perspective of the VWA ie, taking into account the costs and benefits to the VWA.

### 2.4.2 Determination of the size of the tractor rollover toll in Victoria

*(a) Deaths*

For adults (15 years of age and over), data supplied by the VWA on investigated work deaths in the agriculture industry were used. The annual average number of deaths was calculated over two periods: 1985-1996, and 1991-1996.

For children (under 15 years of age), data from the Victorian Coroners' Relational Database was used. Deaths coded as occurring on a farm were selected, and the case narrative examined to identify those cases resulting from a tractor rollover. The annual average number of deaths was calculated for the financial years 1989/90-1993/94, as these were the only years for which electronic data was available.

*(b) Hospital admissions*

For all ages, data for the financial years 1993/94-1995/96 from the Victorian Inpatient Minimum Dataset, which includes all public hospital admissions in Victoria, were used. Injuries coded as occurring on a farm were selected, and the external cause of injury code for agricultural machinery examined. (E-code 919 from the International Classification of Diseases Ninth Revision Clinical Modification). Since this code does not distinguish tractors, or tractor rollover events, other data sources were used to estimate the proportion of hospital admissions due to agricultural machinery injury on farms that are due to tractor rollover events. Published data from Victoria and New Zealand were used to provide an estimation of this proportion (Day and McGrath, 1998, Clarke et al., 1995).

### 2.4.3 Costs of fitting the ROPS

This can be divided into (a) costs of the ROPS themselves and their fitment, and (b) costs of implementing the rebate scheme. Each of these consists of a number of elements as described below.

*(a) Cost of the ROPS themselves and their fitment*

The cost of the ROPS and their installation was estimated from the random sample of participants. Unfortunately, not all of the 1212 sampled participants provided separate costs for the ROPS and installation. Therefore, the average costs for ROPS and installation were estimated separately from those 208 records where both data items were provided. The average cost of installation based on the data from the rebate participants was adjusted for the costs of self-fitment.

Farmer time required to organise fitment was estimated from the 18 interviews conducted with a random selection of the participants. Farmer time was costed using employee earnings adjusted to 1998 values for agricultural and horticultural labourers and was included in the average installation cost (Australian Bureau of Statistics, 1996b).

*(b) Costs of implementing the rebate scheme*

These included the rebates, publicity, mailing, printing and rebate scheme administration costs that were gathered from VWA records.

### 2.4.4 Costs of tractor rollover deaths

Published data from a study of the cost of injury in Victoria was used to provide an estimate of the cost of each tractor rollover death (Watson and Ozanne-Smith, 1997). Estimates based on both the human capital (direct costs plus lost productivity) and the willingness-to-pay (includes pain and suffering) methods were used.

Using the human capital approach, Watson and Ozanne-Smith (1997) estimated an average lifetime cost per injury death of $522,210 for males (all tractor rollover deaths have been males) in 1993/94. This figure represents an average across all age groups and all injury types. It consists of direct costs (ambulance transport, hospital, medical, pharmaceuticals, allied health) ($7249) and indirect costs in the form of foregone paid and unpaid work ($514,961). The estimation for the indirect costs was obtained from the Bureau of Transport Communication and Economics publications, and is based on median weekly earnings applied to the number of years remaining in the work force, discounted at a rate of 7% and adjusted for annual productivity gains (Watson and Ozanne-Smith, 1997).

An alternative method of viewing the cost of injury deaths is provided by the willingness to pay approach, which better reflects the value placed on health and life by individuals than does the value of foregone production. Estimates derived in New Zealand and adjusted to Australian dollars at 1993 values, indicated that people are willing to pay $1,503,860 to avoid an injury-related death (Watson and Ozanne-Smith, 1997).

The costs of tractor rollover deaths to the VWA consist of two components: (1) investigation of the death, and (2) any arising compensation. An estimate of costs for VWA investigations of rollover fatality cases is $5000 in 1998 terms. This figure covers the cost of preparing a brief for the Coroner, which includes salary for approximately 1 week, travel, photography and administrative on-costs (Trevor Martin, VWA, personal communication). Since January 1995, there has been one claim made to the VWA for a tractor rollover fatality, although at this stage only direct costs have been claimed (Ursula Hauser, VWA, personal communication). Therefore, an estimation of 1 death compensation payment every 5 years has been assumed for this study. A maximum payment of $175,000 for each claim has been used, based on the current schedule of payments.

### 2.4.5 Estimation of the effect of the 12,129 frames fitted

Two different approaches were used to estimate the number of deaths expected to be prevented by the 12,129 ROPS. First, published and unpublished data on the rate of rollover deaths per 100,000 tractors not protected by ROPS (unprotected tractors) were used in conjunction with estimates of the number of unprotected tractors remaining in Victoria to estimate the number of deaths expected to be prevented. Second, published data from Sweden (Springfeldt, 1993) on the tractor rollover death rate at varying levels of ROPS fitment was used to estimate the effect of decreasing the proportion of unprotected tractors by that attained with the fitment of 12,129 frames.

The full impact of any reductions would be expected to become apparent in the first year after the completion of the scheme ie, 1999. The scheme would be expected to have an enduring benefit until the 12,129 tractors retrofitted under the scheme are retired from service. Forty percent of tractors retrofitted were manufactured between 1960-69, and an additional 30% were manufactured between 1970-79. Seventy percent of tractors retrofitted were therefore between 19 and 38 years old. The effect of the scheme was assumed to be constant for at least the first 10 years, after which time the effect was assumed to diminish over a period of some 25 years.

### 2.4.6 Adjustment for different values of money over time

Since all intervention costs occurred in 1997/98, the previously published estimated costs of rollover deaths (see 2.4.4) have been adjusted where necessary by the consumer price index (obtained from the Australian Bureau of Statistics on line service) to reflect 1998 values. In addition, since benefits to be received in the future are of lesser value in the present, future benefits have been discounted by 7%. This discount rate is consistent with that currently used by the Victorian Department of Treasury for non-revenue generating investments (Nick Tambura, Victorian Department of Treasury, personal communication).

# 3. Results

## 3.1 Historical overview and context of the 1997/98 rebate scheme

### 3.1.1 Introduction

Previously in Victoria, the regulation and administration of occupational health and safety was separate from the administration of the workers' compensation system. In 1985, regulation and administration of occupational health and safety was vested in the Occupational Health and Safety Authority (later known as the Health and Safety Organisation or HSO) within the Department of Business and Employment. At the same time, the regulatory responsibilities relating to workers' compensation were vested in the Accident Compensation Commission. The workers' compensation responsibilities were assigned in 1992 to a new body, the Victorian WorkCover Authority. In July 1996, there was a merger of the workers' compensation and occupational health and safety structures, with the HSO becoming the Health and Safety Division of the VWA.

