Distributive Justice

in the Pursuit of

Agricultural Sustainability

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While there is a trend towards improving agricultural sustainability, the implementation and uptake of sustainability initiatives will be facilitated if burdens imposed on those expected to participate are perceived as fair. In order to judge whether the distribution of benefits and burdens of agricultural sustainability improvement is fair, there needs to be clarity around which principles can be plausibly used to judge fairness in the context of sustainability enhancement. The research sought to understand how New Zealand agricultural enterprises conceptualise equity or fairness concerns surrounding environmental enhancement. A vignette survey method was used to elicit views on fairness in different distributive justice vignettes. The results suggest that farmers often prioritise fairness concerns over productive efficiency concerns. It was found that in the interest of equity, a grower who was seen to be struggling financially should receive lower environmental improvement targets. Conversely, additional burdens were allocated to a grower who contributed little effort to improving his environmental performance. In contrast to the arguments of many distributive justice theories, the respondents did not give additional support to a struggling grower whose adverse circumstances were caused by events outside of his control. The thesis demonstrates that farmers are sensitive to distributive justice concerns, and that these concerns could have an important role in the development of successful sustainability assessment initiatives. It also highlights the importance of studying equity concerns in a specific context and challenges both the reliance on theories of distributive justice, and the generalising to real world distributive justice challenges of justice research undertaken with student samples. The thesis progresses distributive justice and social choice literature through the application of theoretical principles of distributive justice to a real-world scenario with a practitioner sample. In doing so, the thesis provides insights on the applicability of theoretical notions of fairness to the construction of an effective sustainability assessment initiative.

Keywords: distributive justice, sustainability assessment, environmental indicators, target setting, social choice, fairness

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Unlike the people I have already mentioned, my family played no part in the preparation of this thesis and distracted me from it at every opportunity. They have yet to develop any interest in economic philosophy and know nothing of social choice theory. Furthermore, their lack of knowledge in these areas does not appear to worry them at all. Nevertheless, I would like to dedicate this thesis to Utako and Mizuki.

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Chapter 1

Introduction

Over the past three decades, the world has witnessed growing scientific and social concern about sustainable development. Rapid technological progress and increasing population densities have created intensive agricultural enterprises that have led to a range of sustainability concerns (Filson, 2005; Tayleur et al., 2017; Weiner, 2017). Alongside the benefits that have been achieved through modern agriculture lie a number of issues that threaten inter and intra-generational sustainability. The modernisation of agriculture has contributed to increased pollution, landscape degradation, and deepened regional disparities (Andreoli et al., 1999; Power, 2010).

In New Zealand, farmers are facing a growing challenge to supply food to global markets while meeting societal expectations around environmental impacts, and the need to sustain the local landscapes from which the products are sourced (Swaffield, 2014). The prominent role of agriculture in the New Zealand economy has, however, led successive governments to favour collaborative and voluntarist approaches to promoting sustainability, rather than implementing environmental policy at a national level, for rural land and resources (idem).

Many agricultural sectors and enterprises in New Zealand are pursuing their own voluntary sustainability initiatives which go beyond, or pre-empt, policy interventions (Hunt, 2014a). The search for practical solutions to enhancing sustainability requires both a farm-level focus complemented with a view towards developing appropriate social and economic policies at regional and national levels (Hunt, 2014a). Farm-level sustainability assessment is increasingly being promoted as a tool to address the challenge of agricultural sustainability. However, farm-level sustainability assessment in New Zealand is still a relatively new concept, and as such, presents multiple challenges which have yet to be adequately addressed. Determining critical sustainability thresholds, establishing sustainability indicator targets, and benchmarking farmers' sustainability performance are examples of some of the challenges of farm-level sustainability assessment which are growing in saliency (Whitehead et al., 2016).

The incorporation of sustainability ideals into policy and practice is routinely criticised as being inadequate (Benson & Craig, 2014). Global climate change negotiations serve as an illustration of the collective desire to address sustainability concerns, as well as the barriers to progress faced. At the centre of climate change negotiations, and other sustainability concerns, is a debate on equity and

fairness implications of the burdens imposed by sustainable development (Dannenberg et al., 2010). Just as the adverse effects of environmental and social issues are distributed unequally amongst society (Agyeman, 2008), so too can be the burdens of mitigating these effects. Perceptions of fairness in the allocation of the burdens associated with sustainable development can influence the viability of a sustainability proposal (Carlsson et al., 2011). While fairness and equity concerns in international climate change negotiations have been reported extensively in the academic literature (see Cai et al., 2010; Dannenberg et al., 2010; Dellink et al., 2009; Füssel, 2010; Gampfer, 2014; Gupta & M Bhandari, 1999; Ikeme, 2003; Lange et al., 2010), the relevance of equity and fairness in sustainability initiatives at lower spatial levels has received less attention.

The implementation of a successful sustainability initiative relies on the acceptance of those who are required to implement it (Veisi et al., 2016). If the participants in this process do not consider the sustainable development burdens they receive to be fair and equitable, they may be less likely to willingly accept the sustainability initiative (Vaillancourt, 2004). Developing an understanding of the axioms (or principles) which influence how farmers believe sustainability burdens could be equitably distributed has the potential to aid the creation of sustainability policies or initiatives that can achieve their objectives and garner the support of those expected to implement them.

Multiple ethical questions arise when considering how sustainability initiatives should be constructed. What influence should a farmer's personal circumstances have on the levels of burdens she is allocated? How should levels of responsibility be accounted for? Does it matter if responsibility is intentional or unintentional? Does equity require trading off efficiency in sustainability initiatives? The literature contains two major strands of enquiry which address these types of questions. One approach is descriptive and seeks to explain how opinions in society are distributed amongst various social groups. The descriptive approach views justice as a social construct which is time and culture dependent and therefore, impossible to universalise (Gaertner & Schokkaert, 2012). The other approach is normative which puts forward and analyses different rational arguments about the nature of distributive justice. This thesis follows a welfare economic and social choice theory interpretation of distributive justice which fits among the normative approaches. This path of enquiry can be seen as a form of applied ethics (Gaertner & Schokkaert, 2012) which aligns closely with a normative approach.

A normative approach is not descriptive in that it does not seek to anticipate the actual behaviour of people, but rather, it seeks to explore the ethical notions held by groups of people. It is people's expressed sentiments that are the primary guide in normative theories of justice, rather than

revealed sentiments, which are more readily influenced by strategic, political, and other considerations (Bar-Hillel & Yaari, 1993). A normative approach to distributive justice explores arguments valid for defining a just situation. This thesis provides an enquiry into sentiments related to the just distribution of environmental mitigation burdens amongst a group of New Zealand farmers. In doing so, the intention is to establish a set of axioms which can guide the development of environmental mitigation initiatives which better align with the distributive justice sentiments of farmers. This in turn has the potential to enhance the uptake and operation of farm-level sustainability interventions.

The New Zealand Sustainability Dashboard project (NZSD) is a six-year research project that is developing sustainability assessment and reporting tools for New Zealand primary industries. The NZSD is working to establish benchmarking and target-setting systems to help agricultural enterprises better understand their sustainability performance. Equity concerns around benchmarking and target setting have been raised by NZSD participants who feel that they face unique conditions, (e.g. geographic, climatic, or financial), which mean a direct comparison of their performance against other growers is unfair. Gaining insights into what constitutes a fair distribution of sustainability burdens is essential for ensuring that practical sustainability targets are well accepted by those expected to meet them (Carlsson et al., 2011). A central aim of the thesis is therefore; to develop an understanding of what underpins notions of fairness amongst New Zealand farmers. The thesis investigates New Zealand horticulturalists' conceptions of justice to build an understanding of which burden-sharing arrangements are considered most acceptable, and which conditions influence the participants' conception of fairness. The findings from the research have practical implications for the establishment of sustainability benchmarking and target setting systems being developed by the NZSD through tailoring those systems to the farmers deeply held beliefs on fairness.

Yaari & Bar-Hillel (1984, p. 2) describe the distributive justice challenge as follows: "given that a distribution of some entity [e.g. environmental mitigation burdens] is going to take place, what are the rules which ought to govern the manner in which this will be done?" A range of distributive justice theories exists which posit different sets of rules to guide distributions. There has been extensive debate about the relative merits of different normative theories of justice (see Ballet et al., 2011 ; Remig, 2015), however four theories have received particular attention in regard to sustainability concerns: egalitarianism, a Rawlsian theory of justice, desert based theories of justice, and utilitarianism.

Egalitarianism provides one of the simplest distributive justice mechanisms (Cappelen et al., 2005b). The principle requires absolute equality and states that every person should have the same level of material goods and services. Strict egalitarianism does not hold people responsible for any of the factors determining production (Cappelen et al., 2010). The maximin mechanism proposed by Rawls (1971) regulates inequalities and only permits inequalities that work to the advantage of the worst-off. Rawls (1971) argued that "[s]ocial and economic inequalities… are to be to the greatest benefit of the least advantaged members of society" Desert based principles of distributive justice respond to the view that people deserve economic benefits resulting from their actions (Feinberg, 1970). While there are a number of different welfare functions relevant to distributive justice, the majority of philosophical and economic concern has been concentrated on utilitarianism. Utilitarianism is a welfarist principle popularised by Bentham (1879) that can be used to rank social alternatives according to their 'goodness'. Justice from a utilitarian standpoint is ultimately a matter of maximising the sum total of human happiness (Williams & Cookson, 2000). Utility can be understood as an index of individual lifetime wellbeing, for a fixed population (Blackorby et al., 2002). Unlike a Rawlsian theory of distributive justice, utilitarianism is not concerned with the distribution of any fixed total utility. Equity is imparted through utilitarianism by giving equal weight to each individual's happiness.

The research sought to address two primary research questions which investigated the relationships between horticulturalists perceptions of fairness and different distributive justice theories' moral arguments for fair distributions. The first research question asked:

RQ1. In the absence of contextual information which explains why one person is more efficient than another, how do horticultural stakeholders' perceptions of fairness align with theories of distributive justice?

Formal theories of justice need to account for the moral intuitions held by those who could be affected by them (Schokkaert & Overlaet, 1989). The research sought to progress the practical applicability of distributive justice theories for the challenge of agricultural sustainability through improving an understanding of farmers' alignment to different justice theories. The second research question built upon the first to explore the role of contextual information in explaining differences in the productive efficiency of two farmers, and investigated the subsequent effect on fairness perceptions that contextual information provision had. The second research question asked:

RQ2. When presented with contextual information which explains why one person is more efficient than another, do horticultural stakeholders' perceptions of fairness change, and how are their responses predicted by distributive justice theories?

Each of the major theories of justice drawn on by the research is based on one or more principles of justice (Adams, 1965; Bentham, 1879; Dworkin, 1981a; Feinberg, 1970; Nozick, 1974; Rawls, 1971; Sen, 1973). These principles of justice formed the basis for constructing the contextual information which was provided to the participants to explain differences in productive efficiency between two growers. The provision of this contextual information is predicted by multiple theories to influence the fairness of a given allocation. The research sought to understand the effects of this information provision, and the relevance of different justice theories to the given distribution challenge. Addressing this question has the potential to better understand both the applicability of different distributive justice theories to agricultural environmental challenges, as well as help guiding the development of agricultural environmental policies which could enhance the perceived fairness of environmental initiatives for agricultural stakeholders.

The research followed an empirical social choice approach to answering the research questions and was conducted through a vignette questionnaire, which is recognised as being well suited to gathering information on moral intuitions and ethical opinions (Faravelli, 2007). A vignette is a short hypothetical scenario, which is presented to participants in order to reveal their perceptions, values, social norms, or impressions. The main advantage of vignettes is that they allow contextually rich circumstances, analogous to real world situations, to be presented to participants (Konow, 2009). Goldstein & Weber (1995) show that this contextual richness has a significant positive impact on the ability of people to solve problems in comparison with a problem presented in an abstract form. The research sought to understand farmers' perceptions of justice in a fictional distributive justice challenge which closely mimics real world issues they are facing. A fictional situation was used to reduce the effect of biased views on fairness held by individuals, which have been shown to affect allocations of resources (Babcock & Loewenstein, 1997).

