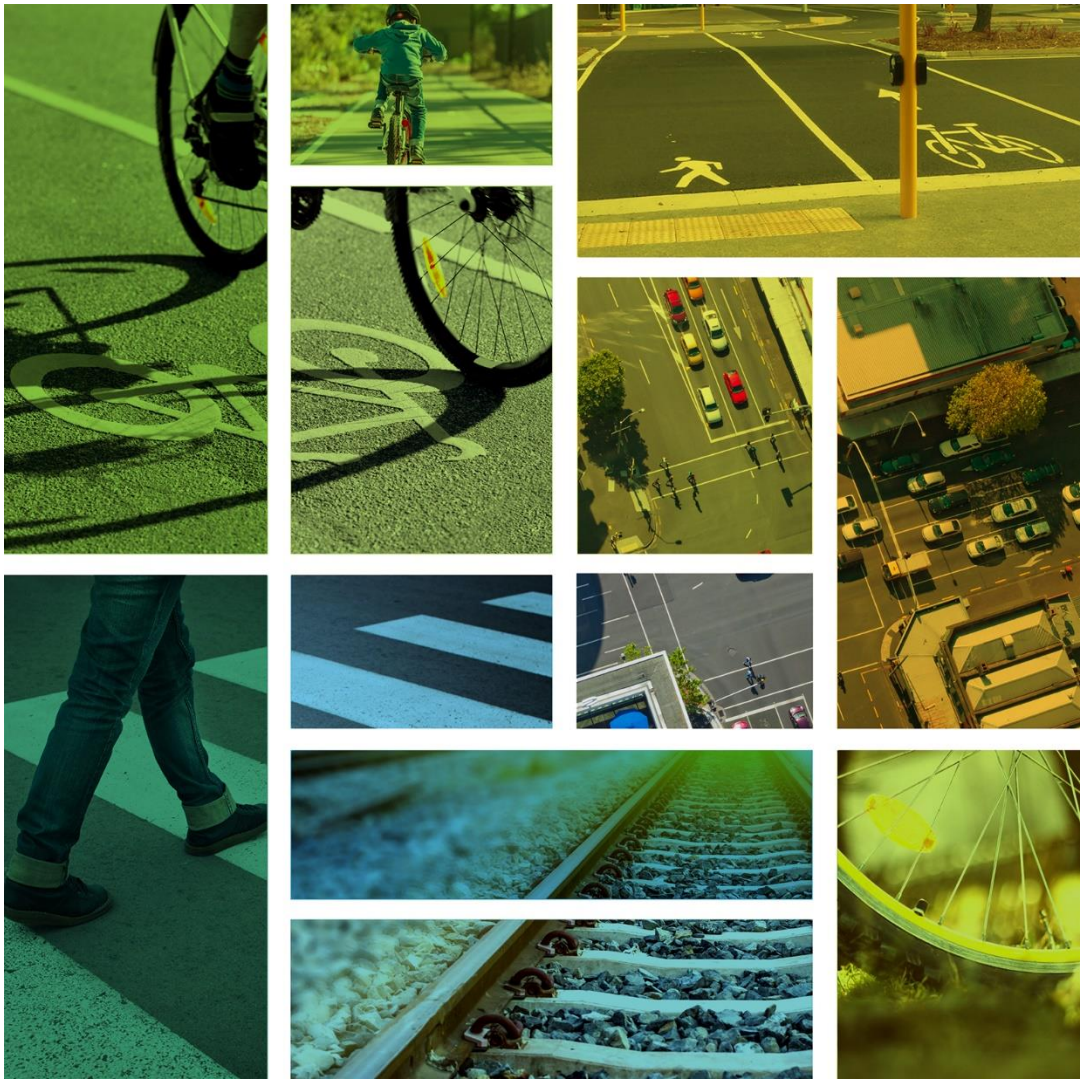

GROWING RESILIENCE

SAFER AND EFFECTIVE LIGHT VEHICLE SYSTEMS FOR KIWIFRUIT ORCHARD APPLICATIONS USING CONTINUAL IMPROVEMENT

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MACKIE RESEARCH
OPTIMISING HUMAN SYSTEMS

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Signed 

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EXECUTIVE SUMMARY

This piece of work was conducted as part of an Enforceable Undertaking following a fatality involving a quadbike in the sector in 2016. The overall aim is to assist decision-making regarding the selection and use of light vehicles within these businesses.

Conceived originally as a recreational vehicle, there have been questions raised about the suitability of quadbikes for tasks in occupational settings across the land-based sectors, both in New Zealand and internationally, during their three decades of use. Alternatives to quad bikes, and more broadly, the suitability of small vehicles for various orchard tasks, are of interest to growers and Zespri.

Accordingly, the core deliverable for this work is a vehicle/task matrix to assist growers in making small vehicle selection decisions. Building on this, a system approach to small vehicle safety is also provided. The approach for this work is in line with the NZ Transport Agency's Safe System approach. It considers not just the vehicle but also recognises that environmental factors and the people within the system also influence the likelihood of incidents and their severity, and that these factors interplay to create an overall safety environment.

The study also sought to identify mechanisms and tools that would assist continual improvement on the properties. Principles of Safety II and Safety Differently informed this thinking. Notably, the study sought to identify means by which systems of measurement on the properties could shift from relying on counting infrequent failures, to logging the far more numerous positive Protective Factors that ensured things 'mostly went right'. Facilitated engagement with field staff running day to day systems is essential in building understanding in this regard.

The study used a participatory process similar to that followed for the *Good Practice Guidelines: Safe Use of Quads* (2014) document produced by Worksafe. The summary matrix on the suitability of the vehicles included in this report is conceptually based on the equivalent in this earlier GPG publication for the agriculture sector (Section 4.1).

Three stages of data collection, discussion, and iterative development were conducted on a representative variety of orchards. Following an initial phase of familiarisation and task/vehicle data collection, the second stage was a focus group session on a single property with invited participants from the sector. From this stage, a draft task/vehicle matrix was developed by summarising in-depth Task Sheets. The third set of visits were used to test the materials developed and create a user-friendly context for the work, by running through Use Cases. The aim of the Use Cases was to establish what Grower's Safe Systems currently look like, and how these might be strengthened - using a three-pronged Resilience Development Diagrams to plot current and potential protective factors in the areas of vehicles, people and environment.

Examples of potential Safe System improvements identified across the three Use Cases included: monitoring the market for side-by-side vehicles that fitted under the crop canopies without modification of safety frames, and improved processes to safeguard visiting contractors working in isolation on small properties.

As next steps following on from this study we recommend wider dissemination within the sector, detailed review of the available data from ACC (and other sources related to OSHW in Kiwifruit orchard work), and consideration of developing a Good Practice Guideline for the sector to sit below Regulations and the Health and Safety at Work Act.

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1. INTRODUCTION

1.1. Background to this work

A range of light vehicles are currently used in kiwifruit orchards in New Zealand including quad bikes, side by side vehicles - often with aftermarket modifications, and 4WD cars. There are risks to operators when vehicles are used in various terrain and user contexts some vehicles are more suited to certain tasks than others. A range of factors determine the vehicles that are used on kiwifruit orchards including price, how versatile the vehicle is, testimonials by other growers, and their availability and marketing by local equipment dealers.

In today's Health and Safety environment there is a need to be more proactive about managing risks and so there is a need to more objectively assess the suitability of various vehicles for different tasks and contexts. There have also been incidents involving quad bikes on kiwifruit orchards where people have been seriously injured or killed, and Zespri has committed to funding research into small vehicle systems and selection as part of an Enforceable Undertaking and larger exercise.

This report responds to this commitment by providing an objective assessment of small vehicle use on Kiwifruit orchards. Ultimately, it is hoped that the assessment can be used as part of a positively framed continual improvement process. While there are risks associated with small vehicle use, most of the time, things go right and there is a significant amount of knowledge and experience used by growers to effectively and safely use small vehicles on their orchards. Therefore, this work aims to build on this experience and expertise, by practically applying sound Human Factors and Health and Safety principles to provide an objective method for assessing the context in which light vehicles are used, which should help with vehicle selection and use, by the sector over time. This would allow all practical contributing factors to be considered to stack the odds increasingly in favour of the operators' continuing wellbeing.

There is also interest in new vehicle concepts for crop testing/sampling work. These specifically were beyond the scope of this study, and the Grower participants as yet had little, or no experience of these new vehicles to contribute information.

1.2. Brief

The purpose of the research is to systematically identify key system factors that will make small vehicle operations inherently safer in kiwifruit orchard operations. More immediately, the aim of this study was identify Safe System (vehicle/environment/user) factors for key tasks and the conditions that are needed to keep operators safe when using light vehicles. Through this process some key risk combinations were identified, and practical orchard-based examples are presented.

1.3. Approach

1.3.1. Human Factors and the Systems Approach

This work uses a systems approach. It aligns with the Safer Journeys 'Safe System' thinking (NZTA 2018) and other related contemporary strategies increasingly recognised in New Zealand and leading agencies here and abroad. The study sought to identify how systems of measurement on the properties could shift from relying on counting infrequent failures, to logging the far more numerous positive Protective Factors. These include:

- People make mistakes – but are also the solution (Dekker 2015);
- The need to understand why the things that mostly go right, sometimes go wrong. (Hollnagel 2017);
- The need to design products and systems for Foreseeable Misuse. Increasingly the Law is reflecting our responsibility to do this. Foreseeable misuse includes errors committed by partially trained operators, or those made by anyone when working fatigued;
- Error Tolerance. Since the work of Charles Perrow in the 1980s, the concept of the Normal Accidents that we learn from has been well established (Perrow 1984). Through such events we learn more about vehicles, our people, and the environment. Ideally those lessons should come within an acceptable level of damage, delay, and injury;
- Hierarchy of Control. Wherever possible we should be seeking system changes that allow us to design out the hazards upstream - instead of accepting them and then attempting to control the exposure or damage;
- Building resilience by strengthening all parts of the system (Hollnagel 2017). Making a farm or orchard totally free of risk cannot be done. However, we can stack the odds increasingly in our favour. The Hollnagel approach (Appendix 2) shows a progression from a purely reactive environment where we wait for bad things to happen, to one where we plan proactively. Resilience as a final target aims to prepare not only for circumstances we can envisage fully - but also for scenarios with combinations we cannot accurately predict and where new solutions using the potentials available will be needed;
- In this work we have categorised the system elements under People, Environment, and Vehicles for simplicity (Work Organisation and Job Design are included under People);
- Recognising and balancing introduced risk. Where we introduce new or increased risk, we have the duty to manage that risk. A common example used is that a person can step from the surrounding matting and walk across an ice rink without falling. But they may fall if, for example you add: time pressure so that they hurry, a shifting load to carry, or a distracting secondary task to complete whilst moving. Similarly, if you modify a vehicle (e.g. adding heavy spray tanks to a vehicle, or modifying it in some other way), and introduce new risks then these need to be understood and managed;
- Task redesign. This exercise was prompted by questions about the suitability of quadbikes for orchard tasks. To help people make better decisions all the options have to be considered. In some cases, there will not be an acceptable solution utilising a light vehicle and so the process included questions in the discussions and focus groups on the heavier or specialist vehicle options. Also included were walking and mountain bikes and mountain e-bikes.

2. METHODOLOGY

The core task for the project was to create a summary table to show the suitability of different light vehicles for various tasks, thus providing an easy to understand and user-friendly tool to guide the sector in their light vehicle use, and manage risks in a structured way.

While this in itself will be useful, there will always be a number of assumptions and considerations for any vehicle/task combination. Therefore, a Safe System approach was also taken where vehicle, environment, and personnel factors can be considered together. This approach is demonstrated in 'Use Case' examples (Appendix 10, Appendix 11, and Appendix 12) and shows how these factors can be considered together to optimise safety. Informally, growers will be considering these factors together and making judgements about vehicles, the terrain they are moving over, and the personnel who use the vehicles. Therefore, this approach fits naturally with how people realistically approach safety. By providing some structure around this approach, a user-friendly yet evidence based best practise human factors approach can be utilised for small vehicle operations in the future.