The 1997/98 ROPS rebate scheme is one of a number of strategies adopted initially by the HSO, and subsequently by the VWA, since around 1987 as part of an integrated approach to addressing the issue of tractor rollover deaths specifically, and farm safety more generally. The approach has included information and awareness programs, education, and regulation (Victorian WorkCover Authority, 1998). The promotion of ROPS has featured strongly within the farm safety program. Strategies undertaken to promote farm safety in general and tractor rollover prevention specifically have been documented previously (Victorian WorkCover Authority, 1988; Cassell et al., 1997; Farmsafe Alliance Project Officer Reports No 2-8).

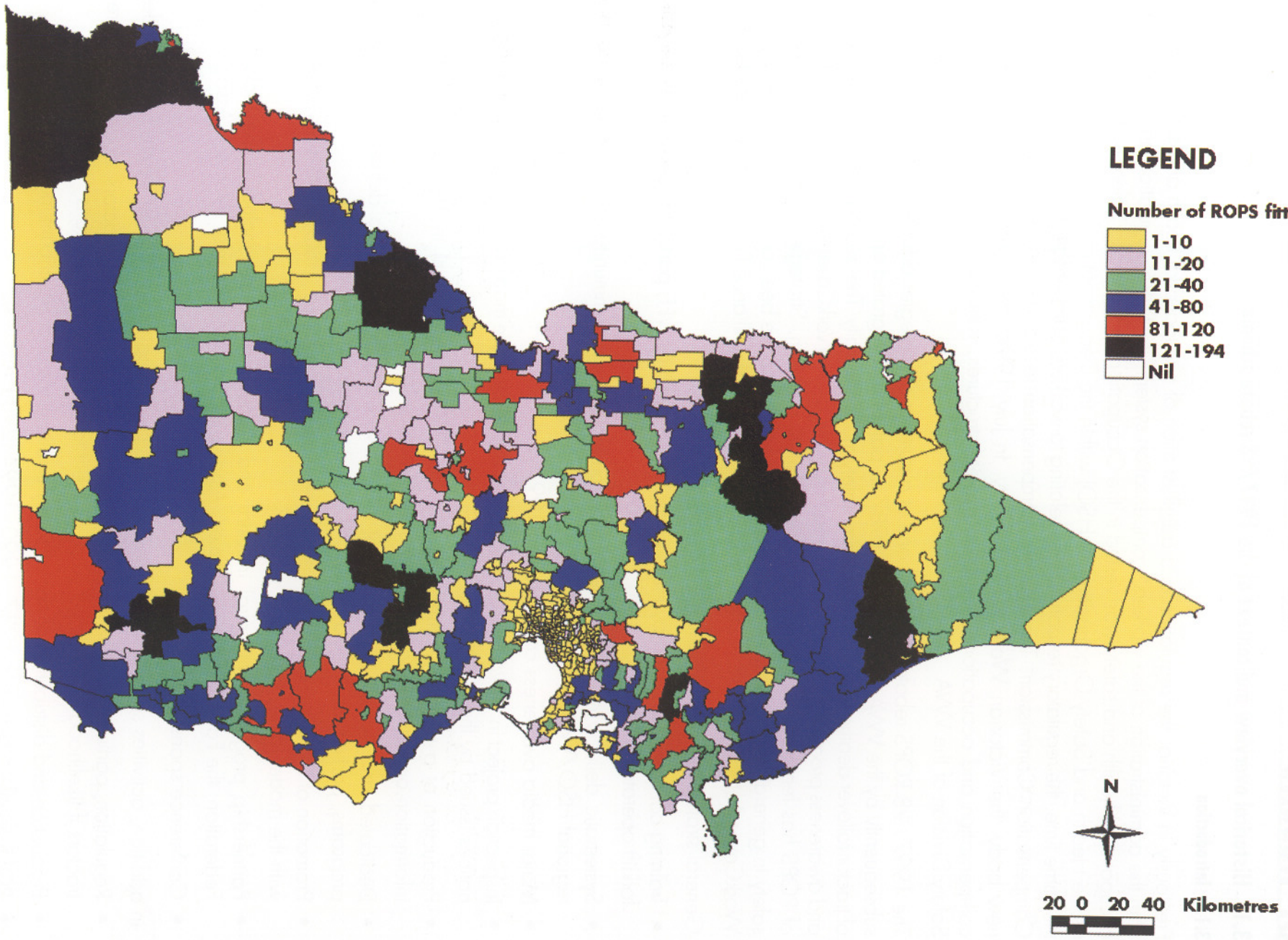
General strategies have included:

- Training courses, conducted by HSO in conjunction with the VFF, particularly on front end loader and forklift operation
- Systematic delivery of farm safety information to the rural community co-ordinated by the Bendigo regional HSO/VWA office
- Major media awareness campaigns in 1995 and 1996
- Inspection project in 1996 during which 300 inspections were made and 100 provisional improvement notices issued by the HSO
- Production of a quarterly Farm Safety Bulletin (22,000 circulation) in 1996 and 1997 providing information on recent serious accidents and fatalities
- Dedicated and trained staff based at HSO/VWA regional offices to deliver farm safety training programs, participate at field days, and to visit community groups
- Promotion of the use of the farm safety model farm (eg., in 1996, HSO/VWA staff visited 33 schools with the model farm)
- Partnership programs with rural industry and community groups, including the Victorian Farmers Federation, the Farm Machinery Dealer's Association, and the Country Women's Association
- Conference sponsorship

In addition, activities specifically directed towards preventing tractor rollover deaths have included:

- Regulation, particularly of the requirement for ROPS on all post-1981 tractors, and fitment to pre-1981 tractors if likelihood of a rollover exists, subject to a number of exceptions
- Production and distribution of tractor safety publications and Significant Incident Reports
- ROPS rebate schemes in 1987, 1990, 1994 (2931 rebates)
- Consistent promotion of ROPS at all 18 field days and shows attended by VWA staff from 1997 to mid 1998

Figure 1 Distribution of ROPS rebate applicants, 1997/98 rebate scheme, Victoria



### 3.1.2 Overview of previous tractor rollover protective structure rebate schemes

There have been at least three previous tractor ROPS rebate schemes. In 1987, the Department of Labour launched a Tractor Safety Awareness Campaign which consisted of advertising in the printed media, a promotional poster, tractor safety kits distributed to dealers, a tractor safety book, and a $100 rebate for ROPS fitment. Following this campaign, occupational health and safety advisors conducted follow-up inspections. There were an anticipated 2000 responses to the rebate scheme, however only 556 applications were received, of which 389 were processed. The scheme ran for a period of 2 months (Anonymous, 1991)

In 1990, the Health and Safety Authority ran a further campaign consisting of advertising in the printed media, a promotional poster, a tractor safety book, participation at major field days and rural show activities, community services television advertising and a $100 rebate for ROPS fitment. The goal was 1000 rebates, and 1436 were actually made. The scheme ran for a period of 10 months (Anonymous, 1991)

In 1994, the Health and Safety Authority ran a similar campaign again consisting of advertising in the printed media and other promotional activities, and a $120 rebate for ROPS fitment. A $5 bonus was offered to the VFF branches for every successful application that was referred from the branches. Four prizes of $500 were offered to applicants. A total of 1116 rebates were made over a period of 7 months (VFF and HSO, 1994)

During the development and implementation of these schemes, particularly the latter two, partnerships were being created between the VWA and the VFF and Farm Machinery Dealers Association (FMDA).