The thesis is structured as follows; context for the research is provided by Chapter 2, which discusses the challenge of sustainability and its equity implications. A key aim of the thesis is to understand how fairness concerns can be accounted for in initiatives to improve agricultural sustainability. The proposed research takes an economic perspective on the inter-related issues of sustainability and equity. The capitals theory approach to sustainability is discussed alongside the role of inter and intra-generational equity in sustainability. The research focuses on intra-generational equity, which

has been shown to influence sustainability (Boyce, 1994; Boyce et al., 1999; Neumayer, 2012; Stymne & Jackson, 2000), yet has received less attention than the more commonly discussed intergenerational equity (Neumayer, 2012). A case study on international climate change negotiations is used to illustrate the central role that equity concerns have in sustainable development.

Chapter 3 provides the theoretical basis for a discussion of intragenerational equity and distributive justice. Chapter 3 begins with an exploration of the philosophical concept of distributive justice, which is central to equity concerns. Different theories and mechanisms of distributive justice are categorised into three primary groups and discussed. Following this, an outline of social choice theory is provided. Social choice theory provides for an analysis of collective decision-making which attempts to connect the values or opinions of a given group of people to derive a collective verdict. Social choice theory acts as a bridge between normative conceptions of distributive justice, and the distributive justice perceptions of a group. Through the aggregation of the preferences of individual members of a group, social choice theory seeks to create social preferences which reflect its general opinion or will (Gaertner, 2009). In this way, social choice theory provides a framework for eliciting normative insights on distributive justice sentiments from a diverse group of people.

Chapter 4 expands on the theoretical base established in the previous chapter. Three different distributive justice principles that are often used to justify inequitable distributions are presented. The three principles are responsibility, need, and efficiency. Each of these three principles can affect an individual's perceptions of the fairness of a distribution (Faravelli, 2007). Each of the principles discussed is related to major theories of distributive justice; however, each provides a different and sometimes incompatible view of fairness. Having established the three key distributive justice principles, the case of international climate change negotiations is used to illustrate the practical implications of fairness concerns in a sustainability challenge. The case of international climate change negotiations also serves to highlight both the difficulty and need for gaining a greater degree of consensus on fair mechanisms for distributing the burdens of sustainability. Chapter 4 ends with a discussion on impartiality and personal bias in distributive justice research. In order to understand an individual's perception of the fairness of a situation, it is often considered necessary to eliminate any personal biases they may have (Aguiar et al., 2013). Therefore, different impartiality inducing mechanisms are explored, which can be used to reduce an individual's personal biases so that they can pass fair judgement on a distributive justice problem.

Chapter 5 presents the research methodology. The research sought to address two primary research questions. The first was to develop an understanding of the participants' sentiments on distributive justice in a sustainability context. The second was to determine the effect of different distributive justice principles on the participants' perceptions of fairness. Several different methods used to conduct distributive justice research are considered before the use of a vignette survey is deemed most appropriate to the needs of the thesis. A vignette is a short hypothetical scenario, which allows participants to be presented with contextually rich information to help them make informed choices. The use of vignettes within an empirical social choice framework allows for the reduction of a complete ethical theory to its constitutive building blocks. In this way, it can make complex philosophical concepts more accessible, and allow an exploration of peoples deeply held ethical values.

Chapter 6 presents the results and discussion from the research. After providing a descriptive analysis of the response and demographic data, the remainder of the chapter addresses the two primary research questions. The findings both support and challenge established conceptions of distributive justice and provide insights into the fairness perceptions of New Zealand horticulturalists which can be used to establish a set of axioms to guide sustainability assessment initiatives.

Finally, Chapter 7 presents the conclusions from the research, the policy implications for farm-level sustainability assessment initiatives, the limitations of the research, and suggestions for future research.

Chapter 2

Sustainability, Agriculture, and the Importance of Equity

2.1 The Challenge of Sustainability

Globally, social–ecological systems are challenged by a range of issues including the over exploitation of natural resources, the degradation of ecosystems, wealth inequalities, climate change, and human conflicts, amongst other serious issues (Brandt et al., 2013). These challenges are interconnected and pose a threat to the sustainability of society (Kates & Parris, 2003; Rockstrom et al., 2009). The environment has long been viewed as something external to humans, as a resource to be exploited, with a few of the most special areas given over to wilderness or parks (Hopwood et al., 2005). Humanity has often held to a Promethean view (Dryzek, 1997) that technology could provide a solution to all problems, including environmental ones. The concept of sustainable development arose from a weakening of this position and a growing awareness of the links between human actions and environmental impacts, and the threats those impacts posed.

The modern idea of sustainability can be traced to debates that took place in the 1970's, particularly through a report, 'The Limits to Growth', published by the Club of Rome in 1972, as well as the United Nations Conference on the Human Environment also from 1972 (Egelston, 2013). Following these early developments, a report from the World Commission of Environment and Development (WCED), Our Common Future, commonly referred to as the Brundtland Report, placed sustainable development at the forefront of discussions around the nature of growth (Bomberg et al., 2006; Brundtland, 1987; Holden & Linnerud, 2007). The Brundtland Report defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own need" (Brundtland, 1987, p. 41). A central contribution of the Brundtland Report was the explicit connections made between human development and the need to maintain environmental carrying capacities across and within generations (Kates et al., 2005).

Explicit recognition was given to the multifaceted nature of the sustainability challenge including natural limits of the biosphere, the influence of technology, social and political structures, and the imperative of growth. The Brundtland Report helped to reemphasise a notion that, rather than having dominion over the environment, human society was a part of the environment, and dependent on its condition (Giddings et al., 2002). Additionally, the Brundtland Report also

attempted to clarify the relationships between local and global issues, demonstrating the need for international cooperation to avoid relocating problems from one location to another. Environmental problems can threaten health, livelihoods, lives, and future generations (Hopwood et al., 2005). In recognition of the perceived failure of much mainstream economic policy to provide for human wellbeing and international prosperity (Sachs, 1999), the Brundtland Report called for a different form of growth. The Brundtland Report argued that patterns of past growth have damaged the environment and led to a "downward spiral of poverty and environmental degradation". This position led the Bruntland Report to call for "changing the quality of growth, meeting essential needs, merging environment and economics in decision making" (Brundtland, 1987, p. 49).

The new vision of growth proposed by the Brundtland Report emphasised human development and equity, with a view towards eliminating poverty, meeting human needs, and ensuring everyone has fair access to resources (Hopwood et al., 2005). The Brundtland Report was however, subject to almost immediate criticism. The term 'sustainable development' and its associated definition were seen by some to be vague and oxymoronic (White, 2013); how can something develop if it also to remain stable (i.e. sustainable)? Despite sustained criticism, the general concept of sustainability as presented by the Brundtland Report has persisted. Costanza and Patten (1995) argue that much of the criticism of sustainable development is misdirected as it fails to account for interrelationships between time and space, arguing instead that sustainability cannot be understood by way of definition alone, but instead, can only be measured ex-post over a defined period.

Most definitions of sustainability contain elements of equitable distribution, scale, and efficient allocation of resources (Costanza & Patten, 1995). Definitions of sustainability can however, provide for a very broad list of components to be sustained including amongst others: societal characteristics (dignity, peace, health, equity, etc.), ecological services (climate, clean air, land productivity, fresh water, etc.), and human values (freedom, tolerance, respect for nature, etc.). Kates et al. (2005), using the Brundtland Report as a reference, splits many of these components into two categories based on those that are to be sustained (nature, life support systems, community), and those that are to be developed (people, economy, society). The term sustainability can mean many different things to a variety of constituencies, despite each respective definition expressing somewhat similar sentiments.

It is unlikely that a mutually agreeable, succinct definition of sustainability will be arrived at any time soon (White, 2013). On this point, Daly (1991, p. 248) wrote early on in the debate over a sustainability definition that, "Lack of a precise definition of the term 'sustainable development' is

not all bad. It has allowed a considerable consensus to evolve in support of the main idea that it is both morally and economically wrong to treat the world as a business in liquidation". The debate over definitions of sustainability is a constructive dialogue that has helped to better elicit the challenge that sustainability poses.

The multifaceted and often contested concept of sustainability (Jamieson, 1998) reflects several distinct concerns and potential solutions. While over four decades has passed since The Limits to Growth was written, sustainable development is still faced by the challenge of translating concept to action. Sustainability research is growing increasingly interdisciplinary and is better identified by the challenges it studies rather than the disciplines it involves (Aronson, 2011; Bettencourt & Kaur, 2011; Brandt et al., 2013). Developments have seen a shift away from seeking to better define sustainability, towards developing practical tools and approaches that can convert the goals of sustainability into specific actions and determining whether any real progress is being made towards them (Agyeman, 2008).

One of the primary areas of focus for this shift towards developing practical approaches in the pursuit of sustainable development is within agricultural systems. Agriculture is one of the dominant forces behind many environmental, and wider sustainability threats, including biodiversity loss, climate change, and the degradation of land and freshwater (Foley et al., 2005; Power, 2010), and is therefore an important focus for sustainability research.

2.1.1 Agricultural Sustainability

Approximately 815 million people are chronically undernourished (WHO, 2017). Concurrently, increasing demands on agriculture and natural resources are degrading land, water, and biodiversity on a global scale (Foley et al., 2011). The OECD has stated that food production is required to grow substantially if it is to meet global demand (OECD-FAO, 2010). Other studies have suggested that, based on current consumption patterns, agricultural production would need to double in the next few decades if it is to keep up with population growth, trends towards greater meat consumption, and increases in bioenergy use (Cirera & Masset, 2010; IAASTD, 2009; Pelletier & Tyedmers, 2010). Achieving this increase in food production to supply global markets, while meeting consumer and citizen expectations, and simultaneously maintaining biodiversity and ecosystem services, is a serious challenge (Ehrlich, 2008; Norgaard, 1987; Schmitzberger et al., 2005; Swaffield, 2014). It is argued that agricultural systems will need to improve in all parts of the world if the long-term sustainability of agriculture is to be secured (Altieri, 2018).

As of 2011, 39.5 percent of the earth's terrestrial surface was being used for agriculture (FAOSTAT, 2014). Globally, crop yields have increased (Foley et al., 2011), with the 174 crops tracked by the UN FAO increasing by 28 percent between 1985 and 2005 (FAOSTAT, 2014). For example, oil crops increased substantially in both yield (57 percent) and harvested area (43 percent) for an overall 135 percent increase in production (FAOSTAT, 2014). Average trends can however mask trends in individual crops or crop groups which have important implications for both sustainability and global food supply.

As dietary patterns change, attention is increasingly being devoted to arable land used to produce animal feed, which can subtract from the world's overall food supply, while simultaneously intensifying environmental effects (Foley et al., 2011). Combining croplands devoted to animal feed, with pasture and grasslands, approximately 76 percent of the world's agricultural land is dedicated to raising animals (Foley et al., 2011). While the calories and protein added to global populations from raising animals are important for satisfying food requirements, as well as contributing to food and economic security, a tension nevertheless exists between the production of meat and global food supply.

Harvested area and yield are two of the most important factors to consider for their environmental effects. The expansion of agriculture has reduced natural grasslands by 70 percent, the savannah by 50 percent, temperate forests by 45 percent, and tropical forests by 27 percent (Ramankutty et al., 2008; Ramankutty & Foley, 1999). This expansion has had significant impacts on carbon storage and soil conditions, biodiversity, and habitats (Foley et al., 2005; Steinfeld et al., 2006). Much of agricultural expansion has been in the tropics, which is of significant concern due to the high level of biodiversity and ecosystem services provided by these areas (Gibbs et al., 2010).

The large increase in agricultural yields that have occurred over recent decades have mostly been driven by agricultural intensification (Foley et al., 2011). Irrigated cropland has more than doubled in area since 1960 (Gleick, 2003), while fertilizer use has increased by over 500 percent with an 800 percent increase in nitrogen use (FAOSTAT, 2014; Matson et al., 1997). This trend towards agricultural intensification has resulted in around 70 percent of the planets freshwater being devoted to agriculture (Postel et al., 1996), while simultaneously contributing to water degradation and widespread pollution (Diaz & Rosenberg, 2008; Gleick, 2003; Postel et al., 1996; Vörösmarty et al., 2000). Additionally, agricultural intensification and expansion are both major contributors to climate change, being responsible for 30-35 percent of global greenhouse gas emissions (Foley et al., 2011).