In the following sections, the method for the three key parts of the research are described. Data were collected via three visits to the Bay of Plenty where a range of Orchard visits, workshops, meetings, and observations were carried out.

2.1. Vehicle/task analysis

The first data collection phase focussed on the widespread collection of data so that detailed vehicle/task sheets could be completed. These vehicle/task sheets would ultimately provide the data for the summary vehicle/task matrix.

Four very different orchards were selected to provide a representative spread of features and operational constraints. Data were also obtained from a service provider with staff who regularly visit and use small vehicles in orchards, and a mobile plant hire firm.

The four orchards were:

- A more traditional family owned medium sized orchard on largely flat terrain
- A medium-sized family owned orchard with sloping terrain and predominant use of modified side by side vehicles
- A larger family owned orchard, with well-maintained internal roads and the use of older 4WD cars.
- A smaller managed orchard with challenging terrain

At each of the visits, a meeting was held with the grower and after introductions and a description of their operation, more detailed questions were asked about:

- The range of tasks that are typically carried out on the orchard (and which ones are carried out by contractors);
- The range of small vehicles that are used for various orchard tasks;
- The personnel who use the vehicles;

- The environment and way in which the vehicles are used. This was generally carried out during an orchard walk around to observe the various features of the environments;
- The advantages and disadvantages of various vehicles in different contexts were considered.

As part of this data collection, a workshop was held at one of the grower's sheds, with 14 other people including growers and small vehicle training personnel. For this workshop the goal was to validate the data that had been collected to date and to further populate the vehicle/task sheets.

At the conclusion of this phase of data collection, a rich picture of the range of vehicle uses for various tasks was achieved. The workshop held at the end of this phase was also used to start creating a summary matrix, derived from the detailed data, to show the suitability of various vehicles for different tasks.

2.2. Vehicle/task matrix

From the detailed vehicle/task analysis, a summary matrix was developed, taking the key tasks and the likely range of vehicles that would realistically be used to carry out those tasks. A traffic light system was used to signal the following status levels:

	The vehicle is designed specifically for this task or is inherently safe across a range of terrain and user conditions
	The vehicle is suitable for the task in some circumstances but not in others. Suitability is dependent on other factors under the Environment and/or People categories being strengthened
	The vehicle is unsafe to use for this task across commonly encountered conditions
N/A	Task and vehicle combination highly impractical

The purpose of the summary matrix was to provide a high-level assessment of vehicle/task suitability so that growers who are new to the industry, or even those who are considering new vehicles can quickly consider their options.

However, it was determined that the summary matrix would not be sufficient in itself to manage small vehicle risks on orchards. This is because modern human factors theory takes a system approach and considers key factors together to manage risk. For example, a generally fit for purpose vehicle may be pushing the limits of acceptable risk if the terrain is very challenging and the driver is untrained. For this reason, Resilience Development Diagrams (RDDs) were also developed so that key factors can be considered in unison. Use cases were then developed to demonstrate how the RDDs can be applied.

2.3. Use cases and Resilience Development Diagrams

Three orchards were visited to gather information for three 'Use Cases'. Here, the information gathered collected earlier could be collected to demonstrate how it can be applied in a practical setting, taking a positive approach. Most of the time 'things go right', and the Use Cases demonstrated how the vehicle, environment, and user factors are being managed to ultimately manage risk.

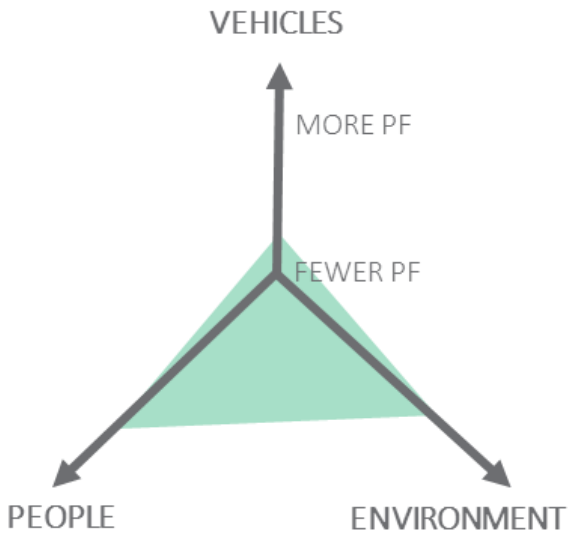
The three orchards were:

- A large orchard on flat terrain
- A small 'life-style' orchard in foothills
- A medium-sized family owned orchard with sloping terrain and predominant use of modified side by side vehicles

At each of these orchards, a meeting was held in a similar fashion to the previous visits. However, a difference was that there was a more systematic focus on the interplay between vehicle, environment, and personnel and how any deficiencies in any of these factors were being offset by advancements in others.

Figure 1 (RDD) below shows how deficiencies in vehicle protective factors, are being off-set by environment and people protective factors (e.g. a Quadbike is used for general inspection purposes, but only on agreed routes and by well trained personnel).

Figure 1: Example Resilience Development Diagram



3. VEHICLE/TASK ANALYSIS

3.1. Task identification – for what are light vehicles used?

3.1.1. Tasks

Seven areas were identified where light vehicles are commonly used (see Appendix 3, Appendix 4, Appendix 5, Appendix 6, Appendix 7, Appendix 8, and Appendix 9).

Of these the predominant ones were 1-4.

1. Personal transport for a single person involved in supervision and/or inspection. Often limited to the manager/owner and senior permanent staff.
2. Moving small numbers of people around the orchard, for example at picking time.
3. Light maintenance work.
4. Other tasks using a trailed implement. Notably: spreading fertiliser, mulching/mowing, cultivating,
   or firewood work.

Less common tasks identified where light vehicles might be used were 5-7.

5. Spot spraying of weeds.
6. Crop imaging.
7. Pollen blowing.

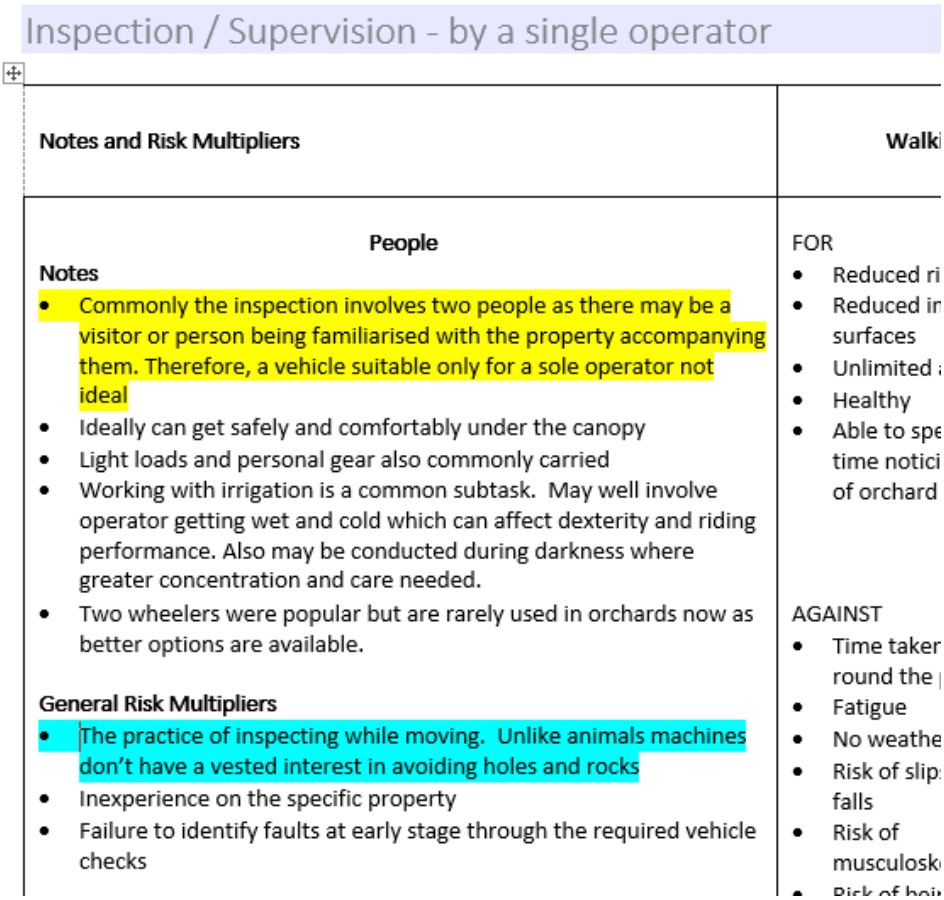
3.1.2. Task Analysis

In each case the task was discussed with all those who had experience of it. Variance in how it was done on differing properties, and why, were explored. A3 data sheets were used to capture this information, and are divided into three sections.

- People
- Environment
- Machine

The first column covers task Notes and Risk Multipliers. This contains key information about the task which is of relevance to vehicle selection. For example, on the sheet covering the task of Inspection, it is noted (highlighted in yellow) that whilst Supervision does not generally involve carrying a passenger, Inspection regularly does.

A significant risk multiplier recorded (highlighted in blue) differentiating Inspection and simply providing personal transportation, is that if looking around to check vine structure, irrigation etc., the driver/rider will have divided attention while moving.



Inspection / Supervision - by a single operator

Notes and Risk Multipliers	Walki
People **Notes** • Commonly the inspection involves two people as there may be a visitor or person being familiarised with the property accompanying them. Therefore, a vehicle suitable only for a sole operator not ideal • Ideally can get safely and comfortably under the canopy • Light loads and personal gear also commonly carried • Working with irrigation is a common subtask. May well involve operator getting wet and cold which can affect dexterity and riding performance. Also may be conducted during darkness where greater concentration and care needed. • Two wheelers were popular but are rarely used in orchards now as better options are available. **General Risk Multipliers** • The practice of inspecting while moving. Unlike animals machines don't have a vested interest in avoiding holes and rocks • Inexperience on the specific property • Failure to identify faults at early stage through the required vehicle checks	FOR • Reduced ri • Reduced ir surfaces • Unlimited • Healthy • Able to spe time notici of orchard AGAINST • Time taker round the • Fatigue • No weathe • Risk of slip falls • Risk of musculosk • Risk of hei

The quad bike concept in a New Zealand land-based occupational setting is commonly described by the manufacturers of the machines as 'a replacement for the horse'. Therefore, whilst the machine may be bought for a number of tasks on an orchard, the stated intent of the designers is limited to providing personal transportation, with minimal personal loads.

However, unlike the horse, the machine doesn't look where it is going, take evasive action to avoid holes, or hesitate and alert the rider to soft bank edges that might be beyond their capabilities to tackle.

4. VEHICLE/TASK MATRIX

4.1. Matrix – choosing the best vehicle for the job

The summary matrix developed from this research is presented on the following page. More detail behind each cell is presented from Appendix 3 to Appendix 9.

4.1.1. The concept

This traffic light summary concept was developed and adopted during the Trans-Tasman Working Party work on quad bike use on farms in Australia and New Zealand (2011). The criteria for the colour allocation was through consensus via discussion between industry representatives, researchers, Regulators, vehicle importers & dealers, and other informed parties.