### 3.1.3 Partnerships between the Victorian WorkCover Authority, Victorian Farmer Federation and the Farm Machinery Dealers Association

There has been a long history of concern by government and individuals regarding tractor rollover deaths that preceded the introduction in 1985 of the regulations requiring ROPS on all post-1981 tractors. However, farm safety as a strategic area within the HSO originated sometime later in 1992 from a pilot of courses for front-end loader operation, conducted in conjunction with the VFF in the Western District. Subsequently, a partnership between the HSO and the VFF began to develop, and a project on Certificate courses became incorporated into the work plan of the HSO. A specific project on shearing shed safety followed. In 1995, the HSO established a Development Taskforce to concentrate on some key areas and issues. Farm safety became incorporated into the Taskforce program as a discrete strategic focus for the partnership program.

The partnership program, which gained considerable impetus within the Taskforce from late 1995 to early 1997, has played a major role in preparing the ground for the 1997/98 ROPS rebate scheme. In 1993, the VFF formed a Farmsafe Victoria committee, as part of the Farmsafe Australia movement. The HSO initially, and the VWA subsequently, has been represented on this committee since its inception.

Through the activities of the Development Taskforce and participation on Farmsafe Victoria, the HSO and VWA have established a professional and productive partnership with a number of organisations, most notably the VFF. The VWA and the VFF have collaborated in delivering the "Managing Farm Safety" training program across Victoria. The VWA provided officers to attend all training programs, and in some cases, to deliver part of the program. The HSO and the VFF also collaborated in delivering some of the previous ROPS rebate schemes.

In 1996, the VFF passed a resolution at the Annual Conference that "no tractor should be permitted to be operated after 1 January 1998 on any farm in Victoria unless it is fitted with a ROPS or a similar structure having the same effectiveness..." (Farmsafe Victoria Meeting Notes, September 1996). This was a landmark in tractor rollover fatality prevention, as previously the VFF had vigorously resisted requirements

for all tractors to be fitted with ROPS. The significance of this resolution, and the strength of its support within the VFF, was demonstrated by the move from the floor of the conference to amend the implementation date from the proposed 1 January 2000 to 1 January 1998. The change in willingness to accept such a requirement was no doubt due in part to the work of the HSO and VWA with Farmsafe Victoria.

Earlier work with the FMDA in the preparation of a tractor safety manual for supply with second hand tractors sold through dealers also developed the working partnership with the Association, necessary for the implementation of the 1997/98 scheme.

### 3.1.4 Victorian Farmsafe Alliance

The Department of Natural Resources and Environment (formerly the Department of Agriculture), the Department of Human Services, the VWA, and the VFF have jointly established a Victorian Farmsafe Alliance to encourage wide participation in farm injury prevention in Victoria. The VWA, in conjunction with the Departments of Natural Resources and Environment, and Human Services, has provided funding for a full time project officer since 1997 to implement the Alliance strategy. The Alliance strategy has included establishment and support of Farm Safety Action groups and allied concerned bodies, promotion of "Managing Farm Safety" training programs, development of RIPPER - a primary school curriculum resource for the teaching of farm safety, and considerable awareness raising through the media and attendance at field days (Alliance Annual Report, 1998).

### 3.1.5 The broader context of farm safety and tractor rollover prevention

The work of the HSO and VWA on farm safety and tractor rollover deaths has occurred during a time of increasing impetus in farm safety in Victoria, with the scope of awareness raising, implementation and research activities rapidly expanding. The Victorian Coroner has made public calls over a long period of time for more attention to the issue of tractor rollovers, and has actively raised the awareness of the farming community to the fatal consequences of tractor rollovers. In particular, he has involved the VFF Agricultural Machinery Committee as observers in a number of inquests. The rural media (print and radio) have increased coverage of the issues. For example, the Weekly Times have devoted a full page (including advertisements) to farm safety since December 1995. This initiative was negotiated by HSO/VWA. Commodity groups and rural communities have been increasingly active with a number of projects including farm safety field days. The Country Women's Association has also conducted a number of farm safety days with seeding money from the HSO.

Funding organisations such as the Department of Human Services and the Victorian Health Promotion Foundation have identified farm safety as an area of priority and have funded a number of local level projects. In addition, the Department of Human Services has recently funded 4 part time regional farm safety officers for a period of 12 months. Some local governments, and other local level organisations such as community health centres and Divisions of General Practice, have conducted farm safety projects in their areas. Kidsafe has also developed programs for child safety on farms.

The Monash University Accident Research Centre has developed a farm injury research and prevention program since 1994. The University of Ballarat has also placed farm safety on its research agenda within the Victorian Institute of Occupational Safety and Health. Research is also being conducted by local level organisations. Several conferences on farm safety have been held.

The integrated strategy of the HSO and VWA prior to the 1997/98 ROPS rebate campaign, and the activities of the other farm safety stakeholders, has provided a strong foundation from which the 1997/98 ROPS rebate campaign has been launched. Undoubtedly, this foundation has played a major role in the high uptake of the scheme.

**Figure 2**

Examples of tractors fitted with rollover frames, 1997/98 rebate scheme, Victoria.

## 3.2 Features of the 1997/98 rebate scheme

### 3.2.1 Overview

The 1997/98 scheme was funded by the VWA and administered, under contract, by the VFF. A Steering Committee was established to advise on the scheme implementation and administration. Membership included the VFF, VWA, and FMDA. The main elements of the scheme were proposed regulatory amendments, publicity and education, and an incentive in the form of the rebate.

A project co-ordinator, Mr Eric Young, was appointed by the VWA to develop the project strategy including the subsidy program, promotion campaign, legislative changes, compliance project, and monitoring and evaluation. The co-ordinator had previously had a managerial role in the development of the HSO and VWA farm safety initiatives, and two of the previous rebate schemes.

The 1997/98 scheme was launched in April 1997 at Lardner, Victoria. A series of television advertisements and press releases developed and co-ordinated by the Public Relations section of the VWA formed the foundation for the scheme publicity. The level of advertising on country television was substantial. Six media releases were made in 1997 and 8 in 1998. There were 242 articles appearing in the print media in 1997, and 51 in 1998 (Table 1).

**Table 1: Tractor rollover protective structure rebate scheme print media publicity, Victoria, 1997/98**

| Month | 1997 | | 1998 | |
|---|---|---|---|---|
| | Media releases | Newspaper articles+ | Media releases | Newspaper articles+ |
| January | | | | 5* |
| February | | | 1 | 4 |
| March | 1 | 26 | 2 | 14 |
| April | | 58 | 1 | 3 |
| May | 1 | 31 | | 4* |
| June | 1 | 8 | 2 | 5 |
| July | 2 | 18 | | 5* |
| August | | 20* | | 5 |
| September | | 22 | 2 | 2 |
| October | 1 | 43 | | 4 |
| November | | 13 | | |
| December | | 3 | | |
| **Total** | **6** | **242** | **8** | **51** |

+ Articles in rural press, names of newspapers were not collated

* Estimates based on previous and following months' data and the presence or absence of medial releases.