Agricultural production faces challenges on multiple fronts, which will require a transformation of agricultural systems to address. Adequate food and nutrition need to be provided to global populations, distribution and access needs to be enhanced, and food supply will need to roughly double in the next few decades (IAASTD, 2009; Pelletier & Tyedmers, 2010). At the same time, agriculture will need to slow the rate of biodiversity and habitat loss, reduce unsustainable water use, prevent water pollution from agricultural chemicals, and cut greenhouse gas emission by at least 80 percent (Foley et al., 2011). Foley (2011) describes four key strategies that could provide potential solutions to the challenge of agricultural sustainability, they are; stop expanding agriculture; close yield gaps (i.e. improving management strategies to maximise crop yields); increase agricultural resource efficiency; and, increase food delivery by shifting diets and reducing waste. Foley (2011) states that all four of these strategies are required, as no single strategy will be sufficient.

Some have argued that early predications on the impact of climate change suggest that global food supplies could increase (Kaye-Blake et al., 2009). Despite this seemingly positive prediction, much of the increase is expected to be generated by industrial scale agriculture, driven by inexpensive energy from fossil fuels (McKillop & Newman, 2005). This has implications both in terms of contributions to climate change, as well concerns over the arrival of 'peak energy' and subsequent declining supplies of cheap energy. Additionally, many farming practices have negative impacts both on and off the farm through the exporting of pollution, sometimes over large distances (Moller et al., 2008), and the importing of ecological subsidies (Gordon et al., 2008). Therefore, agricultural systems have come to be a significant source of environmental harm (Abberton et al., 2016; Paul et al., 2017; Shaver et al., 2015).

While multiple definitions of agricultural sustainability abound, agricultural sustainability at its core addresses multifactorial environmental, economic, and social outcomes, persistence (the ability of a system to continue over the long term) and resilience (the ability of a system to buffer shocks) (Pretty et al., 2008). Agricultural sustainability is both driven by, and responding to, the values of different stakeholder groups at different scales (Lyytimäki & Rosenström, 2008). It is however, at a farm-level were practical steps will likely need to be taken if the challenge of agricultural sustainability is to be addressed. Agriculture in New Zealand is the largest trade sector, accounting for 72 percent of all New Zealand merchandise exports in 2014 (NZ.Stat, 2016b). New Zealand also has the lowest level of producer support for agriculture in the developed world, making it a highly relevant region of focus for sustainability research (OECD, 2008b).

2.1.2 Agricultural Sustainability in New Zealand

The original inhabitants of New Zealand arrived from Polynesia sometime around the 1300s, bringing with them food-gathering practices, which resulted in widespread landscape changes (McGlone, 1989). Large scale agricultural landscapes however, did not come about until after European contact and settlement, where upon European farming techniques and species were adopted by Maori between 1800 and 1840 at a local scale, and used to supply European settlers in New Zealand and Australia (King, 2003). Agricultural expansion through forest clearance followed from 1865-1915, which established new pasture for meat, wool, and dairy exports, resulting in dramatic landscape change (Swaffield, 2014).

The post Second World War II period was characterised by government interventions and subsidies in farming, which helped expand intensive farming into hill countries, and diversify markets and production (Swaffield, 2014). By the mid-1980s however, this government supported approach proved to be economically unsustainable, resulting in structural economic adjustments to farming, and further intensification and diversification of farming practices, which has continued until the present (PCE, 2004). The New Zealand economy is strongly market driven, and operates with minimal subsidies (Swaffield, 2014). The 'New Zealand Experiment' (Kelsey, 1995) created a regime, which permeated all facets of government. Consequently, the public sector was restructured and reduced, tariffs and economic regulations were reduced, producer support was withdrawn, and many state assets were corporatized and subsequently privatised (Swaffield, 2014). The history and development of New Zealand's agricultural industries has resulted in a sector which makes substantial direct and indirect contributions to New Zealand's socio-economic condition, as well as influencing the state of its environment. Table 2-1 presents New Zealand's top six export commodities, ranked by their total value in the calendar year 2014.

Table 2-1 Composition of New Zealand export commodities 2014

Commodity Category Name	Percent of Total Exports
Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere included	29.4%
Meat and edible meat offal	11.8%
Wood and articles of wood; wood charcoal	7.3%
Fruit and nuts, edible; peel of citrus fruit or melons	3.5%
Beverages, spirits and vinegar	3.2%
Fish and crustaceans, molluscs and other aquatic vertebrates	2.7%
All other agri-food exports	14.2%
All other exports	27.8%
Total	**100%**

Source: Statistics New Zealand 2014- *New Zealand.Stat*, Exports for Overseas Merchandise Trade (fob New Zealand$): Country of Destination by Commodity (HS2).

The agri-food commodities shown in Table 2-1 comprise 72 percent of the value of total commodity exports, with dairy and meat products combined accounting for 40 percent alone. While over the time period from 2002 to 2013 the total numbers of livestock in New Zealand have decreased, by 8.75 million animals, the number of dairy cattle have increased by 1.32 million (NZ.Stat, 2014). Due to the high environmental impacts resulting from intensive dairy farming, this demographic change in livestock populations has important implications for sustainability in New Zealand (Jay, 2007). Of particular concern is the impact of intensive dairy farming on water quality. While during the period from 2002 to 2013, total fertiliser use in New Zealand dropped by 14 percent, the use of nitrogen-based urea fertiliser increased by 63 percent (NZ.Stat, 2016a). The leaching of nitrogen-based fertiliser and nitrate laden animal urine into waterways is a contributing factor to the decline in water quality nationally (Monaghan et al., 2007). Ten year trends in the water quality of New Zealand rivers show that while some indicators of water quality are, on average, improving (e.g. dissolved reactive phosphorus and E.Coli), others are getting worse (e.g. nitrate, and aquatic insects) (MfE, 2013).

In respect to contributions to climate change, New Zealand's greenhouse gas emissions profile differs in comparison with many other developed countries. While CO_2 emissions constitute about 80 percent of most developed countries greenhouse gas emissions, CO_2 emissions in 2013 comprised only 42.7 percent in New Zealand, with 54.8 percent coming from methane and nitrous oxide, largely contributed by agriculture (MfE, 2015). Agriculture is the highest contributor of greenhouse gas emissions in New Zealand. While improvements in the efficiency of agricultural production are decreasing the intensity of emissions, the period from 1990 to 2013 saw emissions in the agricultural sector rise about 14 percent overall (MfE, 2015).

The impact of agricultural expansion into New Zealand's indigenous landscapes has resulted in significant changes in their character (MfE, 2007; Norton & Miller, 2000). Agricultural expansion led to extensive clearance of indigenous forests and scrublands, while the ongoing intensification of agricultural has removed or degraded wetlands and lake margins, and further affected forest remnants (Ewers et al., 2006; Moller et al., 2008). As a result, endemic indigenous vegetation and habitats have been replaced by a small variety of exotic production species, resulting in widespread declines in indigenous biodiversity (Norton & Miller, 2000). Agricultural production dominates land use in New Zealand, accounting for over 60 percent of the countries surface area, particularly on lower altitude, fertile sites, which were once the habitat of much of the country's indigenous biodiversity (MacLeod et al., 2009). The lowland ecosystems of New Zealand have been extensively modified through the intensification of land use (MacLeod & Moller, 2006; Norton & Miller, 2000).

Over the past century, New Zealand has prospered from the mass production of a small number of agricultural products, which have been produced efficiently through intensive farming systems, and supplied to markets in Europe, North America, and increasingly, Asia (Campbell et al., 2012). There is however, a growing awareness amongst consumers on issues of food safety and environmental impacts, which is resulting in corporate responsibility around these issues becoming widespread and expected (KPMG, 2011b). While New Zealand has been undertaking a period of environmental reform beginning in the 1980s (Swaffield, 2014), water quality, and biodiversity in particular have continued to decline, most markedly in rural areas undergoing agricultural intensification (Peters et al., 2015). Alongside growing international awareness of sustainability concerns has been a growing critique of New Zealand's environmental record (OECD, 2017). The significant role of agriculture in the New Zealand economy has however led successive governments to favour collaborative and voluntarist approaches to environmental protection over implementing strong environmental standards, or directive policy at a national level which could affect rural land and resources (Swaffield, 2014). Individual agricultural industries, land managers, and communities have therefore become central to developing and implementing initiatives intended to improve agricultural environmental performance in New Zealand. The performance-based nature of New Zealand agricultural industries provides a useful case study to investigate the potential to pursue sustainability improvements in a relatively voluntarist regime, operating with minimal producer support.

The New Zealand government and agribusiness sector has seen global demand for food as an opportunity to increase the quantity of exports, and to some extent, increase their value, in order to grow the national economy and increase the agricultural industries' profitability (Foote et al., 2015).

For New Zealand to maintain or increase its agricultural income, the food attributes that communities and consumers demand, and are willing to pay a premium for need to be carefully considered (Saunders et al., 2010a). Although most farmers align to a version of a sustainable approach to farming, they display variable levels of commitment (Fairweather & Campbell, 2003). In general, despite a rapid diffusion of environmentally friendly farming ideals in New Zealand over the past few decades, general adoption rates of these practices remain low (OECD, 2008a). Recent trends towards greater monitoring and assessment of agricultural production with sustainability assessment frameworks suggest, however, that a greater emphasis is being placed on the need to monitor agricultural sustainability and to demonstrate sustainable performance (Hunt et al., 2013; SAFA, 2014; SAI, 2013; TSC, 2016). The horticulture industry is particularly relevant to agricultural sustainability as growers are intense resource users across relatively small areas of land (Lea-Cox et al., 2010).

2.1.3 Sustainability in the New Zealand Horticulture Industry

There are significant complexities across different primary sector industries, which favours examining sustainability in industry specific contexts. Horticulture is an example where the basic concepts of sustainable agriculture apply (Lal, 2008). For example, Granatstein & Kupferman (2006, p. 296) describe sustainable horticulture as "to support and enhance biological interactions, the extent to which this can be achieved being influenced by economic and social factors".

The New Zealand horticulture industry is worth approximately $4billon and produces a wide variety of products from more than 100,000ha of land (De Silva & Forbes, 2016). Many of the growers have annual sales turnover of less than $100,000, with approximately 10 percent of the growers producing 90 percent of the industry's output (De Silva & Forbes, 2016). This divide between a between a large number of small producers and a small number of large producers is a characteristic of many New Zealand industries.

Horticulture New Zealand is an industry association representing the horticulture industry (www.hortnz.co.New Zealand). There are 22 different product groups affiliated with Horticulture New Zealand: blackcurrants, kiwiberries, potatoes (including seed potatoes), feijoas, avocados, pipfruit, citrus, summerfruit, passionfruit, vegetables, tamarillos, kiwifruit, nashi, olives, persimmons, kabocha (pumpkin squash), processed vegetables, strawberries, boysenberries, tomatoes, asparagus, and blueberries.

Horticulture New Zealand is funded through grower levies collected at the point of first sale by exporters, processors, wholesalers, and supermarkets. Additionally, each grower pays a levy to his or her respective product group. This funding goes towards facilitating and raising issues, as well as funding research on matters like sustainability and product specific issues. Growers recognise the importance of sustainability, particularly economic sustainability, but increasingly social sustainability (De Silva & Forbes, 2016). Environmental sustainability is often embedded in the normal farming practices of growers; however, it may not always be recognised as such.

Regulatory instruments to promote sustainability are often unpopular with New Zealand growers, and have been seen as unfair or even inappropriate (Valentine et al., 2007). There are however, multiple regulations that are intended to act as a safety net to prevent environmental damage and maintain social wellbeing. Environmental regulations in New Zealand tend to focus on point source pollution and direct causes of environmental degradation where the impact is evident (Valentine et al., 2007). Increasingly, the horticulture, and other agricultural industries, are adopting self-regulatory practices. Many of these voluntary sustainability or environmental initiatives have their origins in quality assurance requirements imposed by distributors or retailers.

The New Zealand horticultural industry began adopting EUREPGAP, now known as GLOBALG.A.P as a voluntary certification standard in 2003 (Olssen, 2011). This scheme creates links between New Zealand horticultural producers and end users, including many of the major European supermarket chains. While the major emphasis of GLOBALG.A.P has historically been on food safety, it is increasingly covering more indirect environmental and social issues (GLOBALG.A.P., 2015).

EUREPGAP began in Europe as an initiative developed by retailers which belonged to the Euro-Retailers Produce Working Group (EUREP). The intention was to allow for greater oversight of their supply chains as a response to concerns regarding social and environmental impacts from both consumers and producers (Dungen et al., 2011). Consumers' growing concerns regarding product safety, environmental impact and the health, safety and welfare of workers and animals are said to have been the imperative for the creation of a common certification standard (GLOBALG.A.P, 2017). Following the adoption of the GLOBALG.A.P standard, growers were required to comply with a range of audited criteria and management aims such as reducing agrichemical use, and providing an acceptable level of health and safety for workers (Patel, 2003).