4.1.2. The aims

The aims were to:

- Support the campaigns encouraging users in the Primary Industries to select the Right Tool for the Job;
- Highlight the fact that the quad bike – which is commonly perceived and marketed as a go-anywhere and do-anything tool – has limits. NZ research (Moore 2007) had found that the vast majority of users in occupational settings ignored the operating limits provided in the manual with the rationale 'yes but that's not what I bought if for'. They were using it for more than just personal transportation and therefore felt the manufacturers' stated limits on usage did not apply to them;
- Emphasise the need to view Safety holistically, and balance risks introduced by carrying out additional protective measures. A vehicle less inherently suited to a task requires more of the operator and/or a less demanding operating environment;
- Provide a way for businesses to measure and demonstrate continuing improvement from year to year in simple graphic form. Larger operations with substantial investments in vehicles can indicate progress by gaining a higher proportion of (green) plant designed-for-task.

	The vehicle is designed specifically for this task or is inherently safe across a range of terrain and user conditions
	The vehicle is suitable for the task in some circumstances but not in others. Suitability is dependent on other factors under the Environment and/or People categories being strengthened
	The vehicle is unsafe to use for this task across commonly encountered conditions
N/A	Task and vehicle combination highly impractical

Tasks that light vehicles may be used for	Walking	Mountain Bike or E-Bike	Two-wheeler or motorcycle	Quad bike	Side-by-side#	Roadworthy utes, cars, and 4WDs	Orchard tractors (small, low tractor)
1. Personal transport for inspection and supervision							N/A
2. Groups of people getting around the orchard			N/A				
3. Light construction and maintenance work	N/A	N/A					
4. Other tasks involving trailed implements	N/A	N/A	N/A				
5. Spot spraying		N/A	N/A	*		N/A	
6. Crop imaging		N/A^	N/A^			N/A	
7. Dry pollen blowing		N/A	N/A			N/A	N/A

* Quad for spot spraying - the red rating – rather than yellow - reflects the multiplying effect of the Mental Model of Risk mismatch (see note following)

^ Crop imaging - this could change in the future as technology develops

Side-by-side vehicles - note that modification can vary. More detail is provided in the discussion sheets.

4.1.3. Mental Model of Risk

The matrix identified that under some task/vehicle conditions (the example given was using a Quad for spot spraying), the user's Mental Model of Risk (MMR) may affect the overall safety of the situation. A mismatch in our Mental Model of Risk (MMR) is where our perception is significantly out of kilter with reality. For practical people, such as those working on the land, this does not often happen. We are used to improvising with tools and materials and working out for ourselves how to integrate new tools while keeping safe systems of work.

It has been discussed that the unacceptable incidence of serious events involving spraying from quads here, and in Australia could have been influenced adversely by messages that shifted the Mental Model of Risk amongst potential users. This thinking was reflected in the conclusion of an Australian coroner recently that the term All-Terrain Vehicle (ATV) was in fact a misnomer, giving a misleading impression of the range of environments where use would remain within safe parameters of use.

4.2. Task discussion sheets (for/against) and Use Cases

The matrix is useful, but by definition it is simplistic. There are a lot of things to take into account simultaneously when selecting a light vehicle and designing the Safe System that it sits within.

4.2.1. Differences between orchards

Every property is different. Even adjacent orchards sharing similarities of terrain, soils, and weather can have very different operating conditions that are relevant to vehicle selection.

For example, one may be a second-generation family business with a long-serving core of multi-skilled staff, and the other could be leased to a business partnership and rely entirely on contracted services.

Neighbouring properties can also be in very different positions financially. Strategies such as the improvement of roading between the orchards to accommodate a wider variety of vehicle access may be prohibitive to those less well established. Smaller orchard enterprises where the owner also works in a job away from the property will have the additional consideration of isolation. Contractors coming to do tasks for them during the day will often be working in unfamiliar settings and often without someone there to ask if they have doubts about surface conditions and the safe routes to use with their vehicles.

4.2.2. For and Against

The data used in the Task Discussion sheets is presented in the form of For/Against points - By Vehicle, and under the three categories of people, environment, and machine. A detailed breakdown for each of the seven tasks are provided in the appendices (Appendix 3, Appendix 4, Appendix 5, Appendix 6, Appendix 7, Appendix 8, and Appendix 9).

4.2.3. Use Cases

See. Appendix 10, Appendix 11, and Appendix 12

The most encouraging aspect of these is that they demonstrate an understanding by the sector participants of the systems approach, and that they relate to the People – Environment – Vehicle model in particular. The diagram was used as a prop to illustrate points by participants during the discussions as a useful graphic device.

In its current form, the axes of the Resilience Development Diagram (RDD) operate as a relative indicator only. They show approximate stage of development and planned progress in the three specific categories. This could be formalised with the axes populated with specific measures forming prioritised checklists for use in planning and auditing at the corporate or sector-wide level.

5. SUGGESTED NEXT STEPS

5.1.1. Immediate

- Discuss the next form this resource will take. Options so far considered are an online interactive tool or a printed document.
- Discuss the approach taken so far with Worksafe management responsible for the wider Primary sector to clarify useful commonalities in the Safe Systems work underway nationally. The resource has potential within the Act-Regulation-Good Practice Guideline system.

5.1.2. Longer Term

We recommend that ongoing efforts continue to follow an iterative process to develop an increasingly effective system and resource set.

Progress the planning for consultation on the criteria for colour allocation on the summary matrix chart - Choosing the Best/Right Vehicle for the Job. So far the work has involved collecting and assimilating data from:

- Industry subject matter experts running and working on kiwifruit orchards
- Researchers knowledgeable about off-road workplace incidents involving small vehicles
- Zespri and Eurofins staff

Future engagement to reach an industry-wide consensus statement would be beneficial. Appropriate participants could include:

- Designers and manufacturers of the orchard-specific vehicle types (tractors and sprayers) and generic vehicles (including side by sides);
- Dealers and importers of vehicles and related plant;
- Practising engineers involved in modifications for the sector here in New Zealand and overseas;
- Sector bodies and national agencies with useful data. Needed is current and trend data (to monitor progress/changes) on kiwifruit sector cases from ACC, Worksafe, and potentially the Business data section of Statistics NZ. Specifically, data are needed on the nature and severity of cases, direct/indirect costs and contextual circumstances. A study using keyword searches off the ACC narrative data line would be an obvious first step;
- Workplace Accident Register and equivalent sub-reported level data for owners and managers less likely to record minor incidents that could result in an ACC claim. Information is still needed to get a clearer sense of what specific scenarios are most common outside picking season and for other tasks involving outside crews and contractors;
- Worksafe officers operating in kiwifruit regions. To educate them formally on sector initiatives and involve them proactively in improving the systems.

Refinements to the resources could include:

- Including a Use Case of a large corporation operating across multiple sites that are leased;
- Order PFs in the Use Case RD diagrams to reflect hierarchy of interventions (i.e. by eliminating hazards upstream at the top, what is necessary for PPE use at the bottom?) This would effectively produce checklists that could be organisation-specific as part of structured planning processes. Once agreed on, it would provide a quantitative component to resilience goal setting;
- Speed is included in the NZTA Safe Systems approach but has not been included thus far, as speeds on orchards are low in comparison to road traffic settings. Further work could reveal that relative speed should also be considered, for example on blind corners in orchards where vehicles can meet, and when transiting on public roads where orchard vehicles interact with faster cars and trucks.

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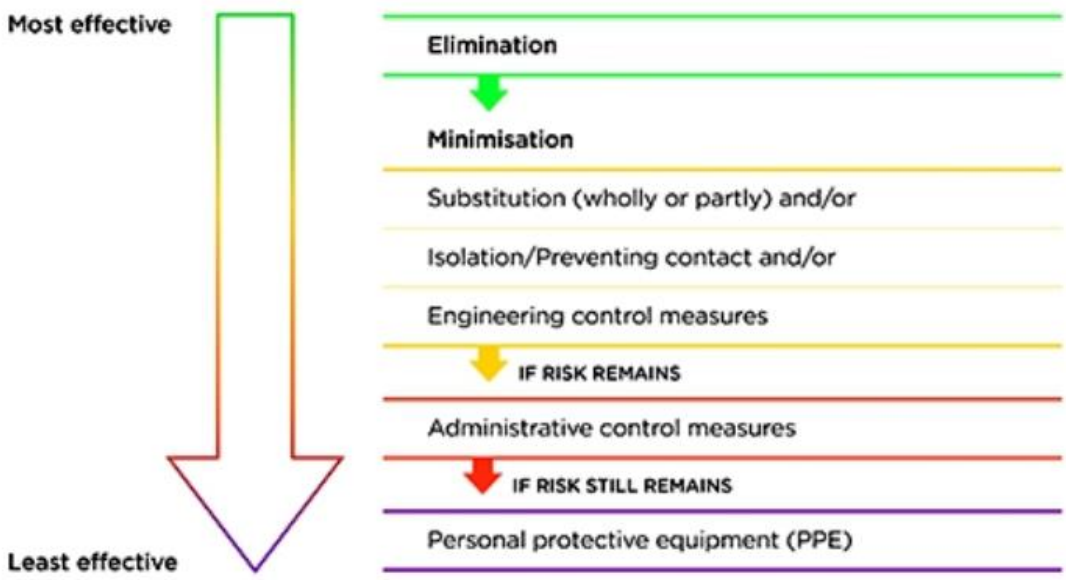
7. APPENDICES

Appendix 1: Hierarchy of controls



Hierarchy of Controls. From the HSWA Regulations (2016): General Risk and Workplace Management. Section: General Duties (6).

Appendix 2: Hollnagel on developing Resilience Potentials

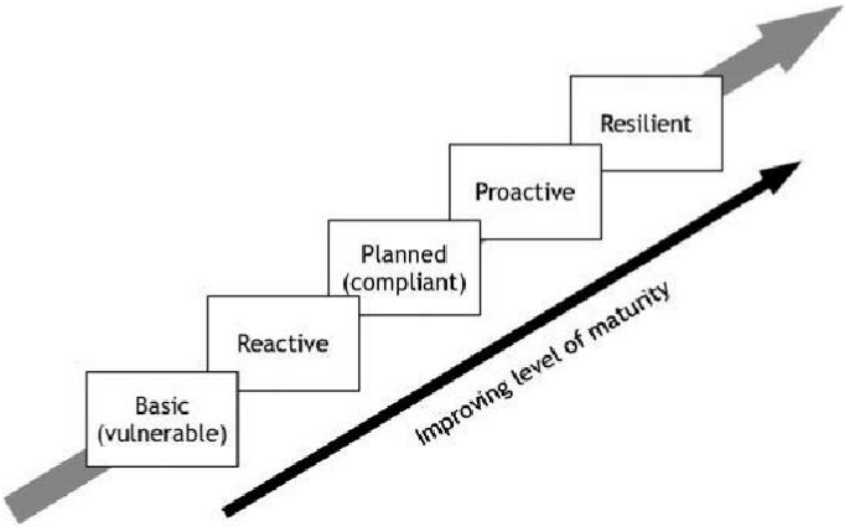


Figure 5.1 The 'safety culture journey'.

Source: Hollnagel (2017). *Safety-II in Practice: Developing the Resilience Potentials*. Routledge. (Chapter 5. The Resilience Assessment Grid. p52).