The VWA conducted a mail out, consisting of the application form and supporting material, using a commercially available list of 39,990 farmers. Tractor rollover incidents, and the rebate scheme, were the main focus of VWA displays at agricultural shows and field days from the launch until August 1998. The VFF also provided publicity in its material to members.

The VWA and the VFF conducted 4 tractor and ROPS information sessions for orchadists to assist this producer group in responding to the scheme and impending regulatory amendments.

The uptake of this scheme was higher than all of the previous schemes combined. An average of 146 rebate applications was received by the VFF each week for the 20 month period, with the peak being 170 per week. The rate of uptake during this most recent scheme (606 per month) was some 4 times higher than that of the previous 1994 scheme (159 per month).

### 3.2.2 Impact of the scheme

In 1996, the number of operational tractors in Victoria without ROPS was estimated at 17,420, which was 24% of operational tractors (Day et al, 1999). A total of 12,129 applications had been processed as of 30th November 1998 (David Griss VFF, personal communication). Therefore, as a result of the scheme, there are now an estimated 5,291 operational tractors without ROPS, which is approximately 7% of operational tractors. The scheme reduced unprotected tractors by 70%.

In the random sample of 1,212 scheme applicants, 66% reported being full-time farmers (Table 2). Victorian Farmers Federation members made up 27% of the applicants, while hobby farmers made up 21%. As would be expected, 96% of the tractors were manufactured prior to 1980. The most common decade of manufacture was 1960-1969 (40%) (Table 3). The most common make of tractor was Massey Ferguson (53%) (Table 3). The rebate scheme was taken up across Victoria and there did not appear to be any particular patterns to the areas where the highest numbers of ROPS were fitted (Figure 1).

Among the 208 applications which recorded both ROPS price and installation price, the average ROPS price was $481 (SD $138, range $52-903) and the average installation price was $142 (SD $155, range $15-1043).

**Table 2: Applicant profile*, tractor rollover protection structure rebate scheme, Victoria, 1997/98**

| Type of farmer | Victorian Farmers Federation Membership | | Total |
|---|---|---|---|
| | Member (%) | Non member (%) | % |
| Full-time | 311 | 486 | 797 |
| | (26) | (40) | (66) |
| Hobby | 6 | 247 | 253 |
| | (0.5) | (20) | (21) |
| Other | 2 | 136 | 138 |
| | (0.2) | (11) | (11) |
| Not sure | 6 | 18 | 24 |
| | (0.5) | (1) | (2) |
| **Total** | **325** | **887** | **1212** |
| | **(27)** | **(73)** | **(100)** |

* Based on a 10% sample of the 12,129 applicants

**Table 3: Tractor make and year of tractor manufacture*, tractor rollover protection structure rebate scheme, Victoria, 1997/98**

| Make of tractor | 1930-39 | 1940-49 | 1950-59 | 1960-69 | 1970-79 | 1980-89 | 1990-98 | Total (%) |
|---|---|---|---|---|---|---|---|---|
| Massey Ferguson | 1 | 11 | 228 | 244 | 137 | 18 | 2 | 641 (53) |
| Ford | | 1 | 49 | 94 | 68 | 2 | 2 | 216 (18) |
| International | | | 10 | 54 | 40 | 4 | | 108 (9) |
| David Brown | | 1 | 3 | 25 | 36 | 5 | | 70 (6) |
| Fiat | | 2 | 1 | 24 | 33 | | 1 | 61 (5) |
| John Deere | | | | 12 | 19 | 3 | | 34 (3) |
| Chamberlain | | | 1 | 12 | 4 | | | 17 (1) |
| Kubota | | | | | 3 | 5 | | 8 (0.7) |
| Leyland | | | | | 5 | 2 | | 7 (0.6) |
| Other | | 1 | 4 | 16 | 20 | 5 | | 46 (4) |
| Total | 1 (0.08) | 16 (1) | 296 (25) | 481 (40) | 365 (30) | 44 (4) | 5 (0.4) | 1208 (100) |

*Based on a 10% sample of the 12,129 applicants

### 3.2.3 Farmer perspective

The interviewed participating farmers were satisfied with the scheme itself. Rollover frames were generally available for their tractors, and of the 22 tractors fitted by the 18 farmers, all except 1 were fitted with a 2 post ROPS. One farmer had fitted three tractors and two farmers fitted two tractors, while the remainder fitted one tractor under the scheme. The process of fitment was relatively straight forward, with only 2 farmers reporting that a ROPS frame was not readily available. Most farmers organised fitment to occur at a time during which the tractor was not required for farm operations. Farmer time required to organise fitment was 2 hours on average. The ROPS were fitted on the farm in 13 of the 18 farmers. ROPS were fitted by a dealer or authorised mechanic in 10 of the 15 farmers from whom this information was available. Figure 2 shows examples of tractors fitted with frames under the scheme.

Farmers had heard about the scheme mainly from the television advertising (7), and advertising or articles in the newspapers (6).

Most of the farmers interviewed reported that they were in favour of the impending ROPS regulatory amendment (15), despite there being some confusion regarding the scope of the regulations and the expected time of promulgation. Three farmers specifically commented that the regulations should be enforced ("I've done it ...everyone should have to"). Two farmers identified protection for inexperienced people as a benefit of the regulations. Two farmers felt that ROPS were not necessary for all farms (eg, those on relatively flat land). Seven farmers reported that the regulatory amendment was the main reason for ROPS fitment at this time. Other reasons for ROPS fitment included the rebate scheme (10), a concern about safety (9), and to facilitate future re-sale of the tractor (5) (farmers could give more than one reason for fitment). Five farmers reported that they had been considering installing ROPS for some time prior to the scheme, with the scheme being the trigger to act now. It is noteworthy that 15 of the 22 tractors fitted had been owned by the farmers for more than 10 years, and therefore it would seem that it required the combined effect of the regulatory amendments and the rebate scheme to initiate ROPS fitment. Sixteen of the tractors had been used tractors when purchased.

In response to being asked to comment on the level of ROPS fitment in their area, 5 responded that there were very few without ROPS, and 4 responded that there were a few without ROPS (data was missing for 8 participants).

An unanticipated effect of the retrofitting of ROPS became apparent during the farmer interviews. Most of the tractors had two post ROPS fitted, which are behind the line of sight of the operator once seated on the tractor. Further, the fitment of ROPS to these tractors significantly raised the clearance height. Eleven of the 18 farmers interviewed reported clearance problems. These ranged from brushing low branches to getting caught on building doorways and trusses. Generally these incidents resulted in no injury or damage to the tractor or buildings. However, there were two such incidents reported. In one incident, an elderly farmer suffered fractured ribs after the tractor got caught on some low branches, and in another incident, several hundred dollars worth of damage was done to a tractor which caught on the trusses of an old dairy shed. Other problems noted following ROPS fitment included the loss of grab points, bumping oneself on the tool box which had been moved to accommodate the ROPS, and hitting ones head on the frame when turning make an adjustment.