Research on the opinions of growers in the New Zealand horticultural industry has found that, while it is not seen as an enjoyable aspect of growing, GLOBALG.A.P certification was accepted as a bureaucratic audit that has to be done (Dungen et al., 2011). Dungen et al. (2011), which focused

specifically on kiwifruit growers, found that growers could be divided into several groups: those who thought GLOBALG.A.P improved the management of their orchards; those who thought it was generally a good thing for the industry to be involved with; those who stated that they only complied with GLOBALG.A.P because they had to; and a small group who were strongly opposed to GLOBALG.A.P on the basis that it was too far reaching (Dungen et al., 2011). Overall, the kiwifruit industry appears to have largely accepted GLOBALG.A.P as a standard part of orchard management practice. However, despite this acceptance, many growers openly challenged any expansion of the certification requirements based on their fairness and validity (Rosin et al., 2007).

The kiwifruit industry, while existing within the New Zealand horticultural industry, also operates as a largely independent industry sector. This is also reflected in their certification programmes. While the wider New Zealand horticulture sector has adopted the GLOBALG.A.P standard and adapted it to the New Zealand context, renaming the adapted standard as NZG.A.P, the kiwifruit industry has created its own certification standard, also based on GLOBALG.A.P but tailored to the kiwifruit industry specifically and renamed ZESPRIG.A.P., ZESPRI being the body representing the kiwifruit sector.

In addition to quality assurance schemes such as GLOBALG.A.P, the horticultural industry has sought to encourage change in orchard management practices through other means. Price premium schemes that rely on financial signals have been a mechanism employed to this end. For example, a scheme known as TasteZESPRI was deployed in the kiwifruit industry which rewarded growers based on the production of dry matter in their fruit, with higher dry matter attracting a higher financial pay-out. Unlike the GLOBALG.A.P based audit, TasteZespri did not provide uniform regulation and benefits across the industry. This more unequal approach to promoting change consequently received a more unfavourable response from the growers (Dungen et al., 2011). Many growers believed it was unfair to base payment incentives on a feature of the fruit that did not have a well-defined set of principles with which to achieve it (Rosin et al., 2007). Rewarding individual growers for achievements that were seen as largely based on luck, or unalterable geographic advantages (or disadvantages), was seen by growers to be unfair, making the TasteZespri approach controversial and contested. A common theme throughout interviews with New Zealand orchardists is that fairness is an important requirement for any initiative intended to facilitate a change in orchard management practices. In developing an initiative that promotes on-farm sustainability, past experience in the horticultural industry suggests that fairness concerns have a large influence of the acceptability, and likely future success of the initiative. This is particularly pertinent as the horticultural industry, under the umbrella of Horticultural New Zealand, and other horticultural

industry sectors such as kiwifruit and wine, are working to expand their quality assurance programmes from being largely focused on environmental issues, towards a much broader range of sustainability concerns.

As the horticultural industry gradually broadens the scope of its market-based assurance schemes towards a wider concept of sustainability it will face an increasingly complex range of issues to address. Sustainability assessment is based on the notion of sustainable development; however, sustainability is a contested concept. The next section provides context for the concept of sustainability which is increasingly being incorporated into on-farm performance assessments.

2.2 Assessing Sustainability Performance

2.2.1 The Capitals Theory Approach to Sustainability

Sustainable development entails trade-offs between the present and the future, and within present generations, particularly around making choices between development or preservation. Economics has a long history of considering trade-offs in resource allocation over time. The broad interpretation of sustainable development provided by the Brundtland report resulted in many different definitions of sustainability being proposed across multiple disciplines throughout the 1980's and 1990's (Stern, 1997). An interpretation of sustainability that rose to prominence in economics during this time was the capitals theory approach to sustainability, which is based on the idea that maintaining a stock of capital over time is a prerequisite of sustainable development (de Wit & Blignaut, 2000).

Robert Solow (1986) built on early work in the literature on economic growth and exhaustible resources in the 1970's, as well as the work of John Hartwick (Hartwick, 1977) to formalize the constant capital rule. The constant capital rule requires a non-declining capital stock over time (Saunders et al., 2010b). The constant capital rule formed the basis of a principal definition of sustainable development used in economics (Pearce et al., 1991; Pearce et al., 1989), requiring non-declining average human welfare over time (Mäler, 1991; Pezzey et al., 1990; Stern, 1997; Toman et al., 1993). Capital stocks can be broadly understood to include human capital, human-made capital, natural capital, social capital, and cultural capital (Stern, 1997).

Natural capital is the aggregate of natural resource stocks that produce inputs of commodities or services for the economy (Stern, 1997). Natural capital can be seen to consist of three main

categories: land, natural resources, and ecosystems (UN, 2008). Human capital can be broadly defined as the knowledge, skills, competencies, and attributes embodied in individuals that facilitate the creation of personal, social, and economic wellbeing (OECD, 2001). Social capital can be understood as a stock of trust, shared values, mutual understanding, and, socially held knowledge (Goodwin, 2003). Social capital differs from human capital in that rather than focusing on the features of individuals, it concentrates on the manner in which individuals interact (Ekins, 2002). Human made capital includes the fixed assets that are used in the production process for more than one year (UN, 2008). It includes machinery, buildings, vehicles, etc., which are commonly referred to as just capital (Stern, 1997). Cultural capital includes the cultural skills and values in a community, which are inherited from the community's previous generation, have undergone adaption and extension, and are seen as desirable to be passed onto the next generation by the community (Dalziel et al., 2009; Saunders et al., 2010b).

Agricultural systems depend heavily on the value of services which flow from the stock of the five types of capital (Pretty, 2008). While there is agreement among many economists that sustainability implies certain indicators of welfare or development are maintained or enhanced over the long term, there are however, opposing views on the degree to which various capital stocks can be substituted for each other (Stern, 1997). Capital theorists can be divided into two primary groups by their support for either weak or strong sustainability.

2.2.2 Weak/Strong Sustainability and Intergenerational Equity

The two primary approaches to sustainability that arose from capital theory in economics are weak and strong sustainability. Both approaches to sustainability aim to leave future generations with a sufficient endowment of capital in order that intergenerational wellbeing can be maintained or enhanced. Where the two approaches differ is in the composition of the different capitals (e.g. human, social, natural, human made, cultural) carried over to the next generations.

Weak sustainability allows for broad substitution possibilities between different capitals, with intergenerational obligations only to leave an undiminished aggregate capital stock. The depreciation in one capital stock can be compensated for by an increase in another. Intergenerational equity requires finding a savings rate large enough to invest in capital formation to offset the exploitation of natural capital and depreciation of artificial and human capital (Solow, 1991). The weak sustainability approach considers the preferences of future generations to be unknowable, and therefore does not place any restrictions on which type of capitals should be preserved or consumed, relying instead on current preferences as the most accurate proxy for

future preferences (Neumayer, 2003). However, some forms of natural capital may have limited potential to be substituted for. An example of this is that there is no technology available, or currently foreseeable, which could regulate the earth's climate. The climate regulating system is a form of capital known as critical natural capital for which substitution possibilities are highly unlikely (Ekins et al., 2003).

A primary difference between weak and strong sustainability depends on how each approach interprets the elasticity of substitution between natural capital and other forms of capital (Neumayer, 2003). Strong sustainability is based on an explicit recognition of the limits to substitution between natural capital and other capitals. Strong sustainability requires that society leave the next generation an undiminished stock of natural capital (Anderson et al., 2012). Broadly, this requires that renewable resources are not exploited below their maximum sustainable yield, and that non-renewable resources are only exploited when they are replaced with investments in capital stocks that will directly offset the loss of the non-renewable capital (e.g. solar technology to offset fossil fuel consumption) (Costanza & Daly, 1987). In contrast to weak sustainability, strong sustainability takes a more precautionary approach to the preservation or consumption of constituent parts of the total capital stock.

Capital indicators have the potential to clarify the measurement of sustainability in a way that is understandable to a broad audience (Saunders et al., 2010b). While the capitals approach can aid the development of practical measures of sustainability, it has some limitations. The constant capital rule does not account for some aspects of sustainability that are seen to be important components (Stern, 1997). Based on the Pearce et al. (1989) definition of sustainability (non-declining average human welfare over time) there is no imperative to maintain stocks of natural resources that do not contribute to human welfare. Another important aspect of sustainability that is not explicitly accounted for by the constant capital rule are intragenerational distributions of resources (Stern, 1997). Sustainability requires both a consideration of resource distributions to future generations (intergenerational sustainability) as well as distributions within present generations (intragenerational sustainability). The capitals approach to sustainability does however establish an overarching vision of sustainability within which intragenerational sustainability can be scrutinised for its contribution to intergenerational sustainability.

The differences in approaches to conceptualising sustainability have not prevented the development of practical tools for measuring and promoting actual sustainability achievements (Van Passel et al.,

2007). The development of these practical tools has been driven by a diverse range of influences on agricultural industries and operations.

2.2.3 Drivers of Sustainability Assessment

Sustainability at the level of an individual farm is a challenging concept to put into practice (Schaltegger & Wagner, 2017). Once the primary domain of large multinational corporations, sustainability assessment and reporting is slowly permeating its way into a range of sectors and industries. Corporateregister.com, which tracks reports from 8,930 companies, shows that the number of sustainability reports rose from 26 in 1992 to more than 6,000 in 2013. All types of entities are coming under increasing pressure to contribute to societal and governmental sustainability goals (Atkinson, 2000).

Multiple voluntary sustainability assessment frameworks and certification schemes have been developed in response to calls for improved sustainability performance. There is a growing consumer expectation for corporate responsibility and reporting around issues of food safety and environmental impacts (KPMG, 2011a). Farmers operating in local and global markets are increasingly required to monitor and measure their management practices in response to not only consumer expectations, but also changing regulatory and certification requirements. There is also a growing awareness in the agricultural sector, much the same as in the corporate environment, that paying close attention to all of a business's interactions with the environment and society can lead to opportunities to improve business resilience. Four of the primary drivers of agricultural sustainability can be described as:

- *Market demands:* Key influences on the marketing of primary products (Saunders et al., 2013), include: the development of agri-environmental policies in export market.; the move towards sustainability in markets driven by the private sector and retailers (e.g., GlobalG.A.P and the Red Tractor Scheme); the change in consumer attitudes and behaviours towards accountability for environmental and social impacts of the products consumers are purchasing and the promotion of sustainable practices; climate change (carbon footprinting); water quality and quantity (water footprinting); protection of biodiversity and wildlife; animal welfare; and the emphasis on local food.