Appendix 3: TASK 1 - Personal transport for inspection and supervision

Notes and Risk Multipliers	Walking	Mountain Bike or E-Bike	Two-wheeler or motorcycle	Quad bike	Side-by-sides	Roadworthy Utes, cars, and 4WDs
 People **Notes** Commonly the inspection involves two people as there may be an additional person visiting or being familiarised with the property. Therefore, a vehicle suitable for a sole operator is not ideal; Autonomy assumed for those in supervisory roles with fewer goal conflict situations that could result in speeding, overloading, and shortcut taking; Ideally can get safely and comfortably under the canopy; Light loads and personal gear commonly carried; Working with irrigation is a common subtask. May involve operator getting wet and cold which can affect dexterity and riding performance. May be conducted in darkness where greater concentration and care is needed; Two wheelers were popular but are rarely used in orchards now as better options are available. **General Risk Multipliers** The practice of inspecting while moving. Unlike animals, machines do not have a vested interest in avoiding holes and rocks; Inexperience on the specific property; Failure to identify faults at early stage through the required vehicle checks.	FOR Reduced risk to others Reduced impact on surfaces Unlimited access Healthy Able to spend more time noticing aspects of orchard AGAINST Time taken to get around the property Fatigue No weather protection Risk of slips, trips, and falls Musculoskeletal injury risk Risk of being struck on tracks or in orchards by drivers, especially at busy times when new and unfamiliar staff on the property	FOR Healthy Reduced noise Small loads possible Transferable skills from pushbikes/motorcycles AGAINST Wouldn't work with two people No weather protection Requires off-road experience Minimal safe load carriage with impacting balance Requires helmet with strap which can catch on vines, pulling rider backwards Risk of being struck on tracks or in orchards by drivers or others on bikes Can be too quiet - people expect to hear vehicles coming	FOR Transferable skills if they have off-road experience Easily manoeuvrable AGAINST Two-up pillion passenger may not see low-hanging hazards as vision blocked by rider No weather protection Risk of crush injury to lower limbs, impact injuries to upper limbs and torso, burns to legs Strength required to operate in some conditions Requires helmet with strap which can catch on vines, pulling rider backwards	FOR Models designed for rider plus passenger could be most compact option if small loads also need to be carried Ease of use for experienced riders Easily carry personal gear AGAINST No weather protection Most designed for single person use Training, site competence assessment, and supervised period required Apparent ease of use can be a trap for inexperienced users Significant injury risk in rollover Requires helmet with strap which can catch on vines, pulling rider backwards	FOR Commonly has complete safety system for two people if unmodified Weather protection in some cases Easier to operate than a quad – Active Riding skills not required Designed to carry personal and extra loads AGAINST The safety concept requires occupant restraint in seat and door openings covered. Getting in and out frequently often leads to these features being ignored or removed Third position on bench seat may interfere with control/displays PPE/helmet may be needed	FOR Weather protection Standard vehicle operator licencing Complete passenger focussed safety system 5+ seat belts Highly evolved for additional passengers and personal luggage No PPE required in transit AGAINST Familiarity may lead to unsafe driving on orchard

Appendix 3: TASK 1 - Personal transport for inspection and supervision

Notes and Risk Multipliers	Walking	Mountain Bike or E-Bike	Two-wheeler or motorcycle	Quad bike	Side-by-sides	Roadworthy Utes, cars, and 4WDs
Environment **Notes** Investment in tracks and areas driven on can reduce mowing needs and make turning on headlands safer and less damaging to surface and drainage; Crop testers visiting property need higher standard. **General Risk Multipliers** Operating on terrain that limits access for some vehicles – tests the boundaries of the vehicle's and operator's skills; Surfaces that require constant monitoring – can't take eyes off the track; Working/travelling in isolation; Quality of roads/tracks; Quality of mown areas (including headlands) to be driven/ridden on; Rainfall patterns/surface water management; Soil types and terrain – slipperiness (often worst in spring-summer when ground hard but surface moist or lush so that knobbly tyres can't bite); Summer rutting of hard soil; Tomo (swallow-holes); Public roads to be crossed or transited.	FOR Lowest impact on surfaces Least investment required for roading and surface improvement/retaining	FOR Lower impact than heavier powered vehicles Low investment required for roading and surface improvement/retaining AGAINST Requires Active Riding which requires being able to 'read the route' and anticipate changes in surface and slope Mowing and maintenance must be to a high standard Agreed lines of travel and No-Go areas required	FOR Acceptable impact on surfaces if ridden with care Agile handling – can fit through narrower gaps than quad AGAINST On soft ground is more hassle than a quad as side stand can sink unless placed on firm surface or against an upright	FOR Lighter than a ute so less surface damage Acceptable impact on surfaces if ridden with care Can use narrower gaps and tracks than SBS Most fit under canopy but in two-up situations the person on the back may not see low-hanging hazards AGAINST Requires Active Riding and therefore predictable surface Agreed lines of travel and No-Go area policies required	FOR Requires less track investment than road vehicles Lighter than car/utes on the land AGAINST Most (e.g. Polaris Ranger) too high to get under the crop all year unless modified by ROP/roof removal Most will tip before sliding on bad sidlings or headlands Wider clearance than quads may be needed in entrances – limits access points	FOR Low enough to fit under canopy (cars and station wagons) Cab roof protects from hazards (i.e. broken wires, old vines, sagging pergola bars) AGAINST Increased cost of roading Some walking still required for detailed inspections Weight results in more surface impact if used off engineered tracks
Machine **Notes** Passenger carriage systems including safety concept test-proven; Load carriage systems for equipment and staff kit; Able to operate on tar seal, gravel, track, or mown orchard aisle; Ideally can be operated by anyone in an emergency (high transferability of skills from commonly used vehicles; Characteristics of SBS machines vary significantly; Quad performance objectively measured by recent University of NSW rollover testing project. **General Risk Multipliers** Deferred maintenance; Modifications contrary to design concept; Availability of parts for rarer imported machines.	N/A	FOR Fuel costs N/A or negligible No emissions Bike $500+ E Bike $2,500 – 5,000 AGAINST Purpose designed panniers needed for any load carriage	FOR Cheap in comparison to other powered options Light in comparison to quad, can be lifted up by one person if it ends up on its side Reduced risk of entrapment vs quad AGAINST Load carriage limited Increased risk of burns from exhaust in comparison to other vehicles	FOR Faster if ridden solo, slower than SBS when two-up AGAINST Motorcycle-derived safety system (vehicle and rider part company to avoid damaging contact, therefore restraint counterproductive) Limited ability to tow or carry loads	FOR Concept provides more capacity than quad AGAINST Car-derived safety system (vehicle provides safe void, and driver held within this to avoid damaging contact - restraint essential) Untested local modifications to rollover protection common – requires significant additional strengthening of upstream protective factors to achieve Safe System Can't see front wheels when ascending hills	FOR Low cost ($2,500-$5,000) leaves funds free for other uses including roading Parts cheap and available locally from multiple sources – not just one dealer Fully tested as a concept (not modified) Existing WOF and registration system (can also be used on public roads) Waterproof and secure accessories and parts readily available

Appendix 4: TASK 2 - Moving people

Notes and Risk Multipliers	Walking	Mountain Bike or E-Bike	Quad bike (and quad with trailer)	Side-by-sides (and with trailer)	Roadworthy Utes, cars, and 4WDs	Orchard tractors with DIY passenger trailer
 People **Notes** • Ideally can move in natural picking groups of 6-8; • They will also have personal equipment to carry or wear; • They may need to return to base independently during the day; • Often seasonal workers who may not be familiar with orchard systems. **General Risk Multipliers** • Their inexperience in the industry; • Inexperience on the specific property; • Inadequate training, skills and/or experience operating or riding in the vehicle types used on the property; • Immaturity; • Low ability to understand and apply written or verbal instructions; • Unwillingness or perceived inability to ask questions or raise concerns; • Transfer of bad practices from other properties or in other sectors; • Failure to identify faults at early stage through required vehicle checks; • Potential increased for pickers to move around the property in undesirable patterns if given independent transport with no supervision. Contamination risks.	FOR • Reduced risk to others • May be more cost effective. Just PPE/Boots and Backpacks and whatever kit is needed for carrying personal and picking gear in • Health AGAINST • No weather protection • Risk of being struck on tracks or in orchards by drivers. Especially at busy times when new and unfamiliar staff on the property • Risk of musculoskeletal injury • Limited by capacity and productivity • Fatigue and time to be considered. Effort best used in work not excessive travel	FOR • Health benefits • Reduced noise AGAINST • No weather protection • Requires off-road experience • Minimal safe load carriage with impacting balance • Requires strapped helmet • Risk of being struck on tracks or in orchards by drivers or others on bikes	FOR • Models designed for rider plus passenger could be most compact option if small loads also to be carried AGAINST • No weather protection • Most designed for single person use • Low weight of quad limits ability to safely tow or carry loads above 40kg • Training, site competence assessment and supervised period required • Requires helmet	FOR • Weather protection in some cases • Easier to operate than a quad – Active Riding skills not required AGAINST • The safety concept requires occupant restraint covered door openings. Frequently getting in/out often leads to ignoring/removal of the features • Designed for smaller numbers than six • Commonly only belts for two people • Third position on bench seat may interfere with control/displays • May nee PPE/helmet	FOR • Weather protection • Standard vehicle operator licencing • Complete passenger focussed safety system • 5+ seat belts • Highly evolved for passengers and personal luggage • PPE not required AGAINST • Risks from letting people drive around. Managers may not know where they are at all times – not where you put them or want them to be • Familiarity may lead to unsafe driving on orchard	FOR • Keeps picker movement under staff control • Limits vehicle numbers moving around the property • Can be driven by a selected staff member at a slow speed AGAINST • No weather protection generally • Obvious risks of injury from people falling or being crushed from trying to get on or off as it's moving without driver being aware as they face the other way • To be legally compliant would require a trailer designed for passengers – seen in tourism and mines but not in ag/hort

Appendix 4: TASK 2 - Moving people

Notes and Risk Multipliers	Walking	Mountain Bike or E-Bike	Quad bike (and quad with trailer)	Side-by-sides (and with trailer)	Roadworthy Utes, cars, and 4WDs	Orchard tractors with DIY passenger trailer
 **Environment** **Notes** • Investment in tracks and areas driven on can reduce mowing needs and make turning on headlands safer and less damaging to surface and drainage; • Roading provided into assembly point, pickers walk from there. **General Risk Multipliers** • Size of property – travel distances from base to be covered and frequency – time potentially lost; • Quality of roads/tracks. Lack of investment often covered by blaming vehicles; • Quality of mown areas to be driven on including headlands; • Rainfall patterns/effectiveness of surface water management; • Soil types and terrain – slipperiness when doing winter maintenance work; • Summer rutting of hard soil; • Tomo (swallow-holes); • Public roads to be crossed or transited.	FOR • Lowest impact • Least investment required for roading and surface improvement/retaining, but care needed to provide predictable terrain to avoid injuries AGAINST • 200-300 metres from assembly point considered maximal travel distance depending on whether loads can be transported separately	FOR • Lower impact than heavier powered vehicles • Low investment required for roading and surface improvement/retaining • No emissions/fuel costs AGAINST • Requires Active Riding which requires being able to 'read the route' and anticipate changes in surface and slope. Mowing and maintenance must be high standard. • Agreed lines of travel and No-Go areas required	FOR • Lighter than a ute so less surface damage • Can use narrower gaps and tracks • Most will fit under canopy AGAINST • Requires Active Riding and therefore predictable surface needed • Loading a trailer with people creates dynamic loads (L-R shift causing roll; fore-aft shift de-loading rear wheels prompting jack-knifing when traversing slopes) • Requires agreed lines of travel and No-Go areas	FOR • Requires less track investment than road vehicles • Lighter than car/utes on the land AGAINST • All/most too high to get under the crop all year unless modified • Most will tip before sliding on bad sidlings or headlands • Wider clearance than quads may be needed in entrances – limits access points	FOR • Low enough to fit under canopy (cars and station wagons) • Cab roof protects from hazards (e.g. broken wires, old vines, sagging pergola bars) AGAINST • The increased cost of roading and tracks	FOR • Keeps people from walking or driving into areas where they shouldn't be going – less impact and chance of contamination AGAINST • Heavy and long so unsuited to tighter or softer routes • Would need specific assessment and WOF for transit on public roads