In relation to the issue of seat belts in tractors, only four farmers reported having seat belts in any of their tractors, and none of these were used. Of the 14 who did not have seat belts, 8 reported that they would not use them, and two each reported that they would maybe use them, or use them for some tasks or applications. This is despite the fact that the interviewed farmers could readily identify the benefits of seat belts in cars. Few of the interviewed farmers recognised the value of seat belts in rollover incidents in preventing ejection or possible crushing by the ROPS itself. It would appear that there is a lack of knowledge of the potential benefits of seat belts in tractors. The most common problems with seat belts raised were the need to frequently get on and off tractors during the course of normal operations (7), and the perceived need to be able to jump free of the tractor if necessary (eg, if the tractor does start to rollover) (4).

Identification and recruitment of non-participating farmers was more difficult and time consuming than anticipated. One non-participating farmer was successfully recruited. This farmer had heard about the scheme through his commodity association. He did not participate in the scheme primarily because tractor rollover risk on the property was already being managed in a way that would comply with the proposed regulatory amendments. The property concerned had some 15-20 tractors, not all of which were operational (ie, some were used as stationary pumps). Since the property was an orchard, tractors operating in the orchard itself were exempt from the ROPS requirement. Consequently, the tractors had been divided into two groups: those that were used in the orchard itself (without ROPS), and those that were used outside the orchard on other parts of the property (with ROPS). Tractor rollover risk within the orchard itself was managed by a number of strategies including wider wheel bases and smaller wheels on tractors used in the orchard, driver training, and a policy of instructing employees to cease any work

where there was a perceived risk of rollover. Tractor rollover risk outside the orchard was managed by the use of ROPS equipped tractors. All tractors used outside the orchard were already fitted with ROPS when the 1997/98 scheme was announced.

The non-participating farmer supported the proposed ROPS regulatory amendments, particularly the option of an exemption for tractors used in orchards. However, he did not believe that a blanket exemption should be given for all tractors used on fruit growing properties, as there are a range of tasks that occur outside the orchard area, for which tractors are used eg, towing, carting. The farmer reported that most of the larger orchards would be using similar strategies to manage tractor rollover risk. However, smaller orchards with only one tractor that was needed for a range of tasks would not have the option of dividing tractor use accordingly. He believed that the folding ROPS was the solution in these instances.

### 3.2.4 Machinery dealer perspective

The Farm Machinery Dealers' Association (FMDA) expressed a generally positive view of the rebate scheme itself. The quality of the television advertising and other publicity, especially the launch, was perceived as excellent and provided an opening for dealers to raise the issue of retrofitting ROPS with their customers. The fact of the impending regulatory amendments meant that dealers would not be perceived as just encouraging business for their own purposes. The efforts of VWA and the VFF to involve the FMDA prior to, and during, the scheme were viewed very positively.

Retrofitting of some old tractor makes and models was an issue that the FMDA felt could have been better addressed prior to the scheme commencement. The definition of practicability was acknowledged as problematic, as was the absence of a standard well-defined rollover risk assessment tool. The FMDA reported plans to develop a guide to standard risk assessment for the major categories of farm equipment.

The FMDA believe that the regulations should be enforced with a compliance campaign, in which enforcement activities and resulting fines are given widespread publicity. This view was also expressed by some of the interviewed dealers and farmers. The consequences of a perceived absence of enforcement were reported to be a questioning of the commitment of the VWA to safety and a perception that the rebate scheme was merely a publicity exercise. A backlash of negative opinion of the VWA was predicted in the perceived absence of enforcement.

All of the machinery dealers interviewed (4) believed that the impending regulatory amendments were the main incentive for the fitment that occurred under the scheme. The rebate was acknowledged as an important secondary factor, followed by the level of publicity and the involvement of the VFF.

Fitment of the frames through these dealers was generally straightforward. Dealers reported having difficulty in obtaining frames for only a minority of tractors. Most of the frames fitted were 2 post ROPS and a significant proportion of fitment was carried out on the property. A number of farmers purchased frames and organised fitment themselves.

The estimation of the extent of ROPS fitment differed according to the geographic area. This probably reflects the belief that ROPS are more important in hilly regions, expressed in the farmer interviews. It would seem likely that the extent to which ROPS are fitted might differ across Victoria.

The perceived delay in promulgating the regulations caused some dealers to believe that they had lost credibility with farmers in their area, since the dealers had been actively publicising the impending regulatory amendments, and subsequent enforcement, as a reason to retrofit tractors with ROPS. Some dealers saw this as a major problem.

Two dealers raised the issue of seat belt use in tractors, noting that these are required to obtain the full protective effect of ROPS. The difficulties in retrofitting seat belts, and in increasing their use among tractor operators were acknowledged.

One dealer interviewed expressed a concern that hobby farmers may not have been well reached by the rebate scheme. The view was expressed that hobby farmers, being less experienced, may be at higher risk of tractor rollover events, while at the same time also being more likely to buy second hand tractors through networks that may not facilitate ROPS retrofitting (eg, clearance sales, smaller dealers unaware of the need to retrofit).

### 3.2.5 Victorian Farmers Federation perspective

The VFF (Industrial and Legal Department) also expressed a positive view of the rebate scheme itself, particularly in relation to the number of farmers who have fitted ROPS to their tractors as a result. Some difficulties in processing of the applications, related to the format of the form, were noted by the ROPS Steering Committee. The importance of a well designed and piloted application form in reducing additional administration and ensuring the collection of quality data was also noted by the ROPS Steering Committee.

The VFF Industrial and Legal Department have observed a greater interest in farm safety among farmers since the ROPS rebate scheme has been operating. Members have been more actively seeking information regarding workplace health and safety obligations and specific advice concerning farm hazards. Staff in the Department believe that the publicity campaign increased the perception that enforcement of the ROPS regulations would follow the scheme, and that the enforcement may extend to include other farm health and safety issues. The VFF recognises that there are farm health and safety issues other than tractor rollovers that require addressing, and will continue to develop and promote farm safety programs in the future.

### 3.2.6 Costs of the 1997/87 rebate scheme

The costs of the rebate scheme are shown in Table 4. Note that some items are estimates only and some significant costs are not included (eg, the cost of screening the television commercials).