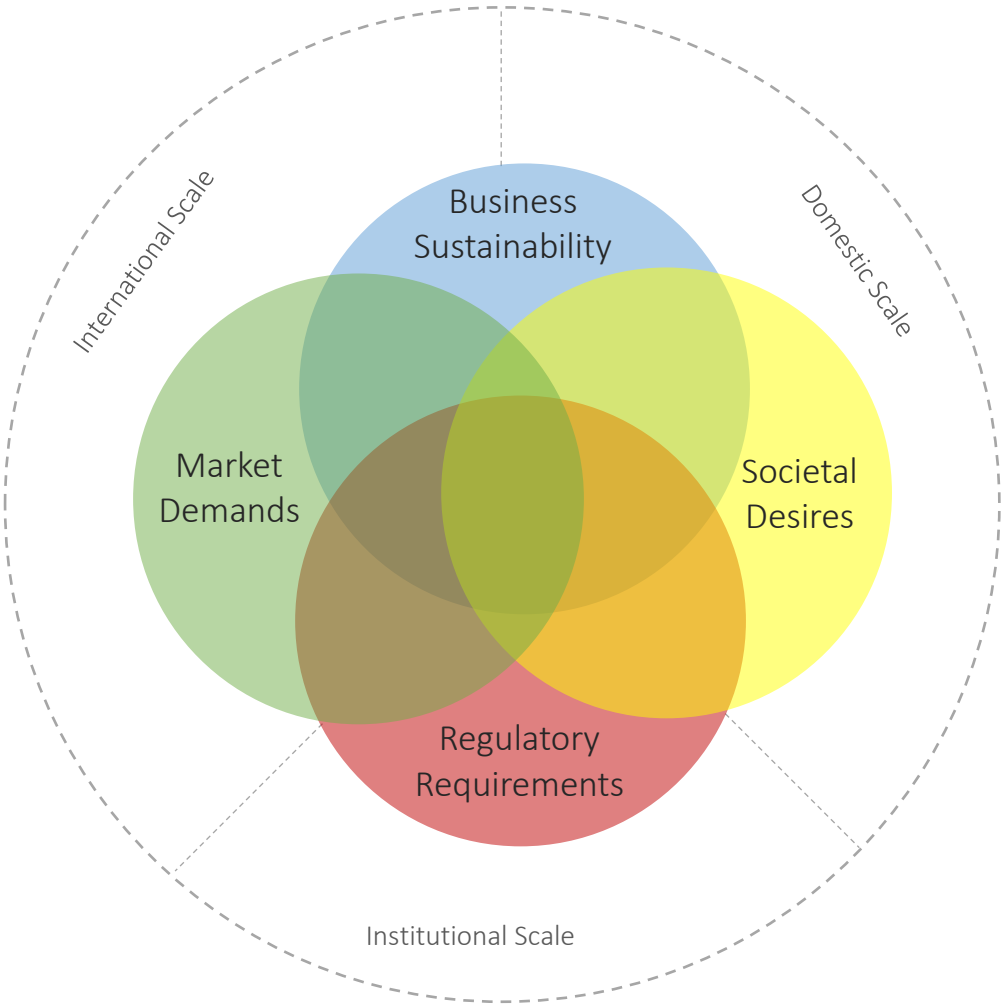
- *Societal Desires:* Wider society presents multiple sustainability concerns that can act as catalysts for changes in consumer behaviour as well as regulations. The values society holds can impact upon agricultural operations in multiple ways (Zasada, 2011).

- *Regulatory Requirements:* Many sustainability frameworks have been developed by regulatory bodies (Sexton & Linder, 2014). These frameworks can cover environmental issues, human rights, employment, animal welfare, company reporting and food quality and safety that cross the economic, social and environmental sustainability dimensions.

- *Business Sustainability*: A business case for sustainable development in agricultural operations can be developed along multiple lines including: generating products with higher consumer value; better risk management; improved work culture; improved owner/worker wellbeing; improved awareness of the business; and improved reputation (Smith, 2008).

Figure 2-1 below illustrates that each of these four drivers of agricultural sustainability overlap with each other in multiple ways and occur at different spatial scales.

Figure 2-1. Four drivers of agricultural sustainability.



In order to operationalise sustainability and address the multiple drivers of sustainability at a farm-level, sustainability indicators are often used. Sustainability indicator frameworks provide a method for the practical assessment of sustainability. They can be grounded in a theoretical basis, such as capital theory, and provide metrics to assess performance against tangible sustainability outcomes.

2.2.4 Sustainability Indicators and Indicator Frameworks

Indicator frameworks have become an increasingly popular way of measuring sustainability. Indicators can be described as "Quantitative measures of progress toward or away from a stated goal" (Parris & Kates, 2003) or simply metrics that are used to describe the "status, trend, or performance of underlying complex systems" (McCool & Stankey, 2004, p. 295). Farrell & Hart (1998) suggest that a good indicator signals a problem and helps demonstrate what needs to be done to fix the problem; however, in practice indicators tend to be more descriptive than analytical (Hezri & Dovers, 2006) and have limited ability to demonstrate solutions to a problem.

Sustainability indicators have been critiqued for several reasons including for measuring what can be measured rather than what should be measured (McCool & Stankey, 2004), and often being narrowly focused on single dimensions of sustainable development (Briassoulis, 2001), failing to adequately account for the multiple feedback loops and pressures of complex systems (Bossel, 1999). Sustainability indicators tend to reveal symptoms rather than causes (Milman & Short, 2008), which can be of limited value when trying to link causes with outcomes, or developing economic and governance responses to sustainability issues.

Multiple indicator-based approaches have been developed that are intended to measure sustainability at a farm-level (Kirner & Kratochvil, 2006; Meul et al., 2008; Rigby et al., 2001; Veleva & Ellenbecker, 2001). The indicators presented within much of the scientific literature on agricultural sustainability tend to be primarily focused on the environmental dimension. This is reflective of the strongly coupled socio-ecological system within which agriculture operates, and partially distinguishes agricultural sustainability from corporate sustainability which can have a greater focus on social and ethical issues (Fortuna et al., 2011). There are multiple challenges to using an indicator framework to measure sustainability in agricultural systems (Kirner & Kratochvil, 2006). Weaknesses in sustainability indicator frameworks can be addressed by developing robust and practical methods for implementing the framework at an end user level. While indicators have been described as, "Quantitative measures of progress toward or away from a stated goal" (Parris & Kates, 2003, p. 573), they are commonly employed without any defined goal, focusing only on trends over time, and therefore have a limited ability to demonstrate sustainability. The definition of

specific targets for sustainability indicators is therefore an important step towards improving their analytic capability.

The New Zealand Sustainability Dashboard (NZSD) is a project to develop practical sustainability assessment, reporting, and learning tools in partnership with several primary industry sectors in New Zealand. Central to the NZSD is a sustainability assessment framework. The NZSD framework draws on internationally recognised sustainability frameworks and their key generic sustainability performance indicators to ensure that overseas consumers can benchmark and verify the sustainability credentials of New Zealand exports (Hunt et al., 2013). The NZSD framework is closely aligned to the Sustainability Assessment of Food and Agriculture systems (SAFA) framework developed by the Food and Agriculture Organisation (FAO) of the United Nations (see SAFA, 2014), while also remaining locally grounded to ensure it is relevant to New Zealand society, ecology, and land care.

The NZSD framework covers the core aspects of primary production industries and their associated operations in New Zealand across four pillars of sustainability; governance, economic, social, and agro-environmental. From the NZSD framework, individual agricultural industry dashboards are being developed with industry specific sets of sustainability indicators. The NZSD tools are provided through the development of multifunctional web applications, which facilitate the uploading of monitoring results from farmers or agricultural producers.

The main purpose of the NZSD is to assist primary production industries, and associated operations, with the management of large amounts of information and complex management decisions. The NZSD is one example of an attempt to translate the high-level goals of sustainability into practical farm-level solutions. The assessment of sustainability however, presents multiple challenges and the development of sustainability indicators has been a topic of extensive debate (Bell & Morse, 2008).

The NZSD was a catalyst for this thesis. Multiple questions have arisen in the project from both researchers and growers about the use of benchmarking in their sustainability assessment. Equity concerns in benchmarking have been raised by growers who feel that they face unique (often geographic or climatic) conditions that mean a direct comparison of their performance to other growers is unfair. This raises questions around the usefulness of direct comparisons between growers in a benchmarking framework, as well as concerns about how a performance benchmark or performance target should be determined. While approaches to sustainability assessment that employ benchmarking have been developed and applied to agricultural sustainability (Figge & Hahn,

2004; Van Passel et al., 2007), there is little empirical research into how benchmarking can accommodate equity concerns.

2.3 Summary of Chapter 2

This chapter has provided context for the thesis. Background has been provided on the challenge of sustainable development where it was described how a range of interconnected socio-ecological issues pose a threat to the sustainability of society. Having discussed broad notions of sustainability, a more specific overview was provided on the challenge of agricultural sustainability. While based directly on broader sustainability concerns, agricultural sustainability poses a unique sustainability challenge of particular relevance for New Zealand. Agricultural production is closely coupled with socio-ecological systems, and the New Zealand economy is in turn highly reliant on agriculture. Each agricultural industry sector faces a unique set of sustainability challenges. The horticultural sector encompasses a diverse array of farm types and was selected as the focus of study for the thesis. The horticultural sector has approached the challenge of agricultural sustainability in multiple ways; however, producer assurance schemes such as GLOBALG.A.P have provided the primary means for assessing and communicating on-farm performance. The horticultural sector is responding to a range of drivers which are influencing a shift in the sector towards higher levels of concern for sustainability performance. A response to these drivers has been the increasing adoption of sustainability assessment practices which can extend the scope of market-based assurance schemes.

In order to provide context for the practice of sustainability assessment, Chapter 2 has first considered different interpretations of what sustainability requires. The capitals approach to sustainability was drawn upon to contextualise some of the debate around the requirements of sustainability. Having established a basis for defining the requirements of sustainability, the discussion then addressed the drivers of sustainability assessment. Four primary drivers were outlined: market demands; societal desires; regulatory requirements; and business sustainability, which are exerting influence over agricultural enterprises. In response to these influences, agricultural enterprises are increasingly turning to sustainability indicator frameworks to provide a system for assessing and communicating agricultural sustainability performance. Chapter 2 discussed the purpose of sustainability indicator frameworks and outlined some of the challenges they pose. One of the foremost challenges is the need to set reference values or targets for addressing sustainability issues. The chapter concluded with a discussion of the role of targets and benchmarks in sustainability assessment. The establishment of reference values presents a critical challenge to the design of a successful sustainability assessment initiative. It is the setting of

reference values in a way that encourages acceptance on the part of the intended participants to the sustainability initiative which is the central concern of this thesis. Underlying expressions of favourability towards a sustainability target is the notion of fairness. Having established the context for the research, the next chapter addresses the theoretical basis for understating fairness and considers also the theoretical basis for an investigation into individuals' perceptions of fairness.

Chapter 3

Distributive Justice and Social Choice Theory

This chapter provides the theoretical basis for the thesis. It begins with a discussion on the major theories of distributive justice. The chapter then explores social choice theory to provide insight into ways that largely philosophical theories of justice may have relevance in a practical application. Social choice theory provides a bridge between theories of distributive justice and the distributive justice perceptions of a group of people. In doing so, social choice theory provides a framework for testing the applicability of different theories of justice to a particular group within a particular context.

The normative foundations for equity concerns in sustainability are often based on philosophical and moral theories of distributive justice, particularly a Rawlsian interpretation of social contract theory (Common & Perrings, 1992; Norton, 1989; Pearce, 1987; Penn, 1990). There has, however, been extensive debate about the relative merits of different normative theories of equity (Ballet et al., 2011; Binder & Witt, 2012; Rauschmayer & Leßmann, 2011; Remig, 2015). Theories of distributive justice address the fair distribution of resources between individuals. Distributive justice is comprised of normative principles designed to guide the allocation of the benefits and burdens of economic activity (Lamont & Favor, 2008). There are numerous mechanisms, or theories of distributive justice that vary on multiple dimensions. One approach to organising different distributive justice theories is provided by Konow (2003) who uses three theoretical categories. The first category, *equality and need*, covers justice theories that incorporate a concern for the least advantaged members of society including egalitarianism and the difference principle. The second category, *utilitarianism and welfare economics,* comprises utilitarianism and Pareto theories that are founded in consequentialist ethics, or the tradition in economics that emphasises consequences and end states. The third category, *equity and desert*, includes desert principles, libertarianism, and equity theory which emphasise proportionality and individual responsibility. The distributive justice theories in each of these categories vary in what matters they consider relevant to distributive justice, who distributive justice should focus on, and the main principles on which distributions should be made. The next section provides an overview of some of the major theories of distributive justice which are of particular relevance to addressing the challenge of sustainability.

3.1 Distributive Justice – Theories and Mechanisms

3.1.1 Equality and Need

Strict Egalitarianism

Strict egalitarianism provides one of the simplest distributive justice theories (Cappelen et al., 2005b). Strict egalitarianism requires absolute equality and states that every person should have the same level of material goods and services. A basic requirement of strict egalitarianism would be that total income be distributed equally between individuals. Strict egalitarianism does not hold people responsible for any of the factors determining production (Cappelen et al., 2010). There are many criticisms directed at strict egalitarianism, particularly around its inability to account for some of the factors affecting the outcome of a person's actions (Roemer, 2002), and its Pareto inefficient distribution of incomes (Carens, 1981). Pareto efficient allocations require that no person can be made better off, without making anyone else worse off (Konow, 2001). Despite the criticism and inefficiency, strict egalitarianism maintains a degree of appeal as a simple conception of fairness.