Appendix 4: TASK 2 - Moving people

Notes and Risk Multipliers	Walking	Mountain Bike or E-Bike	Quad bike (and quad with trailer)	Side-by-sides (and with trailer)	Roadworthy Utes, cars, and 4WDs	Orchard tractors with DIY passenger trailer
 **Machine** **Notes** • Affordability; • Passenger carriage systems including safety concept test-proven; • Load carriage systems for equipment and staff kit; • Able to operate on tar seal, gravel, track or mown orchard aisle; • Ideally can be operated by anyone in an emergency (high transferability of skills from commonly used vehicles); • Characteristics of SBS machines vary significantly; • Tractors pulling trailers with passengers on them are an old established method but with obvious risks. There are purpose-built vehicles such as self-powered electric options used in mines, but these are used on mostly level flat surfaces. They are low - roughly same height as purpose designed crop sprayers. Some tourism businesses also use tractors to pull carriages (e.g. Fullers Rangitoto); • Quad performance objectively measured by recent University of NSW rollover testing project **General Risk Multipliers** • Deferred maintenance; • Modifications contrary to design concept; • Availability of parts for rarer imported machines; • Absence of a tow bar swivel or equivalent device to reduce increased rollover risk generated by surging fluid or shifting materials in trailed tanks and implements.	N/A	FOR • Fuel costs N/A or negligible • Bike $500+ • E Bike. $2,500 – 5,000 AGAINST • Purpose designed panniers needed for any load carriage • Need one bike per person trip	FOR • Fast for one passenger AGAINST • Easy to use at unsafe speed • $15,000+ • Rollover/crush risk, entrapment especially at lower speed • Motorcycle-derived safety system that assumes solo unrestrained rider (vehicle and rider part company to avoid damaging contact)	FOR • Concept provides more capacity than quad AGAINST • Car-derived safety system (vehicle provides safe void, and driver held within this to avoid damaging contact, so restraint essential) • Untested local modifications to rollover protection common – requires significant balancing of risk to ensure Safe System • Can't see front wheels when ascending hills • Limited passenger space, tempting to exceed designed-for limits if moving all staff this way	FOR • Get themselves there and then walk - no specialist vehicle driven by staff member needed • Low cost ($2,500-$5,000) leaves funds free for other uses including roading • Parts cheap and available locally from multiple sources – not just one dealer • Fully tested as a concept (not modified) • Existing WOF and registration system • Waterproof and secure accessories and parts readily available AGAINST • Larger and less manoeuvrable	FOR • Familiar method people will have used before • Tractor already obtained for other uses AGAINST • Engineering testing required • Fuel thirsty • May be needed for other work

Appendix 5: TASK 3 - Light construction and maintenance work

Notes and Risk Multipliers	Two-wheeler Motorcycle	Quad bike (and quad with trailer)	Side-by-sides (and with trailer)	Roadworthy Utes, cars, and 4WDs	Orchard tractors
 People **Notes** This task involves pergola repair, fixing irrigation, fixing wires; The task varies from quick fixes to a long day's work; The irrigation work can involve getting cold and wet in the dark; Can be mentally demanding including problem solving. **General Risk Multipliers** Decision to overload (often to reduce number of trips needed); Failing to secure resulting in shifting loads; Operator inexperience in the industry; Inexperience on the specific property; Inexperience with the tools/materials/techniques for the work resulting in slow progress and haste in travel to make up for it; Inadequate training, skills and/or experience operating the vehicle types used on the property; Immaturity; Low ability to understand and apply written or verbal instructions; Unwillingness or perceived inability to ask questions or raise concerns; Transfer of bad practices from other properties/sectors; Failure to identify faults at early stage through the required vehicle checks; Distraction or inattention due to mind on task-related problems.	FOR The pillion can carry a few things and it may not affect the balance too much No licence or training course legally required if only riding on private land Most would be happier falling off a motorbike than a quad AGAINST Balance is controlled through the handlebars and foot pegs and requires concentration heightened by having extra load on board Potential for crush or other injury due to weight of machine	FOR Models designed for rider plus passenger could be most compact option if small loads also to be carried Quick for frequent mounting and dismounting No licence or course legally required for use AGAINST No licence or course legally required for use - the message to beginners is it's easy, and informal training is sufficient Experienced people rate as them as harder than two wheelers to master Easy to overrate the ability of the machine Training specifically needed for quad with trailer (NZQA) Site competence assessment and supervised period required for safe operation No weather protection Requires helmet, strap can pull if caught on vine Strength and active riding needed, may decline with age Most aren't designed for two people. The long seat is for weight shift during active riding, not two bodies	FOR Weather protection in some cases Easier to operate than a quad – Active Riding skills not required Relatively stable, unlikely to roll AGAINST The safety concept requires occupant restraint in seat and door openings covered. Frequently getting in and out can lead to these features being ignored or removed Third position on bench seat may interfere with control/displays PPE/helmet may be needed	FOR Weather protection Standard vehicle operator licencing Complete passenger focussed safety system 5+ seat belts Highly evolved for passengers and personal luggage Can keep person and gear dry and clean No PPE required in transit AGAINST Lower models that fit under the canopy will be less suited to tow heavy material loads Getting in and out, less convenient for repetitive maintenance/repair tasks than quads (but should be the same as SBS if belts and door coverings used) Familiarity may lead to unsafe driving on orchard	FOR Handling characteristics with typical loads change less with tractor than with lighter vehicles AGAINST Generally no weather protection

Appendix 5: TASK 3 - Light construction and maintenance work

Notes and Risk Multipliers	Two-wheeler Motorcycle	Quad bike (and quad with trailer)	Side-by-sides (and with trailer)	Roadworthy Utes, cars, and 4WDs	Orchard tractors
 **Environment** **Notes** These may be heaviest loads moved through the property and so provide most extreme test for banks and tracks that are deteriorating; Investment in tracks and areas driven on can reduce mowing needs and make turning on headlands safer and less damaging to surface and drainage when moving heavier vehicles and loads. **General Risk Multipliers** Size of property – travel distances and frequency from base to be covered; Quality of roads/tracks, especially slopes, that need to be travelled with loads; Quality of mown areas to be driven on especially headlands and fence lines; Rainfall patterns/effectiveness of surface water management; Soil types and terrain – slipperiness when doing: maintenance work in winter mud, running with loads on lush spring grass on hard ground, or on moist surfaces in summer when ground hard but after light rain and knobbly tyres not biting; Summer rutting of hard soil; Tomo (swallow-holes); Public roads to be crossed or transited.	N/A	FOR Lighter than a ute so less surface damage Can use narrower gaps and tracks Most will fit well under canopy Can do a 3-point turn in a row AGAINST Requires Active Riding and therefore a predictable surface as they roll easily, even on flat land if poor throttle/steering control. Higher centre of gravity and more prone to tipping than new riders expect When a trailer is attached to it and you are on steep terrain it can be very hard to stop Loading a trailer with loose materials can create dynamic loads increasing risk of rolling (or jack-knifing when traversing slopes) Agreed lines of travel and No-Go areas required as quad Need to look out for drainage, weather, mud, ruts, slopes	FOR Requires less track investment than road vehicles Lighter than car/utes on the land AGAINST All/most (e.g. Polaris Ranger) too high to get under the crop all year unless modified Most will tip before sliding on bad sidlings or headlands (more stable examples e.g. Gator) Wider clearance than quads may be needed in entrances – limits access points to get close to where work will be done	FOR Some low enough to fit under canopy (cars and station wagons) Many utes and 4WD too high Cab roof protects from hazards (broken wires, old vines, sagging pergola bars) AGAINST The increased cost of roading	FOR Fewer journeys required to cart materials – reduces impact in that way AGAINST Heavy and long so unsuited to tighter or softer routes Slow for transit involving public roads with faster moving vehicles Heavier so can damage soft ground easily? Weight may lead to unstable edges or holes giving-way easily, leading to risk of rollover

Appendix 5: TASK 3 - Light construction and maintenance work

Notes and Risk Multipliers	Two-wheeler Motorcycle	Quad bike (and quad with trailer)	Side-by-sides (and with trailer)	Roadworthy Utes, cars, and 4WDs	Orchard tractors
 **Machine** **Notes** Materials often needed: coil of wire, pliers, hammer, wire strainer, wire cutter, chainsaw, replacement posts, staples (i.e. 5kg packets), post rammer, spade, post hole digger, straining machine for tightening the wire; Walking isn't feasible. The gear is too heavy and generally there is more gear than you can carry. Walking is too slow; Mountain bikes and E-Bikes don't have sufficient carrying capacity and can be unstable depending on the terrain. UBCO bike has been shown in the Eurofins tests to be 'terrifying', very difficult to balance; Mowers are too light and often do not have good stability. Not good in rain/mud as they do not have gritty tyres. They can be complicated to operate. They are very slow, small machines with some carrying capacity but not much - unlikely to use one for any maintenance tasks; Vehicle used ideally able to operate on tar seal, gravel, track, or mown orchard aisle; Vehicle ideally doubling as workbench to assist tasks; Ideally can be operated by anyone in an emergency (so high transferability of skills from commonly used vehicles; Characteristics of SBS machines vary significantly; Quad performance objectively measured by recent University of NSW rollover testing project **General Risk Multipliers** Overloading or misloading; Speed in transit, especially descending with towed loads; Deferred maintenance; Modifications contrary to design concept; Availability of parts for rarer imported machines; Absence of a tow bar swivel or equivalent device to reduce increased rollover risk generated by surging fluid or shifting materials in trailed tanks and implements.	FOR It can go uphill faster than a mountain bike, maybe a similar speed to an E-Bike? Very manoeuvrable They have some carrying capacity and you can attach a tray onto them Can carry small amounts of tools sufficient for a small task AGAINST Unlikely to be road-worthy (they start like that but don't end up like that)	FOR Fast option if minimal tools and materials needed AGAINST $15,000+ Motorcycle-derived safety system. Vehicle and rider need to part company in loss of control to avoid damaging contact and load being carried may obstruct exit route Due to their power, they are generally used for more tasks than they technically are fit for Trailer makes it more unstable and reduces stopping ability Pulling a load and stopping one are two different things, especially with the un-braked trailers normally used with quads, and in slick conditions that offers little purchase for the tyres Less manoeuvrable that a motorbike Easy to overload with tools or materials and dangerously increase instability	FOR Concept provides more capacity than quad for carrying gear and materials required within designed-for limits AGAINST Car-derived safety system (vehicle provides protected zone, and driver held within this to avoid damaging contact, so restraint is essential) Untested local modifications to rollover protection common – requires significant balancing of risk to ensure Safe System Can't see front wheels when ascending hills	FOR Boot/tray space larger than quad/SBS. Can carry a lot of gear. Can also attach a trailer if needed Low cost ($2,500-$5,000) leaves funds free for other uses including roading Parts cheap and available locally from multiple sources – not just one dealer Fully tested as a concept (not modified) Existing WOF and registration system Waterproof and secure accessories and parts readily available AGAINST Not designed for moving heavy trailer loads off-road	FOR Best option for bigger loads Tractor already obtained for other uses AGAINST Fuel thirsty May be needed for other work