**Table 4: Costs of 1997/98 Victorian WorkCover Authority tractor ROPS rebate scheme**

| Costs borne by: | 1997/98 dollar values |
|---|---|
| ***Victorian WorkCover Authority*** | |
| - rebates | 2,000,000 |
| - advertising | 229,000 |
| - administration contract | 40,000 |
| - rebate application forms | 15,932 |
| - list purchase and mailing | 30,465 |
| ***Participating farmers*** | |
| - ROPS purphase and installation | 5,561,947 |
| ***Victorian Farmers Federation*** | |
| In-kind staff time | (significant but not quantifiable) |

## 3.3 Short and long term benefits of the 1997/98 rebate scheme

### 3.3.1 Potential lives saved

Data from the USA for 1993 (Myers et al., 1998), from Victoria for 1995/96 (Day et al., 1999), from New South Wales for 1991 (Coleman 1996; Richard Franklin, Australian Agricultural Health Unit, personal communication) and from Queensland for 1992/3 (Keith Ferguson, Department of Education, Training and Industrial Relations, personal communication) indicate that the rate of rollover deaths among adults per 100,000 unprotected tractors ranges from 2.43 (USA) to 12.61 (NSW). For Victoria 1995/96, the rate was 5.74. However, there was only one death in that year. If the deaths were two rather than one, then the rate would be 11.48.

Prior to the scheme in Victoria, there was an estimated 73,816 operational tractors on farms (Day et al, 1999). This estimate was derived by applying the reported distribution of tractor number per property size (random telephone survey of 153 farms) to the distribution of property size in Victoria. In the same survey, it was reported that 23.6% of tractors were without ROPS. Therefore, an estimated 17,420 tractors were without ROPS in Victoria just prior to the rebate scheme commencement in April 1997.

Given that 12,129 tractors were retrofitted with ROPS, then after the scheme, 5291 tractors remained unprotected by ROPS. If the Victorian derived rate of 5.74 deaths per 100,000 unprotected tractors is used, then there would be a statistical estimate of 0.30 rollover deaths per year after the scheme. This is compared with the annual average of 3 per year for the period 1991-1996. If the highest rate of 12.61 is used, then there would be a statistical estimate of 0.67 rollover deaths per year after the scheme. The net effect is that the scheme would be expected to prevent 2 deaths per year.

These calculations are based on the assumption that there are no rollover deaths that occur on tractors fitted with rollover frames. This in fact is not true. In Victoria, from 1985-1996, there were 29 rollover deaths for which the presence or absence of a ROPS was recorded. In 5 of these cases (17%), the tractor was fitted with a ROPS (Day, 1998). In Sweden, from 1959-1971, 3.6% of 218 rollover fatalities occurred in a tractor fitted with a ROPS (Springfeldt, 1993). Consequently, the actual effect of the rebate scheme may be to prevent slightly less than 2 deaths per year.

The reduction would be expected to become apparent in the first year after the completion of the scheme ie, 1999. The scheme would be expected to have an enduring benefit until the 12,129 tractors retrofitted under the scheme are retired from service. Forty percent of tractors retrofitted were manufactured between 1960-69, and an additional 30% were manufactured between 1970-79. Seventy percent of tractors retrofitted were therefore between 19 and 38 years old. The effect of the scheme could be expected to be constant for approximately 10 years after which the effect of the scheme would begin to diminish as the tractors are replaced with new tractors (all of which will have ROPS). Some of these tractors may well be replaced with used tractors. The used tractors would be expected to have ROPS, some of which will have been provided through the scheme.

If the effect of the scheme were considered to be constant for the first 10 years, then a total of 20 deaths would be expected to be prevented, all other things remaining the same.

The actual effect may be slightly less than this for the reason noted above, and also due to the diminution of any potential behavioural effect of the publicity given to the prevention of tractor rollovers as a result of the scheme promotion.

An alternative means of estimating the number of deaths prevented by the scheme is to consider the effect of increasing the proportion of tractors with ROPS from the pre-scheme level of 76.4% to the post-scheme level of 92.8%. The only data available on which such estimates could be based is from Sweden. In Sweden in 1976, 76% of tractors had ROPS and the rollover fatality rate was 3.2 deaths per 100,000

tractors. By 1985, the proportion had risen to 91%, and the rollover fatality rate had fallen to 1 per 100,000, and by 1986, the proportion had risen to 92%, and the rollover fatality rate had fallen to 0 (Springfeldt, 1993).

In Victoria, prior to the scheme, the average annual rollover fatality rate was 4 per 100,000 tractors. If a reduction of similar proportions to Sweden occurred, then the rollover fatality rate would be expected to fall to 1.3 (or less) per 100,000 tractors. This equates to 0.96 or fewer deaths per year, meaning that 2 deaths per year would be prevented. This is the same estimate as that derived above. Similarly, this is probably a slight over-estimate since the legislation in Sweden during this period changed from requiring cabins on all new tractors and ROPS on all tractors used by employees, to in 1981 requiring cabins on all tractors. This would mean that the proportion of tractors in Sweden with full cabins would be much higher than that in Victoria. Cabins on tractors are more effective in preventing rollover deaths than either four post or two post ROPS (Springfeldt, 1993).

### 3.3.2 Psychological trauma averted

The key informant on this topic outlined a number of aspects to the psychological and emotional trauma experienced by families and communities among whom rollover deaths occur.

In addition to dealing with the normal grieving process, a farm family may also have to deal with other concurrent crises that occur following a tractor rollover death. If the deceased member was integral to the farm operations, then often immediate arrangements must be made to ensure that critical tasks are attended to. In the longer term, the deceased member will have to be replaced by either another family member or by employed labour. The latter alternative may not be financially feasible, and if there is no family member available, then the property may have to be sold or leased. The making of these decisions can be extremely traumatic itself, as can the consequences of these decisions. The family, while still grieving for the deceased, may also face other significant losses ie, the loss of property, employment, financial support and life-style.

Depending on the exact circumstances of the death, members of the family may also experience guilt and self-blame. Blaming others in the family may lead to a breakdown of the family communications and structure. Reactions from the community may cause the family to withdraw from the community, alienating them from sources of support.

A traumatic injury death such as a tractor rollover can have profound effects on rural communities, beyond the immediate family and friends, since because rural communities often have relatively tight networks, characterised by an interdependence of individuals. In many cases, those professionals who must attend to various aspects of the incident (eg, police, health professionals) will at least know the deceased person, and in some cases, may have been close friends.

While a traumatic injury death can, in some senses, be a unifying experience for some communities, or for some elements within communities, it can also be divisive. As people within the community grapple with trying to understand the incident, rumours may spread and blame may be unfairly laid. Usually, up to the time of the funeral, the community may be quite distracted by the incident and by supporting the family. This may impact on productivity. Often most people in the community will return to normal activities following the funeral, and this can be mis-interpreted by the family as being un-caring, leading to bitterness and withdrawal from the community.

The sale of a property and the possible re-location of a whole family away from the community can also be quite distracting as individuals in the community come to terms with the personal, and sometimes economic, impact of this.

Further, the community may have lost an active contributing member, and if the family withdraws or moves, the community may lose several active contributing members. Community based initiatives, clubs and activities are often a strong feature of rural communities and these activities and organisations are usually dependent on involvement of community members. This contribution can be measured to some extent by calculating the value of voluntary time in terms of the equivalent labour costs, but the worth of these activities to rural communities goes beyond this kind of economic value.