Luck Egalitarianism

Unlike strict egalitarianism, which is concerned with equality of outcome, luck egalitarianism is concerned with equality of opportunity. It is supported by those who believe that people can be treated fairly without requiring them to have the same material goods and services, so long as they have equal opportunities to obtain them. Ronald Dworkin provided some of the most influential insights in the luck egalitarianism literature (Dworkin, 1981a, 1981b, 2002). Dworkin distinguishes the luck egalitarianism approach by contrasting 'endowments' and 'ambitions'. Ambitions are the choices we make and the results of those choices, such as the choice to work hard, and endowments are the result of luck or factors over which we have no control, such as genetics. Another way to consider these two concepts is in terms of responsibility. Endowments are outside an individual's control and can be considered a type of exogenous responsibility, while ambitions are within an individual's control and can be considered a type of endogenous responsibility.

Dworkin argues that while people should begin with equal resources, they should be able to end up with unequal benefits because of their choices. To control for the influence of natural endowments, Dworkin proposes a hypothetical compensation scheme to benefit those people who have been unlucky in the natural lottery. The compensation of those people with unequal natural endowments was put forward by Dworkin as a response to the inability of Rawls' difference principle (discussed below) to account for specific instances where people have been disadvantaged through no fault of

their own. The role that responsibility and opportunity play in the distribution of economic goods is an important topic and area of debate (Cohen, 1995; Sen, 1988; Vallentyne, 1997).

John Rawls – The Difference Principle

In *A Theory of Justice*, Rawls (1971) argues that the moral and political point of view is discovered via impartiality. Rawls uses the notion of a 'veil of ignorance' behind which no person is aware of their individual circumstances such as age, gender, race, talents, social status, or their idea of what makes a good life. It is also assumed that all people are rational and disinterested in each other's wellbeing. From this position, Rawls argues that two principles of justice will arise. The first is that there must be equal basic liberties for all citizens. The second is the 'difference principle' that regulates inequalities and only permits inequalities that work to the advantage of the worst-off. These two principles are meant to be guidelines for how society should be structured to realise values of equity (Gaertner, 1994).

The difference principle promoted by Rawls has become widely discussed in modern theories of justice, particularly in relation to sustainability (Anderson et al., 2012; Common & Perrings, 1992; Norton, 1989; Pearce, 1987). Rawls proposed the following two primary principles of justice:

1. Each person has an equal claim to a fully adequate scheme of equal basic rights and liberties, which scheme is compatible with the same scheme for all; and in this scheme the equal political liberties, and only those liberties, are to be guaranteed their fair value.

2. Social and economic inequalities are to satisfy two conditions: (a) They are to be attached to positions and offices open to all under conditions of fair equality of opportunity; and (b), they are to be to the greatest benefit of the least advantaged members of society (Rawls, 1971).

The second of these two principles is what Rawls termed the maximin equity criterion, which has come to be known as the difference principle. While strongly based in the concept of strict equality, the difference principle allows for unequal distributions when it is for the benefit of the least advantaged member of society. Rawls' conception of moral equality and the right to resources lends support to the Bruntland definition of sustainable development, which emphasises the need to equitably satisfy human needs across generations (Lamont & Favor, 2008; Pelletier, 2010; Wenar, 2001). The difference principle has come under several criticisms: from a utilitarian perspective for not maximising utility; from a libertarian perspective for infringing on property rights and self-ownership; from a deserts-based perspective for ignoring economic benefits that are deserved by

individuals in light of their actions; and from a luck egalitarian perspective for ignoring luck and responsibilities (Lamont & Favor, 2008). The Rawlsian approach to distributive justice is known as contractarian justice. Contractarian approaches to justice exert a dominant influence in contemporary political philosophy (Sen, 2011), and are prominent in discussions on sustainability (Common & Perrings, 1992).

Contractarian Justice

Contractarian approaches to distributive justice, such as that provided by Rawls (1971), have obtained a high level of saliency in sustainability research, particularly in the formative years in the development of ecological economics (Common & Perrings, 1992; Norton, 1989; Pearce, 1987; Penn, 1990). A reason for this focus on contractarian conceptions of justice is that sustainability presents a unique and complex social coordination challenge (Milinski et al., 2006; Tavoni et al., 2011) which can be clearly articulated with reference to a social contract.

Thomas Hobbes argued that there is a mutually advantageous outcome (avoiding the state of nature) that is only achievable through coordinated behaviour (Hobbes, 1651). The primary motivation for the establishment of a social contract has traditionally been the need to provide public goods that have non-rivalry and non-excludability as characteristic features (Hobbes, 1651; Hume, 1739; Locke, 1669). With these characteristics, the amount of public good or bad provided by an agent is automatically consumed by all other agents involved. Social contract theory is based on the view that a persons' moral and/or political obligations are dependent upon a contract or agreement among them to form the society in which they live (Binmore, 1998) . This is an important consideration for sustainability, which is itself essentially a social contract between present and future generations.

Social contract theory is most closely associated with modern moral and political theory developed by Thomas Hobbes, John Locke, Jean-Jacques Rousseau, Immanuel Kant, and more recently John Rawls and David Gauthier (Baynes, 1989). Contractual models of behaviour underlie the majority of relations and interactions between people. In order to ensure equity in contractual relations, however, principles of justice are required to constrain the contract. A requirement of sustainability is an equitable distribution of resources both within present generations (Brundtland, 1987), and also for future generations and therefore requires some constraints on behaviour.

According to the ‘isolation paradox’, an individual will sacrifice consumption to benefit future generations only if the guarantee exists that others will also do so (Padilla, 2002). Sen (1961) makes

a comparison between transfers to future generations and the prisoners' dilemma, a scenario in which an individual stands to benefit the most through non-cooperative behaviour, while cooperation would lead to more equitable overall outcomes. Sustainability has public good characteristics, as it would be optimal for an individual in an industry that is pursuing sustainability if others invest, while the individual would be better off without investing in sustainability and still reaping the rewards of the industry's efforts (Marglin, 1963).

3.1.2 Utilitarianism and welfare economics

While there are a number of different welfare functions relevant to distributive justice, the majority of philosophical and economic concern has been concentrated on utilitarianism. Utilitarianism is a welfarist principle popularised by Bentham (1879) that can be used to rank social alternatives according to their 'goodness'. Justice from a utilitarian standpoint is ultimately a matter of maximising the sum total of human happiness (Williams & Cookson, 2000). Utility can be understood as an index of individual lifetime wellbeing, for a fixed population (Blackorby et al., 2002). According to utilitarianism, alternative x is said to be better than alternative y, if total utility is greater in x than in y. Unlike a Rawlsian theory of distributive justice, utilitarianism is not concerned with the distribution of any fixed total utility. Equity is imparted through utilitarianism by giving equal weight to each individual's happiness. While there are several different types of utilitarianism, Williams and Cookson (2000, p. 1872) identify three common features:

1. Consequentialism: things must be evaluated in terms of their consequences.

2. Welfarism: consequences must be evaluated in terms of the welfare or utility of human beings.

3. Sum-ranking: the overall evaluation must be based on the sum total of individual utilities in the relevant population.

It is the third point above which highlights the lack of intrinsic concern for the distribution of utilities between people. Utilitarianism requires that utilities must be interpersonally comparable, and cardinally measurable. However, despite criticisms of utilitarianism for its inability to account for the needs of individuals (Rawls, 1971; Sen et al., 1982), the founders of utilitarianism, Bentham and Mills, were strong advocates of redistributing income, health care, and other social goods from the wealthy to the poor (Williams & Cookson, 2000). Redistribution is supported by utilitarianism if diminishing marginal utility of a good is assumed, and if everybody's utility declines in the same way. Utilitarianism can then support redistribution on the grounds that the loss in happiness to the rich

from one less unit of a good will be less than the gain in happiness to the poor from one more unit of the good.

Different types of utilitarianism are distinguishable by how utility is understood (e.g. pleasures or preferences) and how the evaluation unit is defined (e.g. motives for acting or particular acts). Modern interpretations of utility commonly define it as preference satisfaction (Hausman & McPherson, 2009). Preferences can be identified in different ways, such as personal judgements about what is in an individual's interests (Sen, 1973), or through revealed-preference theory, which identifies preferences by choices or hypothetical choices (Binmore, 1998). Utilitarians therefore, promote a distribution that maximises the sum of all satisfied preferences, which have been weighted for the intensity of those preferences. There are several objections to a preference satisfaction view of wellbeing that commonly underlies utilitarian approaches (Hausman & McPherson, 2009). Revealed preferences, which are commonly used to determine utility, are based on an agent's choices. What agents choose may not always be what they prefer, as agents may make mistakes, they may choose when they are unable to rank alternatives, and their choices may be guided by moral principles, which are ordinarily distinguished from preferences (Hausman, 2000).

Despite having faced criticism on multiple grounds (Hausman, 2000; Hausman & McPherson, 2009; Rawls, 1971; Sen et al., 1982), utilitarianism remains an important economic theory of justice.

3.1.3 Equity and desert

Desert-Based Principles

Desert based principles of distributive justice respond to the view that people deserve economic benefits resulting from their actions (Feinberg, 1970). There are three primary features of desert based principles that dominate the literature; people should be rewarded based on their contribution; people should be rewarded based on their effort; and people should be rewarded based on the costs they incur in their work (Dick, 1975; Riley, 1989; Sadurski, 1985).

The concept of desert can be described as a relationship between three elements: a subject (S), a desert basis (DB) which is the grounds on which the subject is said to be deserving, and a desert (D) which is a treatment or state of affairs deserved by the subject (Olsaretti, 2003; Pojman, 1999; Sher, 1987). This relationship can be written as:

S deserves D in virtue of DB.

The *desert* that is deserved by the subject may be positive or negative. Positive deserts include things such as, respect, wages, grades, prizes rights, benefits, or love. Negative deserts include things such as fines, contempt, penalties, onerous obligations, condemnation, or hate. A general categorisation of deserts could be made distinguishing between deserts that are *benefits* and deserts that are *burdens*. In a distributive justice scenario, the subject and the deserts are usually given and uncontroversial. For example, the subject could be a student, and the desert their grades. The most important element of desert-based theories of justice, therefore, is the basis on which deserts are determined. Determining the basis on which a subject is deserving is largely contingent on establishing responsibility in desert (Konow, 2003).

It has been argued that at least some type of responsibility is a necessary condition for all desert (Smilansky, 1996). However, it has also been argued that in some cases it is possible for a subject to qualify for a desert without having any responsibility for the desert base that gave rise to the desert (Feldman, 1996). For example, a driver involved in a car accident for which they were not at fault is deserving of compensation despite not being responsible for the accident. However, this scenario still contains an element of responsibility, although it rests with the other driver.

Smilansky (1996) argues that if a subject suffers misfortune for which they are not responsible, they can deserve some treatment because of their suffering. Others have argued that a person can deserve something in virtue of a certain basis, only if that basis is about the person (Feinberg, 1970). For example, a student is awarded good grades on the basis of academic work they produce. This focus on individual virtue as the site of a desert basis can lead to highly restrictive desertist theories of justice, such as that espoused by Leibniz:

> ...everyone is to participate in the perfection of the universe, and to have personal happiness, in proportion to his own virtue and to the extent that his will has contributed to the common good. (Leibniz, 1697)

Unlike luck egalitarianism, which also emphasises responsibility, desert theories do not make the same distinction between whether the responsibility is exogenous or endogenous, and whether the desert basis is a result of an endowment or luck (Dworkin, 1981a). On a related point, Rawls (1971) criticised desert theories on the basis that desert does not apply in the distribution of natural endowments, the society and position into which a subject is born, or to the inheritance of a particular character that can benefit a person's abilities. The argument progressed by Rawls (1971) is that because undeserved natural endowments and circumstances exert a large influence over who a subject is or what they do, it is not possible to deserve anything. Rawls believes that because these

undeserved endowments and circumstances have a major influence on would be desert bases, desert should have no role in distributive justice (Sher, 1987). The primary objection to desert based principles is that they make economic benefits dependant on factors that are often outside of an individual's control (Rawls, 1971). These factors go beyond poor luck and include all other factors that may affect a person's productivity.

Equity Theory

Unlike the majority of distributive justice theories discussed here, which have their roots in philosophy or normative economics, equity theory originated with the work of sociologists and social psychologists (Adams, 1965; Homans, 1958; Walster et al., 1973). Equity theory provides a theory of justice based on proportionality, a notion first espoused by Aristotle in the fourth Century B.C (Konow, 2003). An equity formula based on the outcomes (O) of two persons, (A and B) and inputs (I) can be written as:

$O_A/I_A = O_B/I_B$

Inputs are the participant's contributions to an exchange and outcomes are the consequences which could be either positive or negative that the participant incurs in the exchange. Equity theory holds that in addition to self-interest, people are also motivated in their social interactions by a desire to create or establish equity by rewarding or punishing others that they perceive to have received a just or unjust outcome.