Appendix 6: TASK 4 – Other tasks involving trailed implements

Notes and Risk Multipliers	Quad bike	Side-by-sides	Roadworthy Utes, cars, and 4WDs	Orchard Tractors
 **People** **Notes** • Tasks include: spreading fertiliser, mulching/mowing, cultivating, firewood splitting; • Kubota and other more specialised vehicles common for mowing. **General Risk Multipliers** • Mismatch of task and operator – inadequate skills and/or knowledge; • Postural issues leading to neck and back problems.	FOR • None identified AGAINST • Loading a small vehicle onto a trailer or ute for transporting between properties or for maintenance/repair - inherent risk with slopes and ramps. Requires training, skill and practise • Quad operation overuse issues include sore shoulders, necks, backs when working under the low canopy in vehicles too high off the ground - so in a bent-over position all day	FOR • Risk compensation possible because the vehicle appears simple to use by a range of people. AGAINST • May be inclined to go faster at key times e.g. when towing, because in a larger vehicle than a quad it seems safe to do so. Training important to counter this	FOR • Weather protection in some cases • Easier to operate than a quad – Active Riding skills not required Designed to carry personal and extra loads AGAINST • Transfer of experience on-road to unsealed track could result in excessive speed and unwarranted confidence when towing • Not normally suitable for these tasks	FOR • Light trailer and large machine slower. So inherently safer for a range of users when towing. Fewer skills needed AGAINST • Need to consider vibration and other forces from no suspension (sometimes taken out of seat to remain low under canopy)
 **Environment** **General Risk Multipliers** • Contours on the property can make turning between rows difficult/dangerous; • Dappled light under the canopy can cause sunstrike.	FOR None identified AGAINST • Small wheel base, light weight, and lack of suitably braked trailers significantly reduce the capability of a quad when towing • Especially jack-knife-resisting performance in descent when ground conditions are hard and slick	FOR None identified AGAINST • Rollover risk for contractors who are not as familiar with ground/terrain characteristics • Towing increases dynamic load so more training is needed • Steep wet terrain especially risky when towing	FOR • Low enough to fit under canopy (cars and station wagons) • Cab roof protects from hazards (i.e. broken wires, old vines, sagging pergola bars) AGAINST • Not always designed for off-road so might need better tracks to use	FOR • Generally more stable on variable surfaces • Only serious option for cultivating and any subsoiling work. Nothing else has both the power and low clearance height to be working in the ground whilst under the canopy AGAINST None identified
 **Machine** **General Risk Multipliers** • Mismatch of implement and vehicle; • Badly balanced trailer (two wheeled) that unloads or overloads tow bar.	FOR None identified AGAINST • Towing mowers. Adaptations from trailers to fit on the back of a quad bike. Uses lawnmower engines and are 1.2-8m long. May have dangerous moving parts and aimed at lifestyle properties. Noisy and only for very small jobs	FOR None identified AGAINST • Handling characteristics change when towing • Modifications alter safety system (i.e. rollover protection often removed), need to be very confident of non-roll over to compensate	FOR Can tow a trailer AGAINST None identified	FOR • Combination safer • Speed limitation self-enforcing as bumpy at speed • If jack-knifed on a headland tractor and trailer won't roll - too heavy and low AGAINST None identified

Appendix 7: TASK 5 – Spot spraying

Notes and Risk Multipliers	Walking (with knapsack)	Quad bike (and quad with short spray boom and/or trailer tank)	Side-by-sides (and with trailer)	Orchard tractors
 **People** **Notes** • Supplementary to main spraying passes using dedicated vehicle; • Orchardists may opt to just get in a contractor with the specialist gear for the weed spot spraying. **General Risk Multipliers** • Spray fluid exposure; • Load carriage – destabilising fluid shift in tanks; • Repetition, force, twisting, and awkward postures in spraying can cause or exacerbate overuse injuries; • Their inexperience with chemicals in the industry; • Inadequate training, skills and/or experience operating or riding in the vehicle type used for spraying; • Immaturity; • Low ability to understand and apply written or verbal instructions; • Unwillingness/perceived inability to ask questions/raise concerns; • Transfer of bad practices picked up on other properties or in other sectors; • Failure to identify faults at early stage through the required vehicle checks.	FOR • Accurate • Can hit weeds from all sides AGAINST • Knapsack application carries same risks as pollen blowing but extra weight. Risk of musculoskeletal injury • Fatigue • Slower, more time spent refilling • Widespread ignorance about agri-chemical handling	FOR • With adequate hose can get close but safe distance from weeds then dismount and hit from all sides • Easy to get on and off vehicle AGAINST • No weather protection • Two hands required to ride but spraying requires one hand on the spray wand. Theoretically operators should dismount and use the hose. In practice the temptation is to ride right handed and spray with the left hand from the seat • Most designed loads lighter than a 60-80L tank of spray and considerable skill and experience needed • Training, site competence assessment, and supervised period required. Risky operation • Requires helmet	FOR • Risks reduced if using a trailer (which SBS will generally handle better than a quad) • Weather protection in some cases • Easier to operate than a quad – Active Riding skills not required AGAINST • The safety concept requires occupant restraint in seat and door openings covered. Getting in and out frequently often leads to these features being ignored or removed. Therefore, spraying from the seat of the SBS is theoretically impractical. • Some risk to operator from spillage if tank mounted on machine – not on trailer • PPE/helmet may be needed • Dynamic load to be understood and managed. Therefore, training and monitoring is essential	FOR • Conventional option, safer for a range of users AGAINST • Not as agile around the orchard rows. Handling a longer can add time
 **Environment** **Notes** • Far less spot-spraying in kiwifruit orchards than in other sectors; • Investment in tracks and areas driven on can reduce mowing needs and make turning on headlands safer and less damaging to surface and drainage. **General Risk Multipliers** • Lumpy surfaces can cause fluid to surge in spray tanks destabilising the vehicle; • Size of property – travel distances from base to be covered and frequency – time potentially lost; • Quality of roads/tracks, lack of investment often covered by blaming vehicles; • Quality of mown areas to be driven on including headlands; • Rainfall patterns/effectiveness of surface water management; • Soil types and terrain – slipperiness when doing winter maintenance work; • Summer rutting of hard soil; • Tomo (swallow-holes); • Public roads to be crossed or transited.	FOR • Lowest impact AGAINST • Uneven terrain and surface irregularity pose a risk of injury, falls, and spills	FOR • Lighter than a ute so less surface damage • Can use narrower gaps and tracks • Most will fit under canopy AGAINST • Requires Active Riding and therefore predictable surface needed • Fluid is a dynamic load especially if tank is not well-baffled to limit surge. Suited only to predictable surfaces and mild terrain • Agreed lines of travel and No-Go areas required as quad	FOR • More stable on a greater range of terrain • Easier to get from one place to another AGAINST • All/most too high to get under the crop all year unless modified • Most will tip before sliding on bad sidlings or headlands overloading with spray will exacerbate this • Wider clearance than quads may be needed in entrances – limits access points	FOR • Least return journeys – biggest spray capacity AGAINST • Not as practical for getting from place to place

Appendix 7: TASK 5 – Spot spraying

Notes and Risk Multipliers	Walking (with knapsack)	Quad bike (and quad with short spray boom and/or trailer tank)	Side-by-sides (and with trailer)	Orchard tractors
 **Machine** **Notes** • If hose length too short then vehicle forced to move more often and into spots it otherwise wouldn't be taken; • Two-wheelers (and arguably quads) not an option as you can't ride a bike of any kind for extended periods off road one-handed; • Mower an option but limited capacity; • E3 Electric farm vehicle – judged by users as similar in suitability to SBS; • Load carriage systems for spray tanks may exceed manufacturer's guidelines in volume, or contravene tank mounting or balance specifications; • Ideally able to transit safely on tar seal, gravel, track or mown orchard aisle; • Ideally can be operated by anyone on staff (so high transferability of skills from commonly used vehicles); • Characteristics of SBS machines and quads vary significantly with regard to centre of gravity and safe loading characteristics. Polaris Ace (single seat) - judged by users as more like a quad than a SBS: need to be more conservative with terrain, centre of gravity significantly influenced by fluid load, limited room for spray system equipment; • Quad uses a motorcycle-derived safety system that assumes solo unrestrained rider. Which is that vehicle and rider part company far enough to avoid crushing/pinning in a loss of control event; • Quad performance objectively measured by recent University of NSW rollover testing project. **General Risk Multipliers** • Short hose forcing spraying from the seat; • Deferred maintenance; • Modifications contrary to design concept; • Absence of a tow bar swivel or equivalent device to reduce increased rollover risk generated by surging fluid on mounted tanks or in towed trailer tanks.	FOR • Low tech – low cost AGAINST • Load systems places operator closer to chemicals	FOR • Agile AGAINST • Agility means it could be tempting to take to into marginal areas of the property including semi-stable banking and along drainage lines where slow speed rollovers and drownings occur • Easy to use at unsafe high speeds – max 20 km/h • $15,000+ • Rollover/crush risk, entrapment especially at the lower speeds - typical of when spraying from the seat. Rider not thrown clear • With load higher centre of gravity • Volume limited - 80L back, 50L front common but this still represents a load 50% of the vehicle weight. Like putting 1 tonne on a car • Can be unstable and unpredictable when loaded	FOR • Inherently safer with fluid loads for operators than quad • Concept provides more spray capacity (300-400L) than quad, but less than a tractor AGAINST • Spraying from the seat likely to contravene the designed safety system that keeps body parts within the protected zone • Untested local modifications to rollover protection common – requires significant balancing of risk to ensure Safe System • Can't see front wheels when ascending hills	FOR • With large tank, similar to large trailer • Use a tractor to carry bits and then walk in to apply the hose (10m hose to get at weeds from all angles) AGAINST • Fuel thirsty • May be needed for other work

Appendix 8: TASK 6 – Crop imaging

Notes and Risk Multipliers	Walking	Quad bike (and with trailer)	Side-by-sides	Orchard Tractors
 **People** **Notes** • The task involves taking photos of the crop from under the canopy. It requires a consistent distance from the crop - so not varying field of view; • Crop images are collected from large portions of the property - there is a lot of ground to cover; • Done during fruit or flower time when canopy is low; • A task that is safe for one person might not be safe for someone with less experience. Might need a system of working that requires different things (tasks, kit, training, experience).	FOR • It can be done with a smartphone or a go-pro via walking, although this would be a slow approach AGAINST • It also requires a consistent field of view which might not be achievable with this mode. The height of the person walking may not be ergonomically ideal to walk under the canopy. • It is an intensive application and requires you to be in every block and to carry the camera equipment	FOR • Quad bikes and tractors most commonly used for this – so familiar technique • Easy to get on and off vehicle AGAINST • Camera gear is on a mounting platform on a trailer which introduces an inherent safety issue as quad models generally not designed for trailer use • Requires helmet	FOR • Easier to operate than a quad – Active Riding skills not required– more like a car • Has seat belts and range of seating 2-6 people • No licence required. Easy to use in basic way without training (so an advantage in an emergency), but means people may use it when they are not supposed to AGAINST • Skills not transferrable from quad • Easy to overrate its abilities	FOR • Inherently uncomfortable therefore you cannot go fast and this makes them inherently safe • A tractor is ergonomically set for working under a canopy. It is low and you can sit up straight AGAINST • One-person • Requires training to operate
 **Environment** **Notes** • Single pass so negligible impact in comparison to tasks with cumulative impact potential such as spraying; • Often kiwifruit farms will have an associated avocado orchard. It is good to have tools that can cross over and be used in both environments. **General Risk Multipliers** • Poor surface.	FOR • None offered AGAINST • Uneven terrain and surface irregularity (e.g. rabbit holes) pose a risk of injury, falls • Risks of hitting head/face on beams, low hanging vines and broken wires	FOR • Most will fit under canopy AGAINST • Need to be careful of rabbit holes, rolling risk • Requires Active Riding and therefore predictable surface needed • Agreed lines of travel and No-Go areas required as quad	FOR • None offered AGAINST • The risk of a roll over is property and context-specific so requires expertise and judgement • Can't do a 3-point turn in a row, maybe 7-point	FOR • None offered AGAINST • None offered
 **Machine** **Notes** • This is a changing technology and the optimal way of doing it hasn't been developed yet; • Most commonly mapping camera is positioned on a small vehicle attached to a mounting platform; • Machines travel under canopy along rows; • The imaging gear can be heavy; • Ability to maintain a slow consistent speed is important; • Using small drones being considered; • Remote control buggies moving alongside someone who is walking are another option. This would have a steadier and more consistent field of view.	N/A	FOR • Agile • Productive (but not as targeted as walking). With pollen blower on front vehicle, moves at 6 km/h AGAINST • None offered	FOR • Wide platform and low centre of gravity • Can be speed limited • Can carry a lot of materials and a trailer can be added • Efficient, easy to get on and go AGAINST • When they are adapted for versatility their safety performance is reduced • Limited number of safety courses exist • Vehicle bought for general transport use may not fit under canopy	FOR • Tractors are currently used for this and the camera gear is placed on a mounting platform. Tractors travel at a low speed, you just need to attach the imaging gear- so they are well set up for this task • Powerful • Unlikely to roll • Cheap for the work capacity. 7-80 horse power for under 30k • If you have a cheap tractor as your only orchard vehicle you can do most tasks AGAINST • Slow • Not very manoeuvrable