The key informant report was supported by the interview with a farmer (Ms X) whose husband had been killed 4 years previously in a rollover event on their farm. Ms X reported that she "could not possibly communicate how devastating it was". From a personal view point, Ms X found that she was not in a position to be making major decisions, such as whether to sell the farm, and felt she was fortunate not to have been forced to do so. The loss of the farm and family home would have greatly increased the emotional trauma experienced, particularly for the children. Farm operations were maintained initially by the local community, followed by a period of employed labour. Ms X had been actively involved in the farm operations prior to her husband's death, but reported that moving to being the farm manager required additional training. Insurance payouts facilitated this transition. A decision was eventually made to establish a share farming arrangement to allow her children to have more time with their one parent.

Based on the calculations presented in this report, the rebate scheme is likely to have prevented the above events occurring for two farm families and their communities each year for at least the next 10 years.

### 3.3.3 General effects on farm safety

Based on the farmer interviews, the scheme may have had some impact on other areas of farm safety. Four of the 18 farmers reported taking any other safety related action since fitting the ROPS, including improvements to a wool shed, maintenance of creek crossings and irrigations ditches, locking away firearms, creating a fire break, and ensuring the storage of chemicals in a cupboard. It is not known to what extent these actions can be attributed directly to the scheme, or to the general farm safety awareness activities and promotions operating concurrently.

The VFF Industrial and Legal Department have observed a greater interest in farm safety among farmers since the ROPS rebate scheme has been operating. Members have been more actively seeking information regarding workplace health and safety obligations and specific advice concerning farm hazards. Staff in the Department believe that the publicity campaign increased the perception that enforcement of the ROPS regulations would follow the scheme, and that the enforcement may cover farm health and safety more broadly.

It is likely that any influence that the rebate scheme may have had on farm safety behaviour in general will decay fairly rapidly upon completion of the scheme, unless other measures are implemented. For example, the high profile road safety advertising campaign that targets drink driving has a half life of 3 weeks in regional Victoria (ie, half of the estimated effect of the advertisements remain 3 weeks after cessation of screening) (Shtifelman et al., 1998). However, it is possible that the scheme and the resulting publicity may have increased receptivity to future safety initiatives.

## 3.4 Cost outcome analysis of 1997/98 rebate scheme

### 3.4.1 Strengths and limitations

An analysis of the applicability of the human capital estimates of the Watson and Ozanne-Smith study to tractor rollover deaths reveals a number of issues for consideration.

The direct costs were based on motor vehicle traffic deaths from the TAC, due to the relatively small number of injury-related death claims in the WorkCover database reducing the options for developing costs for the genders, various age groups and types of injury causes. It is possible that this may be an under-estimate of the direct costs associated with tractor rollover deaths since the rescue and ambulance transport costs may be higher than the average for motor vehicle traffic deaths.

The direct costs did not include coronial investigations or VWA investigations. An estimate of costs for VWA investigations of rollover fatality cases is $5000 in 1998 terms. This figure covers the cost of preparing a brief for the Coroner, which includes salary for approximately 1 week, travel, photography and administrative on-costs (Trevor Martin, VWA, personal communication).

The indirect costs were estimated from tables provided by the Australia Bureau of Transport, Communication and Economics and include both paid and unpaid production components (Watson and Ozanne-Smith 1997). The indirect cost component of the average life time cost per injury death for males may not accurately represent the situation for tractor rollover deaths for two reasons. First, the average age of rollover victims (44 years) would be older than the average age of all injury male victims. However, this would be likely to be offset by the longer than average working life of farmers. For example, in 1996, 4% of the employed labour force were over 60 years of age, compared with 32% of farm operators over 60 years of age in 1992-93 (Australian Bureau of Statistics).

Second, the average annual income of farm operators tends to be lower than that for employed males. For example, in 1994, the average male annual earnings were $32,505, compared with an estimate of $27,533 for farmers (Australian Bureau of Statistics, Australia Bureau of Agricultural and Resource Economics, 1997).

Since 1994, the average male annual earnings have increased, while anecdotal evidence is that the average earnings for farmers have decreased. This could have the effect of overestimating the indirect costs. However, particularly in the agricultural industry, annual earnings can be considered to be a fairly poor indicator of the value of agricultural work.

A number of parameters used in the cost outcome analysis are estimates based on the best available data. Obviously, the accuracy of these estimates impacts on the accuracy of the cost outcome analysis. These estimates include: costs of farmer time associated with ROPS fitment (based on sample of 18 farmers), costs of tractor roll-over deaths (discussed above), estimation of the number of deaths prevented by the 12,129 ROPS fitted (discussed in Section 3.3.1), estimation of the time period during which the benefits of the scheme would be anticipated (discussed in Section 3.3.1), and the level of discounting used (discussed in Section 4.1).

An over-riding limitation of cost outcome analyses is the tendency for their use in justifying the very existence of programs that prevent injury deaths, and other serious injury outcomes, rather than as a tool to guide selection of the most effective interventions for the prevention of injury deaths, and other serious injury outcomes.

### 3.4.2 Societal perspective

The total cost of the rebate scheme was $7,877,344 in 1997/98. If the effect is assumed to be constant for the first 10 years, then 20 deaths could be expected to be prevented. In economic terms, $393,867 will have been spent per life saved. If the effect of the scheme was constant for 20 years (ie, if the protected tractors remain in operation longer than assumed), then 40 deaths could be expected to be prevented. In this case, $196,934 will have been spent per life saved.

For comparison, the lifetime economic cost per rollover death is estimated at $571,735 and $1,646,482 for the human capital and willingness-to-pay approaches respectively.

Additional uncosted outcomes that would arise include:

- Justice system costs associated with coronial inquests would be reduced
- Property damage to tractors involved in rollovers would be averted
- Psychological and emotional trauma for families and rural communities would be averted

Additional uncosted outcomes that could arise include:

- Health care system costs should there be an increase in non-fatal injuries due to rollover events, or incidents directly associated with the retrofitted frames.
- Reduced WorkCover insurance premiums for the agricultural industry
- An improvement in other areas of farm health and safety, resulting from the scheme

### 3.4.3 Victorian WorkCover Authority perspective

The estimated cost of the rebate scheme to the VWA was $2,315,397 in 1997/98 (excluding VWA staff costs). If the effect is assumed to be constant for the first 10 years, then 20 deaths could be expected to be prevented. In economic terms, this equates to $115,770 spent by the VWA per life saved. If the effect of the scheme was constant for 20 years (ie, if the protected tractors remain in operation longer than assumed), then 40 deaths could be expect to be prevented. In this case, $57,885 will have been spent per life saved.

For comparison, the economic cost to the VWA of 20 rollover deaths over the next 10 years is estimated to be $316,061, and of 40 rollover deaths over the next 20 years is estimated to be $476,731.

Additional uncosted outcomes that could arise include:

- An improvement in other areas of farm health and safety, resulting from the scheme
- Strengthening of partnerships with other key players in farm safety

# 4. Discussion

## 4.1 Methods and findings

This evaluation used a combination of qualitative and quantitative methods to describe the effect of the 1997/98 tractor ROPS rebate scheme. The two data types complement each other and serve to provide a more comprehensive evaluation than either alone. The quantitative aspects to the evaluation were based on the best information available within the time constraints of this project. Where possible and appropriate, data from more than one source were used to provide comparisons.