Despite deriving from a sociological and social psychology context, equity theory has been extensively criticised (Folger, 1986; Leventhal, 1980). A major obstacle to using equity theory to assess fairness is determining what is considered an 'input' (Konow, 2003). Equity theory permits people to employ an input variable they consider relevant to justice. In taking that position, equity theory allows anything to be a principle of justice and is therefore incapable of generating a refutable proposition (Konow, 2003). In order to overcome the shortcomings of equity theory, it became common to merge equity theory with other social psychological theories such as attribution theory (Leventhal & Michaels, 1971).

Libertarian Justice and Nozick's Entitlement Theory

A common thread between many of the versions of distributive justice discussed above is that they all employ the market or public policy to some degree as a means of achieving a just distribution (Sud & VanSandt, 2011). For example, the difference principle relies on public policy for reallocation

to the least advantaged, desert principles use the market to distribute goods according to desert, and utilitarian principles the market it to achieve maximum utility. Libertarian principles however, do not rely on markets or public policy, but instead consider distributive justice to be best determined by the separate just actions of individuals. The libertarianism conception is based on a commitment to private property rights with distributive justice seen as providing the freedom for individuals to pursue their material desires. The libertarian conception of distributive justice is closely aligned to utilitarianism in that it focuses on maximising the sum of individual utilities with little concern for the interpersonal distribution of that sum (Gaertner, 1994). The free market is therefore seen to be just as it is an expression of the sum of individual desires. Any redistributive interventions are seen to be unjust on the basis that they violate an individual's basic right to liberty (Lamont & Favor, 2008). The libertarian conception of distributive justice underlies many of the free market principles of neoclassical economics (Friedman, 1953).

An entitlement claim to justice is made to the effect that a person is entitled to something, from someone, on some basis. While this argument is similar in structure to the desert-based theories of justice, there is an important distinction between entitlement and desert. Where desert is a normative concept, entitlement is an empirical or sociological concept. For example, a student deserves high grades from his teacher because he performed well in an exam. Whereas, a person is entitled to a refund from a store manager for a faulty product because the product was purchased with a guarantee against defects.

Nozick (1974) advocates that a distribution is just if everyone is entitled to the holdings they possess under the distribution. Nozick (1974) provides the following principles to describe justice in holdings:

a) A person who acquires a holding in accordance with the principle of justice in acquisition is entitled to that holding.

b) A person who acquires a holding in accordance with the principle of justice in transfer, from someone else entitled to the holding, is entitled to the holding.

c) No one is entitled to a holding except by (repeated) applications of (a) and (b).

A significant problem with the libertarian approach advocated by Nozick is that it provides no mechanism to redress past acquisitions that were not just and is therefore incapable of evaluating the justice of current economic distributions (Pogge, 1994). The difference principle as advocated by Rawls is seen by some as being a possible mechanism to rectify past injustices (Pogge, 1994).

This section has provided an overview of different theories of justice. These theories of justice underlie investigations into distributive fairness in any situation. The theories were grouped under the principles of fairness that they emphasise. This grouping helps to establish the major principles of fairness which can be distilled from considering the different theories of justice as a collective. Principles of equality, need, utility, efficiency, equity, and responsibility can be seen throughout the different theories, emphasised to a greater or lesser extent. The lack of a unified theory of distributive justice indicates that the importance given to each of these fairness principles is not consistent throughout society. If perceived fairness is to be studied amongst a specific group of people, the analysis of collective decision making is required. Social choice theory provides a theoretical basis from which the diverse views of individuals can be interpreted. The next section provides an overview of social choice theory as it applies to distributive justice challenges.

Table 3-1. Summary of distributive justice theories

Category	Theory	Requirements
Equality and Need	Strict Egalitarianism	Absolute equality and states that every person should have the same level of material goods and services.
	Luck Egalitarianism	While people should begin with equal resources, they should be able to end up with unequal benefits because of their choices.
	The Difference Principle	Inequalities should work to the advantage of the worst-off.
Utilitarianism and welfare economics	Utilitarianism	The sum total of human happiness should be maximised
Equity and desert	Desert-Based Principles	People should be rewarded based on their contribution, effort, and the costs they incur.
	Equity Theory	People are motivated in their social interactions by a desire to create or establish equity by rewarding or punishing others that they perceive to have received a just or unjust outcome.
	Libertarian Justice and Nozick's Entitlement Theory	The just acquisition of private property rights provides the freedom for individuals to pursue their material desires.

3.2 Social Choice Theory

As demonstrated by the preceding discussion, there is no unified theory of distributive justice that could be considered *the* theory of distributive justice. Social choice theory provides for an analysis of collective decision-making which attempts to connect the values or opinions of a given group of people to derive a collective verdict. Social choice theory acts as a bridge between philosophical conceptions of distributive justice, and the distributive justice perceptions of a group. Through the aggregation of the preferences of individual members of the group, social choice theory seeks to create social preferences that reflect its general opinion or will (Gaertner, 2009). As the plethora of distributive justice theories demonstrate, perceptions of fairness are not fixed and can take different forms. Real world distribution challenges raise difficult questions, the foremost question being: according to which rules should a distribution be carried out. Each theory of distributive justice relies on a set of axioms which need to be fulfilled for a distribution to be considered just. Social choice theory aids the discovery of preferable axioms within a specific group which can be analysed alongside the theories of justice which support those axioms. (Yaari & Bar-Hillel, 1984) describe a social choice process which seeks to establish a just distribution amongst a group (Figure 3-1).

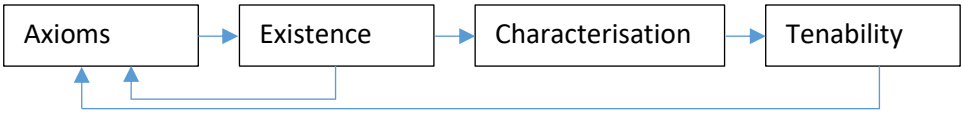


Figure 3-1 Axiomatic approach to distributive justice (Yaari & Bar-Hillel, 1984)

First, a list of properties (axioms) that a distribution mechanism ought to have is drawn up. Theories of distributive justice provide a source of axioms for this purpose. Next, the existence of a distribution mechanism which satisfies all these axioms is examined. If no such mechanism exists, then a revised list of axioms is drawn. If a mechanism which does satisfy all the axioms exists, then an attempt is made to characterise all the mechanisms which satisfy the axioms. Finally, the issue of tenability is raised. The mechanisms must be examined to determine whether they possess any undesirable properties. If the distribution mechanism is found to have untenable properties, the process begins again until an equilibrium is reached.

The process proposed by Yaari & Bar-Hillel (1984) is a iterative process of self-correction intended to arrive at a fair distributive justice mechanism that satisfies a range of axioms. The act of following a self-correcting process to arrive at an equilibrium in distributive justice was described as seeking a

reflective equilibrium by Rawls (1971, pp. 48-51). Both Rawls (1971) and Yaari & Bar-Hillel (1984) argue that a theory of justice, like all theories, should be tested against evidence. Yaari & Bar-Hillel (1984, p. 3) argue that a theory of justice must be tested against "observed ethical judgements or moral intuitions". The tenability of a distribution mechanism therefore relies on its alignment with observed ethical judgements. Evidence gathered through the observation of individuals under experimental conditions can be used as a basis to explore the tenability of different distribution mechanisms, and through them, the theoretical frameworks that promote them. Schokkaert (1998) argues that for normative economics to have real influence on decisions made in a political system, it has to consider the opinions and preferences of its citizens as these determine the social context. Policy proposals require public support and empirical research can provide information on the acceptance of concepts of justice by different social groups that live in different cultural and geographical environments (Gaertner, 2009).

In situations where there is a conflict or a trade-off between efficiency and equity in a distributional challenge, social choice theory can define ethically attractive solutions with an axiomatic approach. Luce & Raiffa (1957, p. 123) provide a summary of this social choice approach:

> ...rather than dream up a multitude of arbitration schemes and determine whether or not each withstands the best investigation? of plausibility in a host of special cases, let us invert the procedure. Let us examine our subjective intuition of fairness and formulate this as a set of precise desiderata that any acceptable arbitration scheme must fulfil. Once these desiderata are formalized as axioms, then the problem is reduced to a mathematical investigation of the existence of and characterization of arbitration schemes which satisfy the axioms.

Gaertner & Schokkaert (2012) argue that the purpose of axiomatic social choice is normative, that is, it can determine which schemes are ethically acceptable, and which are unfair. This perspective was also espoused by Luce & Raiffa (1957, p. 123) which stated:

> By means of a (small) finite number of axioms, we are able to "examine" the infinity of possible schemes, to throw away those which are unfair, and to characterize those which are acceptable. The only alternative - to examine in detail each of the infinity of schemes for each of the infinity of possible conflicts it is supposed to arbitrate - is not practical.

Axiomatic social choice theory can be used to reduce complex ethical theory to its essential parts.

3.2.1 Empirical Social Choice

Empirical insights are necessary to apply theories of justice in the real world (Gaertner & Schokkaert, 2012). Normative theories of distributive justice, such as that put forward by Rawls (1971), aim to be put into practice. However, the implementation of any theory of justice is reliant on the support of the public. The values and preferences of the public will in turn influence their willingness to support a theory of justice. In order to determine the acceptance of distributive justice theories by different social groups through the exploration of social values, empirical research is required (Alesina & Angeletos, 2005). Roemer (1993, p. 166), in discussing how to distinguish between 'effort' and 'circumstance' in a distributive justice context, stated:

> Because the choice by society of these parameters cannot but be influenced by the physiological, psychological, and social theories of man that it has, the present proposal would implement different degrees of opportunity egalitarianism in different societies.

Roemer (1993) recognises the culture dependency of distributive justice theories and emphasises the need to explore intercultural differences in developing theories of distributive justice. Sen (2011, p. 44) offers a similar sentiment when he writes about the essential nature of public reasoning in creating objectivity in political and ethical beliefs:

> … public reasoning is clearly an essential feature of objectivity in political and ethical beliefs. . . . In seeking resolution by public reasoning, there is clearly a strong case for not leaving out the perspectives and reasonings presented by anyone whose assessments are relevant, either because their interests are involved, or because their ways of thinking about these issues throw light on particular judgements — a light that might be missed in the absence of giving those perspectives an opportunity to be aired."

Sen (2011) like Roemer (1993) believes that the opinions held by society are essential for developing a good theory of justice. Empirical social choice typically relies on the use of questionnaires (Gaertner & Schokkaert, 2012). The implementation of questionnaire studies for the purpose of understanding social choice is explored in more detail in Chapter 4.

3.3 Summary of Chapter 3

This chapter has provided the theoretical basis for the thesis as a study in distributive justice and social choice. The chapter began by outlining major theories of distributive justice. Philosophical inquiries into distributive justice have a long history. Multiple theories of distributive justice have arisen, emphasising different principles of justice to a greater or lesser extent. The chapter grouped theories of justice under the principles of justice they emphasise the most. No unified theory of distributive justice exists as principles of justice can conflict. For example, efficient allocations promoted by utilitarianism may conflict with an egalitarian emphasis of equality in allocations. The degree to which different principles of justice are prioritised by an agent is therefore likely to be an indicator of the particular theory of justice they sympathise with.

Developing an understanding of perceived fairness in a particular distributive challenge can be aided by a theoretical framework capable of providing an analysis of collective decision-making which attempts to connect the values or opinions of a given group of people to derive a collective verdict. The chapter turned to social choice theory to provide a theoretical framework appropriate for an investigation into fairness preferences in a distributive challenge. Social choice theory provides a bridge between philosophical conceptions of justice, and the everyday decisions of individuals. The chapter described how social choice theory has been used to establish axioms which need to be fulfilled for a given distribution to be considered just. The chapter concluded with a discussion of empirical social choice which provides a means for obtaining empirical insights necessary to apply theories of justice in the real world. As perceptions of justice are intertwined within a particular cultural context, empirical social choice (grounded within the broader theory of social choice) provides an appropriate basis from which the distributive justice sentiments for a specific group of people addressing a specific distributive challenge can be investigated.