Appendix 9: TASK 7 - Dry pollen blowing

Notes and Risk Multipliers	Walking	Quad bike (and with trailer)	Side-by-sides
 **People** **Notes** • Pollen expensive so training essential; • Specialised task only done once a year. **General Risk Multipliers** • Looking up at the canopy while moving; • Distraction from hazards at ground or head level due to concentrating on task - not wasting pollen; • Inexperience using a trailer.	FOR • Commonly done so understood and predictable accuracy/productivity • Can vary rates and be more specific/targeted in application • Can use cheaper system • Necessary for applying wet pollen AGAINST • A lot of distance to cover so can get tired (but not a daily/weekly repeated task). Annual only, unless contractor • Slower • Risk of overuse injury – is hard work to hold a blower	FOR • Blower systems mostly designed for quad operators to use • Easy to get on and off vehicle AGAINST • Training essential as it is a specialised task and expensive product (but anyone can run the quad systems if trained) • Requires helmet • Needs to tow a trailer with a pump for larger blower systems (e.g. six nozzle), so some increased risk for operator when turning on headlands and transiting around property	FOR • Easier to operate than a quad – Active Riding skills not required AGAINST • Need to be careful of hitting head for higher models, especially if concentrating hard on pollen application
 **Environment** **Notes** • Single pass so negligible impact in comparison to tasks with cumulative impact potential such as spraying. **General Risk Multipliers** • Poorly maintained or weather-damaged canopy; • Sloping, rutted, or otherwise unpredictable headland surface characteristics.	FOR • None offered AGAINST • Uneven terrain and surface irregularity (e.g. rabbit holes) pose a risk of injury, falls • Risks of hitting head/face on beams, low hanging vines and broken wires	FOR • Most will fit under canopy AGAINST • Need to be careful of rabbit holes etc as bike could roll • Requires Active Riding and therefore predictable surface needed • Agreed lines of travel and No-Go areas required as quad	FOR • None offered AGAINST • Maintaining canopy clear height may be more crucial
 **Machine** **Notes** • Machines travel under canopy along rows and so have to be low enough to deliver the blower outlets to the right height in relation to the canopy; • Orchard tractors not commonly used, but are with heavier more sophisticated systems for increasing pollination success rates that get drawn on a trailer; • Polaris Ace type machines could be used in principle, as could E3 Electric farm vehicle (from user perspective – not researcher or Regulator).	N/A	FOR • Agile • Productive (but not as targeted as walking). With pollen blower on front vehicle moves at 6 km/h AGAINST • None offered	FOR • Easier to get from one orchard block to another • None offered AGAINST • Vehicle bought for general transport use may not fit under canopy

Appendix 10: Use case 1

USE CASE: LARGE ESTABLISHED MULTI-SITE BUSINESS, BoP.

Property type: Mostly Gold, some Green.

Size: 54 hectares plus a six hectare block nearby, close enough to share equipment with. Another property in Hawkes Bay that vehicles can be shared with but requires trucking.

Years of operation as orchard: Nearly 40 years

Years under current management / ownership: Nearly 40 years

Staffing:

- 8 FT permanent (20 staff total across both main sites)
- Supervision ratio across the site 1:3
- Two teams, each with a Team Leader
    - Operations (including maintenance, mulching, spraying)
    - Vine Management (all vine-contact work)
- 150 max staff at any one time across all three orchards, averaging 60 (including the 20 FT permanents)
- Pickers provided by contractors. All walk from the carparks (500 metre longest walk into orchard)
- Have lost a greater number of experienced staff in the last year than is common

Terrain: Flat. Coastal peninsula

Roading:

- Main access ways are metalled
- Regular short distance use of two public roads

Tasks:

- Maintenance
- Transporting of single visitors around the orchard
- Checking irrigation (mostly on hard surfaces but some under the canopy)
- All tasks involve some use of public roads

Small Vehicle Systems used

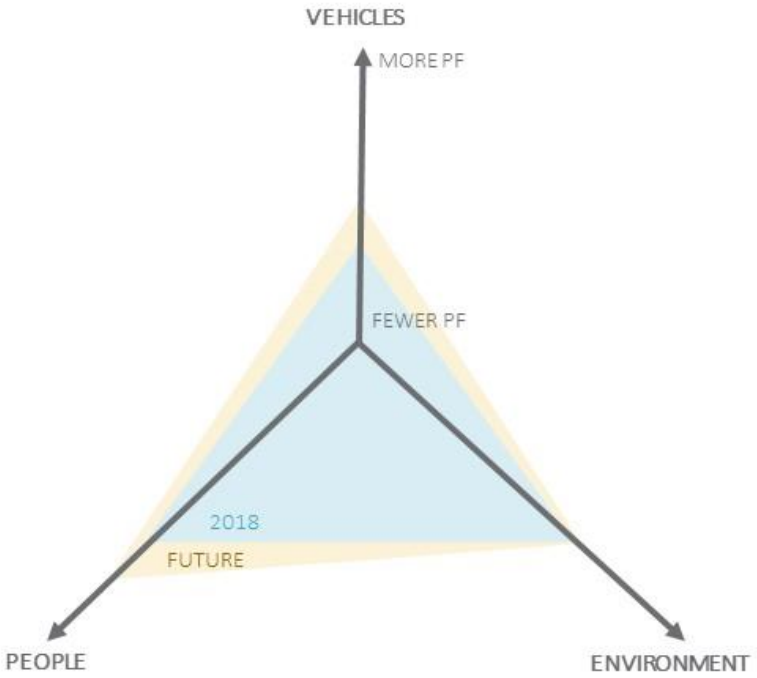
- Six side-by-sides. 2wd Kawasaki Mules and 4wd Polaris Rangers (both with modified rollover protective structures to fit under the canopy)
- Utes used in the Hawkes Bay operation more as more driving on public roads is required

Use of contractors

- Rarely needed due to size of operation and ownership of most of the equipment

USE CASE: LARGE ESTABLISHED MULTI-SITE BUSINESS, BoP.

Tasks: *Personal transportation, visitor transporting, light maintenance, irrigation checking, under-canopy work*
Light Vehicle System: *(modified) side-by-sides (SBS)*
Protective Factors (PF) are positive actions that build a more resilient Safe System involving small vehicle use



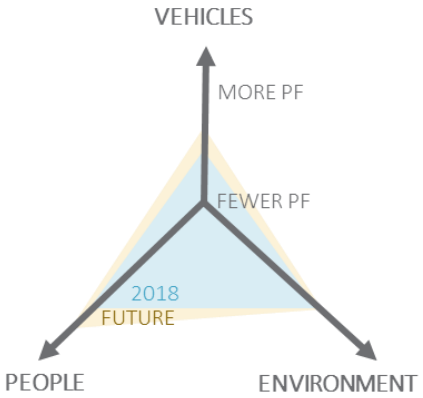
Vehicles

- Mules lower than quads (once modified), reduces head-strike potential when under the canopy
- Move from quads to SBS. Motivated by desire for safer passenger (bench) and load carriage (tray). More stability and flexibility in tasks
- Spraying all from cab sprayers so visibility of other vehicles optimised. (Vehicle coming out of rows colliding with vehicle on headland a recognised hazard)
- Flashing mounted lights always on – road and orchard. Registered for road use
- Maintenance regular by visiting mechanics who service all vehicles on site at the same time

FUTURE PLANS

- Looking at vehicle tracking systems (e.g. Farm Angel) to monitor and build understanding about speeds, routes taken, incidents
- Monitoring availability of SBS option that provide under-canopy clearance without modification

USE CASE: LARGE ESTABLISHED MULTI-SITE BUSINESS, BoP.



People

- Staff meetings every two weeks to formally review site issues
- Induction training includes most common vehicle incident scenarios from near-miss analysis (blind corners and row v headland traffic in orchards, low-hanging vines and wires, pulling out onto roads)
- Training refresh every three years
- All staff professionally trained in biannual sessions to NZQA standard in specific skills and knowledge areas as required by their role. Competency assessment between these times for new staff or re-training
- All permanent staff attend breaks at base at fixed times (morning tea, lunch) for reporting, monitoring, discussion, feedback
- Load limits and speed limits taught at courses. Limits enforced. Breaches result in having to walk not ride
- Monitoring by supervisor of new staff and youths
- Contractor crews walk in from carparks. Portable toilets provided so no reason to wander unexpectedly into other areas
- PPE (helmets rated to 30kph) provided and are required
- PeopleSafe app system used (recognised as not a complete solution – especially at busy times)

FUTURE PLANS

- Communications upgrades linked to on-vehicle systems
- HSW professional starting on staff

Environment

- Recognises that the environment is dynamic and changes hourly. Staff policies prioritising face to face contact during the day reflects this
- Terrain is level throughout. Main routes metalled and maintained to high standard
- Alternative routes used where possible to minimise exposure on public roads
- Public road sections all have pull-off areas to allow staff in SBS to let cars safely pass
- Short distances travelled where public road use is unavoidable
- Canopy height maintained - Steel Ag beams replaced old structures which were more prone to sagging
- Canopy structure maintained to high standard to minimise hanging wires/vine hazards
- Artificial cloth replaced shelter belt trees on corners where vehicles could be hidden from other drivers
- Biannual major orchard track maintenance checks and remedial work. Bobcat fills holes (rabbits main problem)
- Expectation that staff don't walk past problems (e.g. holes) or wait to report at fortnightly meetings – but address it on the day. Reinforced by supervisors and Team Leaders
- Speed restriction policies, signs placed as reminders
- Designated parking areas
- Mobile phone coverage in all areas

Appendix 11: Use case 2

USE CASE: SMALL ORCHARD WITH MIXED TERRAIN, BoP.

Property type: Two hectares of Green orchard. Plus 75 avocado trees.

Size: Eleven hectares
Years of operation as orchard: 30 years.

Years under current management / ownership: Three months. First orchard property he has owned.

Staffing:
- Owner does all maintenance and mowing in free time from a full time job away from the property.
- Kiwifruit orchards managed for him by a contracting firm.
- Specialist contractors brought in on one-off basis for other tasks e.g. Old shelter belt tree removal.
- Avocados managed by another specialist contractor.

Terrain: Mixed. Some quite steep.

Roading:
- Main access ways need work. Overdue for maintenance and so wheels spin a bit in places, and a bit of a run-up needed where the flat meets the bank.
- No need for use of public roads. State Highway 2 is nearby and he says that as driver on the road he doesn't like the way orchardists down there will sometimes pop out of entrances in slow work vehicles. Feels they should make alternative routes possible to avoid interfering with flow on what is already a fast and dangerous road. Very different if an orchard is up a cul-de-sac with just neighbours as traffic.

Tasks:
- Transporting of himself and single visitors around the orchard.
- Spot spraying.
- Mowing.
- Light Maintenance.