The level of discounting (7%) for this study was consistent with that currently used by the Victorian Department of Treasury. However, there is considerable variation in discount rates, with values of between 1% and 8% being cited (Miller and Levy, 1997). The use of a lower discount rate in this study would have the effect of increasing the extent of economic benefits estimated for tractor ROPS. For example, an annual benefit of $100,000 over a ten year period, would equate to a total benefit in 1998 terms of $875,206 using a 2.5% discount rate, $811,089 using a 4% discount rate, and $702,358 using a 7% discount rate. Therefore, the economic benefits estimated here could be regarded as a minimum.

The 1997/98 ROPS rebate scheme was extremely successful when measured against a number of criteria. This study found that the 1997/98 ROPS scheme reduced the number of unprotected tractors in Victoria by 70% from an estimated 17,420 to 5,290. The proportion of unprotected tractors in Victoria is now approximately 7%, compared with an estimated 24% at the commencement of the scheme.

The demand for the ROPS rebates was substantially higher than in any previous scheme, with the uptake rate for the 1997/98 scheme being four times that of the last rebate scheme in 1994. Penetration of the scheme extended well beyond the membership of the VFF, with 73% of applicants being non-members, and 21% being self-nominated hobby farmers. At the same time, members of the VFF made good use of the scheme, representing 27% of applicants. This is slightly less than the previously reported proportion of farmers who are VFF members (36%) (Day et al., 1999). All participant groups and organisations (farmers, farm machinery dealers, the VFF and the FMDA) were satisfied with the scheme, and problems of obtaining ROPS for the older model tractors were not overwhelming.

The success of the scheme appears to be founded on a number of equally important and inter-related factors. The combination of regulatory amendments, publicity, and the rebate clearly provided the impetus to action required to increase ROPS fitment. While the regulations themselves, and the perceived threat of subsequent enforcement, were significant factors, the effect would not have been as dramatic had these strategies been used in isolation. There had been considerable development of the necessary partnerships over previous years, and the scheme was implemented at a time of increasing impetus in farm safety in Victoria. Previous schemes had familiarised the community with the principle of rebate schemes, and had in effect served as pilots for this largest effort. Further, the scheme, and especially the regulatory amendments, was implemented at a time when the proportion of tractors fitted with ROPS was already more than 50%. Most importantly, there had been a change in the acceptance of the need for compulsory ROPS fitment among the members of the VFF, prior to the move made by the VWA towards regulatory change. This approach to tractor rollover prevention is unique to Victoria.

The future benefits that are expected to follow the fitment of these 12,129 ROPS are significant. Tractor rollover deaths have been forecast as a result to reduce from an annual average of 3 to 1 or less. The influence of the ROPS fitted under the scheme is likely to remain for at least 10 years before the fitted tractors begin to be replaced, equating to the prevention of 20 deaths in rural communities. The societal benefits go beyond the obvious economic considerations. Psychological trauma, pain and suffering associated with tractor rollover deaths will be considerably reduced in Victoria. In addition, improvements in other areas of farm safety may occur due to the scheme publicity. More importantly, the combination of

increased awareness of the importance of farm safety, and the strengthened partnerships between key organisations, may provide a springboard from which further farm safety initiatives can be launched.

The benefits arising as a result of the ROPS scheme appear to far outweigh any potential disbenefits. There is the possibility of some increase in non-fatal tractor rollover injuries occurring, and it will be important to monitor these events. Most farmers interviewed for this study were supportive of the regulatory amendments, suggesting that the risk of widespread resistance to further farm safety initiatives is low. However, the views of those who did not participate in the scheme were not widely canvassed.

The current ROPS scheme has not addressed two factors contributing to the effectiveness of ROPS as an intervention for tractor rollover deaths. First, different types of ROPS have varying degrees of effectiveness eg, a cabin meeting the rollover standard will be more effective than a four post or two post ROPS in keeping the tractor operator within the safety zone during a rollover incident (Springfeldt, 1993). The vast majority of ROPS fitted under the scheme were two post ROPS. Second, the effectiveness of ROPS, particularly four and two post ROPS, is greatly enhanced by the use of seat belts. Interviews with the farmers conducted in this study indicated that the presence of seat belts on tractors in Victoria is low, and that even if it was high, the potential benefits of seat belts are not well recognised and the predicted use is extremely low.

## 4.2 Transferrability of general principles

Governments have traditionally found difficulty in forming working partnerships on health and safety with the agricultural industry. Consequently, there is merit in examining the principles arising from the rebate scheme that could be transferred to other farm safety initiatives, and possibly more broadly to other work related injury prevention programs.

The key players included representatives of a large section of the agricultural industry (the VFF), government (WA), and private enterprise (FMDA). All key players were involved in the development and implementation of the ROPS scheme from the early planning stages. The working relationships between these key players had been established through previous activities, including previous schemes.

The role of good timing and of recognising and using opportunities was important. A commitment to proceed with regulatory amendment was not activated until there was a demonstration of a considerable degree of acceptance of the need for such regulation from the key players, particularly the VFF. Further, the scheme was implemented following a period of increasing farm safety activity and awareness, providing a receptive environment for the scheme.

The combination of strategies (regulatory amendment, publicity and education, an incentive in the form of the rebate, and perceived enforcement) proved to be a potent initiator of action.

The need to thoroughly review implementation plans for potential difficulties and barriers and then to address these prior to implementation is clear from the issues relating to availability of ROPS for very old tractors, and the format of the application form.

Actual enforcement of the regulations was not part of the rebate scheme, since the scheme itself preceded the regulatory amendments. The perceived threat of enforcement however did play an important role in the uptake of the scheme. There is a level of expectation in the farming community that enforcement will, and should, follow. Delays in implementation can often be beneficial providing opportunities to improve operations. However, in this case the delay in passage of the ROPS regulation did generate some negative opinions among the farm machinery dealers and the participating farmers.

Based on some of the comments received from the key players, frequent updates on all aspects of progress are desirable. For example, more public information regarding the changed time frame for the passage of the ROPS regulation would have been welcomed. Implementation should be closely monitored so that these updates could also include any arising issues to which the target audience needs to be alerted eg, the altered clearance of tractors retrofitted with ROPS.

## 4.3 Recommended additional activities

The following activities are recommended on the basis of this study:

- Implementation of a public communication strategy regarding the impact of the rebate scheme and the new ROPS regulation
- Issuing of a hazard alert regarding potential impact of the altered clearance height of tractors retrofitted with ROPS
- Continued surveillance of tractor rollover deaths to confirm the anticipated decrease
- Continued surveillance of tractor rollover serious injuries to monitor for any increase
- Capitalising on the combination of increased awareness of the importance of farm safety, and the strengthened organisational partnerships, by developing and implementing a comprehensive farm safety strategy

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