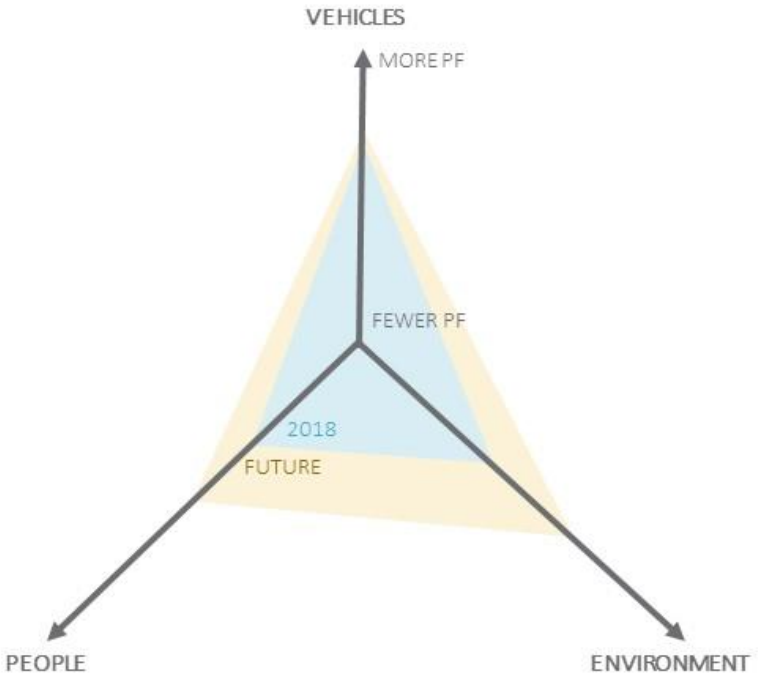
Small Vehicle Systems used
- Side-by-side. Polaris Ranger (un-modified rollover protective structures so it doesn't fit under the canopy. Considered it but too much work involved).
- Small 4WD (Honda CX5) used when wet or when taking visitors around.

Use of contractors
- Yes. For management and other specialist tasks. They will commonly be working alone on site as he has full time job off-site and so not around to receive them or supervise or answer questions on the day other than by phone.



USE CASE: SMALL ORCHARD WITH MIXED TERRAIN, BoP.

Tasks: *Personal transportation, visitor transporting, light maintenance, (planning to spray)*
Light Vehicle System: *side-by-side (SBS) , road vehicle*
Protective Factors (PF) are positive actions that build a more resilient Safe System involving small vehicle use



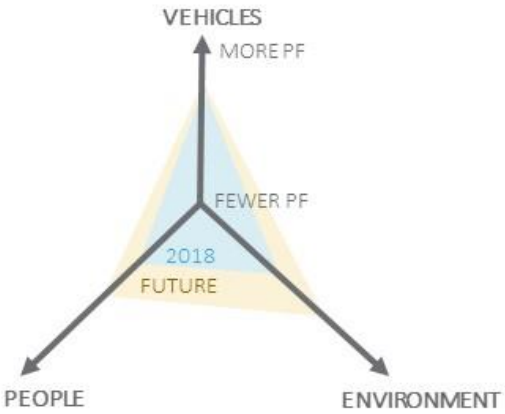
People

- Hazard board and signing in point at entrance.
- Uses online (Haz and Co) system for people checking in and out of site. Gets alert wherever he is , therefore would be aware if a contractor was late leaving (potentially in trouble/trapped) assuming they have used the system.
- Takes visitors around in passenger vehicle – not Polaris or tractor.
- Brings specialist contractors onto site for full orientation when they are pricing a job.
- Encourages 'play to the conditions' flexibility on site. Doesn't expect the same performance every day.
- Sets example by filling out all forms as he would expect other to do.
- Polaris use limited to himself and partner.
- Has trained on the Polaris (but only by the dealer – not a recognised course)
- Keeps kids indoors away from access track used by contractors when they are on site.

FUTURE PLANS

- Involvement in community grouping for small growers to discuss issues of common interest including OHS. Lots of small operators on 2-3 hectare orchards in BoP. Centrally facilitated (small) growers forum giving practical advice would be helpful.
- Direct discussion with the contractors sending people onto site about their people, vehicles, and his expectations about communication on the day. Mobile coverage on the site is not great, and the person who comes to check out the job may not be the one who actually gets sent to do it. So he as owner needs a chance to talk to them on the day before they start to provide sufficient induction to the site and talk through specific considerations applying that day (e.g. Others present on site, impact of weather on routes to use, areas with weak or no coverage).
- Getting formal training for himself and partner on the Polaris.
- Joining Polaris user group.

USE CASE: SMALL ORCHARD WITH MIXED TERRAIN, BoP.



Vehicles

- Uses an unmodified Polaris so ROPS safety features intact.
- Doesn't take it under the vines as a result – parks up on headland walks in.
- Is planning to use it for spraying using possibly a 200L tank on the fixed deck of the SBS with a 30m hose. Recognises that there will be extra limits on where he can take the SBS around the site once that shifting load is added. Will need to avoid descents especially.
- Has a tractor but avoids using it too much – does a lot on foot.
- Has 4WD road passenger vehicle for moving around when wet, or when moving visitors.

FUTURE PLANS

- Considerations for how the environment is made more risk-free for contractors and their vehicles coming on site when he is not there.

Environment

- Recognises that small growers with full time work away from the property need to be providing an even safer 'no surprises' environment for contractors.
- Mows every two weeks (takes 6-7 hours) to keep orchards easy to navigate in spring/summer, and reduce the need for major weed spraying by contractors.
- Spraying is coordinated with neighbours over the three day period to avoid risks to kids and dogs as spray can settle in pools.
- Steep drop offs into old quarry workings blocked by solid barriers.

FUTURE PLANS

- Improved tracking, but getting metal into the steeper sections will need to be done in small loads.
- Removing debris and aged shelter belt trees but the heavy vehicles required may need stronger tracks in place first. Could put contractors at risk otherwise
- Identifying key areas that need doing first: particular slopes on tracks and headlands. Can't do everything in one year when coming onto a new property as a first timer.
- Use maps, signage and physical barriers in combination.
- Divert main track in from the road that is used by the contractors – take it away from the house as a potential risk to children where it is as contractors maybe unaware. Signage and /or traffic calming in the meantime.
- Wider use of solid barriers, fences to indicate routes for contractors – will work better then signage or maps alone.
- Rain or erosion can create a hazard and warning may be needed on a given day. In this case a check of the site before leaving for work and temporary taping off of an area as a short term fix if contractors could be on site unattended.
- Ensuring that all track junctions, changes of level, headlands and other obvious turning spots are suitable for the range of vehicles contractors may bring in. This will involve discussion with these contractors and updating as their fleet changes.

Appendix 12: Use case 3

USE CASE: MEDIUM-LARGE ORCHARDS WITH STEEPER TERRAIN

Property type: Orchard.

Size: 15 hectares

Years under current management / ownership: Established family business.

Staffing: Owner plus two teams of regular contractors.

Terrain: Mixed with some steep.

Roading:
- Metaled tracks for all fruit movement lines.
- Split by public road (away from State Highway - not a busy route).

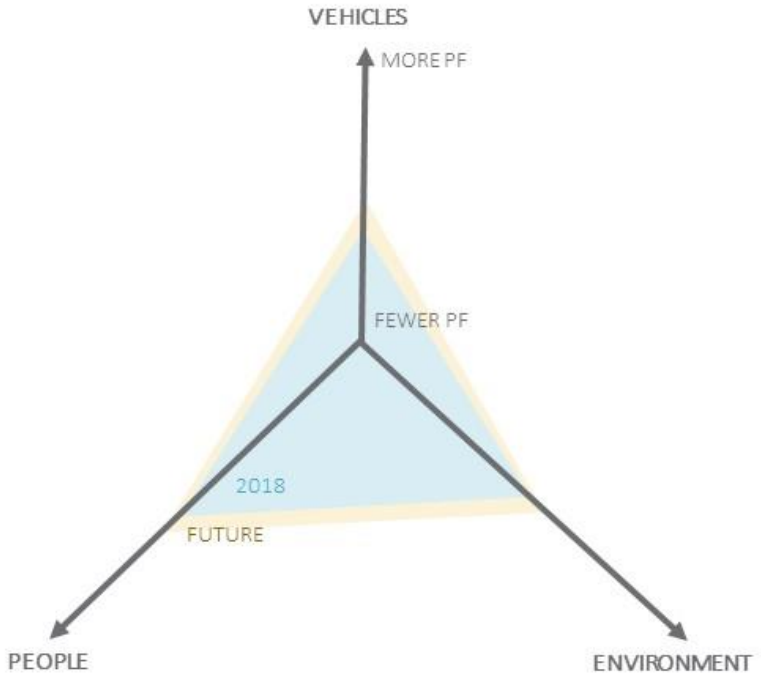
Tasks:
- Personnel movement around the orchard.
- Inspection of crop from under canopy.

Light Vehicle Systems used
- Side-by-side. Three Polaris Ranger (modified rollover protective structures to fit under the canopy).

Use of contractors
- Yes. No permanent staff other than owners.

USE CASE: MEDIUM-LARGE ORCHARDS WITH STEEPER TERRAIN

Tasks: *Personnel movement and under-canopy work*
Light Vehicle System: *(modified) side-by-sides (SBS)*
Protective Factors (PF) are positive actions that build a more resilient Safe System involving small vehicle use



Vehicles

- Research done into options. Currently feel they have the best vehicle for the job.
- Trailer size limited to small ones – not car size.
- Policies extend to barring contractor vehicles that they deem unfit for the terrain. Quads not allowed.

FUTURE PLANS

- Maintain awareness of market to ensure they have the best vehicles for the jobs.

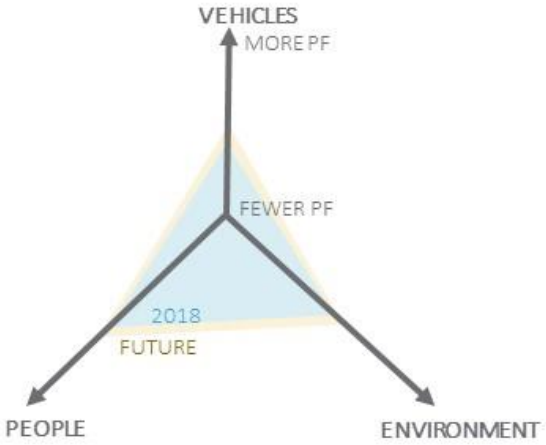
Environment

- Recognises that small growers with full time work away from the property need to be providing an even safer Metaled roads for all fruit movement lines. Smoothness maintained to reduce wear and maintain stability.
- Don't weed spray much (less than five hours in last two years) as the extra vegetation reduces soil run-off and provides extra traction for vehicles.
- Designated danger areas marked.

FUTURE PLANS

- Signage at orchard corners where drivers may not see other approaching due to shelter belts blocking view

USE CASE: MEDIUM-LARGE ORCHARDS WITH STEEPER TERRAIN



People

- Awareness that no matter whether steep or level there is always something changing that requires extra thought.
- Used to working on slopes and so have practices developed to allow for this and work with it, for all tasks concerned.
- Vehicle training comprehensive.
- Training on this site, and emphasises engine braking for the steep site sections. Also protection of the grass banks to minimise erosion onto the tracks..
- Policy of high levels of supervision, especially around picking areas as pickers are less familiar with the systems and vehicles.
- Protocols policed.
- Daily briefing and specific brief to the blocks being worked.
- High awareness of the need for extreme care and slow speeds where slope and camber combine on descending corners.
- Full induction training.
- Online site visitor app system (Zero Harm).
- Polaris use only for family and two contractors that have done the two day training
- Communications approach prioritises regular face to face contact – don't rely on technology.
- Speeders made to walk.
- Induction to site includes risk from vehicle-vehicle incidents such as on headlands at orchard corners.

FUTURE PLANS

- Continue to carry out their responsibility to check driver credentials of contractors coming onto the property - even if in a new vehicle that appears suitable. Have they been trained adequately for this steeper site?