Following on from the broad theoretical discussion provided by this chapter, the next chapter considers in more depth the key principles of distributive justice and their application to real world distributive challenges. An overview is given of the relationship between equity and sustainability and a range of different mechanisms by which equity can affect sustainability are described. International climate change negotiations are used to illustrate the applicability of distributive justice to a major sustainability challenge. The following chapter also considers some of the requirements of conducting distributive justice research and provides a review of the literature on distributive justice studies as they pertain to these requirements.

Chapter 4

Distributive Justice in Practice

The previous chapter provided a broad theoretical basis for the thesis, Chapter 4 expands on this theoretical basis. It has two main parts. The first part draws connections between philosophical conceptions of distributive justice and their practical relevance to applied sustainability challenges. The second part provides a review of the relevant literature for drawing connections between theoretical notions of distributive justice and the application to applied distribution challenges.

The first part of the chapter begins by drawing out the primary principles of justice contained within theoretical interpretations of distributive justice. The establishment of these justice principles provides a framework upon which the fairness of a particular distribution can be determined. The discussion then moves to outlining the relevance of distributive justice to the challenge of sustainable development. Three primary relationships which establish the importance of distributive justice to sustainability are outlined and the relevant literature within each is reviewed. Having established the relevance of distributive justice to sustainability, the case of international climate change negotiations is used to illustrate the relevance of distributive justice to an ongoing sustainability challenge.

In addition to providing an outline of different distributive justice theories, the previous chapter also established social choice theory as a bridging theory between philosophical conceptions of justice and the fairness perceptions of groups of people faced with a distribution challenge. The second part of this chapter further expands on the social choice discussion by outlining specific challenges in conducting social choice research, particularly relating to the need for inducing impartiality in social choice research. The social choice literature is reviewed to provide a discussion of how research has addressed these challenges and provided insights into the distributive justice perceptions of diverse groups of people facing different distributive challenges.

4.1 Distributive Justice and Sustainability

This section investigates the relevancy of distributive justice for the challenges of agricultural sustainability. It begins with a discussion of the key principles of distributive justice which underlie major distributive justice theories. The relevance of distributive justice to sustainability is then outlined, giving particular attention to the challenge of intragenerational equity. International climate change negotiations are then discussed to illustrate the intragenerational implications of

distributive justice decisions on a major sustainability issue. Finally, the role of benchmarking and target setting in agricultural sustainability assessment is presented as a sustainability challenge which presents distributive justice challenges of a related yet different kind to those faced by international climate change negotiations.

4.1.1 Departing from Equality – Distributive Justice Principles

It has been argued that the default mechanism for creating fair distributions is equality, or the notion that all parties should receive equitable burdens and benefits (Ringius et al., 2002). In the case of two individuals, adopting equality as an appropriate distributive justice mechanism would mean that any differences between the two individuals are not regarded as sufficient to warrant a departure from equality. However, when making comparisons between two or more individuals, countries, or any other entities, there will most likely be extenuating or inculpatory circumstances that provide *prima facie* grounds for departing from equality. Distributive justice principles which may provide grounds for a departure from equality have been discussed extensively in both philosophy and welfare economics (Rescher, 1969; Yaari & Bar-Hillel, 1984).

Research has been undertaken in welfare economics, resource economics, and social choice theory to better define and categorise the different distributive justice principles upon which distributive justice theories and mechanisms are based (see Faravelli, 2007; Johansson-Stenman & Konow, 2010; Konow, 2003, 2009; Yaari & Bar-Hillel, 1984). Three broad distributive justice principles can be identified throughout the literature, and also form the foundations of the majority of key distributive justice theories. The three primary distributive justice principles can be described as responsibility, need, and efficiency (Konow, 2001).

Responsibility Principle

Responsibility is a central feature of luck egalitarianism, desert-based theories of justice and libertarian theories. Konow (1996, p. 14) suggests:

> "a person's entitlement or fair allocation (e.g., of income) varies in proportion to the relevant variables which he can influence (e.g., work effort), but not according to those which he cannot reasonably influence (e.g., a physical handicap)".

The distinction between controllable and uncontrollable variables echoes Dworkin's theory of luck egalitarianism which distinguishes between 'ambitions', being the choices we make and the results of those choices, such as the choice to work hard, and 'endowments', being the result of luck or

factors over which we have no control, such as genetics. The distinction is essentially between endogenous variables, which the individual has the ability to impact or influence and exogenous variables, which impact or influence an individual.

The principle of responsibility allows a distinction to be made between an agent's role in causing damage and that agent's moral responsibility for the damage caused (Underdal & Wei, 2015). Responsibility therefore relates directly to an agent's ability to exert control on their circumstances. International climate change negotiations provide a good illustration of the implications of distinguishing between exogenous and endogenous responsibility. For example, if Countries A and B both have the same level of GHG emissions, but Country B has a long history of knowingly contributing significant greenhouse gas emissions whereas Country A does not, then Country B could be seen to have a higher level of responsibility and therefore, be more accountable for reducing their emissions. Konow (2001), like Nozick (1974) and Dworkin (1981a) emphasise that responsibility should only be considered in respect to variables which can be influenced by an agent.

However, the 'Brazilian Proposal' in climate negotiations argues that countries should be considered responsible for historic emissions, despite present day governments having no control over the actions of past governments, and past governments having had no understanding of the adverse effects of GHG emissions (Klinsky & Dowlatabadi, 2009). On the other side of the climate change debate, the USA argues that they should not be responsible for emissions that occurred before the adverse effects of those emissions were known (Ringius et al., 2002). This position would also be supported by Dworkin who makes a distinction between 'option luck', which is the output of an intentional gamble, and 'brute luck', which is the output where no gamble was entered into (Dworkin, 1981b). The development that occurred in countries before the adverse effects of greenhouse gas emissions were known would be considered brute luck by Dworkin, which suggests that any allocation decisions made based on historic emissions would be considered unfair.

Climate change negotiations began around the year 1990, in which the first IPCC report was published, to develop a mechanism to assign responsibility for historical damage to the world's atmosphere. It has been argued in climate change research that, as the responsibilities of individuals within a country vary widely due to power and income inequalities, the best level of analysis for determining responsibility should be individuals, or small entities rather than countries (Newell et al., 2015). Johansson-Stenman & Konow (2010) also discuss the principle of responsibility in relation to climate change; however, they do not consider the ongoing debate over responsibility

occurring between countries and the implications this has for the condition of discretionary responsibility.

Several studies have considered the issue of individual responsibility. They generally conclude that only differences individuals have control over should be included in justice considerations (Faravelli, 2007; Schokkaert & Devooght, 2003; Schokkaert & Lagrou, 1983; Schokkaert & Overlaet, 1989). However, it has also been found that people find it fair to hold others responsible for factors beyond individual control if these factors are considered personal characteristics (Cappelen et al., 2005a). None of these studies however, examines a scenario like that posed by climate change and other sustainability issues. Put in terms of two individuals, this situation could be described as follows: Person A has benefited from actions taken in the past, which were considered legitimate at the time, but are no longer seen to be conducive to the greater good. Person B was unable, due to circumstances beyond their control, to benefit from the same past actions as Person A. Furthermore, due in part to the past actions of Person A, both A and B will have their future opportunities reduced. Sustainability therefore raises a somewhat unique challenge to the concept of discretionary responsibility.

Sustainability issues question whether responsibility should be restricted to only matters in which an individual or country can exert control over. Climate negotiations have shown that in the interests of fairness, countries could be considered culpable for historic emissions over which present day governments had no control, and previous governments had no understanding of the adverse effects. Whether this position applies at the level of an individual has received little attention in the field of sustainability.

The inability of the responsibility principle to fully address historic responsibility concerns surrounding sustainability highlights the need to consider responsibility alongside other distributive justice principles. Nozick (1974) and Pogge (1994) suggest that the difference principle advanced by Rawls (1971) could be applied to overcome some of the weaknesses in other justice theories in regard to historic responsibility. This idea is highly relevant when considering responsibility as a distributive justice principle. The principle of need, on which Rawls' theory of justice is largely based, and which inspires the difference principle, complements the responsibility principle and helps to overcome some of the complexities raised by historic sustainability responsibility.

Need Principle

The satisfaction of needs played an important role in some of the early concerns of economics (George, 1879; Malthus, 1872; Marx, 1875; Smith, 1776), but is given significantly less attention in modern economics, particularly in social preference models where the consideration of meeting basic needs as a motivating factor is largely ignored (Johansson-Stenman & Konow, 2010). Many early economists expressed concern for issues of poverty, and developed theories around how these issues could be addressed within different socio-political systems.

The principle of need forms the foundation of distributive justice theories such as egalitarianism and the difference principle (Cappelen et al., 2010; Rawls, 1971) and provides an absolute standard that must be achieved through any distribution. Multiple studies have found evidence of support for meeting basic needs as a central requirement of distributive fairness (Carlsson et al., 2011; Crumpler & Grossman, 2008; Gaertner et al., 2001; Konow, 2010; Kravitz & Gunto, 1992). However, Konow (2001) finds that while people associate fairness with the satisfaction of basic needs, when needs satisfaction conflicts with other justice principles such as responsibility or efficiency, a trade-off is made by individuals which does not always prioritise need.

The principle of need provides an absolute standard that must be achieved through any distribution. The principle of need implies a threshold below which an entity would not be obliged to accept any burden for addressing an issue. This is evident in the Kyoto Protocol, where Non-Annex 1 countries were excluded from emission mitigation targets (UN, 1998).

The distributive justice mechanism 'ability to pay' advanced in climate change negotiations combines both elements of need and responsibility. The ability of a country's citizens to meet their basic needs essentially places a threshold level on a country's responsibility to mitigate its greenhouse gas emissions. If a country cannot contribute to mitigation efforts without compromising the ability of its citizens to meet their basic needs, they can be considered to have no ability to pay. Lange (2010) finds strong support for the 'ability to pay' mechanism based on a country's gross domestic product (GDP).

Efficiency

The efficiency principle advocates for the maximisation of total surplus and is a fundamental concern of environmental economics, and economics more generally. Fairness and efficiency are often seen to be at odds and trade-offs are required in one to satisfy the other (Johansson-Stenman & Konow,

2010; Okun, 1975). However, efficiency and equity can often be complementary, as is the case where developing countries are treated differently to developed countries in climate change negotiations to ensure the long-term efficiency of developing nations.

Experiments have shown that individuals seek to maximise aggregate social welfare in distributive challenges even if it requires individual sacrifices (Charness & Rabin, 2002; Kritikos & Bolle, 2001; Oxoby, 2013). This suggests that efficiency is not at odds with justice, but instead is a type of justice in itself (Konow, 2003). Oxoby (2013) demonstrates with a voluntary contribution game, that surplus maximisation also affects willingness to cooperate. If people are given the ability to influence the choices of others to ensure overall efficiency, they tend to voluntarily contribute themselves rather than free-ride (Oxoby, 2013). It is common for people to base distribution decisions on efficiency considerations when there is a difference in effort involved, and distribute according to need when abilities are different (Faravelli, 2007). The conflict between efficiency and equity sits at the core of discussions about the fairness of different theories of justice. This debate is often framed in terms of consequentialist theories of justice, such as utilitarianism, that judge the rightness of an act based on its consequences, and deontological theories of justice, like John Rawls' difference principle, which emphasises adhering to ethical obligations and duties.

The search for appropriate equity principles on which departures from equality can be justified has experienced a resurgence of interest in recent years due to the global challenge of climate change, and the associated international climate negotiations (Carlsson et al., 2011; Cattaneo et al., 2010; Dannenberg et al., 2010; Johansson-Stenman & Konow, 2010; Klinsky & Dowlatabadi, 2009; Lange et al., 2010). International climate change mitigation requires that countries commit to reducing their greenhouse gas emissions. The extent to which each country should reduce its emissions is a question of distributive justice as reducing emissions often entails economic burdens. Multiple mechanisms have been proposed by different countries on how the burdens of climate change mitigation can be distributed fairly. The most prominent of these mechanisms are outlined in Table 4-1, alongside the key distributive justice principles they promote.

Table 4-1. Distributive Justice Solutions in Climate Change Negotiations

Distributive Justice Solution	Description of Solution	Key Distributive Justice Principles
Egalitarian	Every individual is given an equal right to pollute and to be protected from pollution. Emission rights distributed on a per capita basis	**Equality** Rights to emit and be protected from emissions are distributed equally regardless of any extenuating or inculpatory circumstances.
Sovereignty	All countries have an equal right to pollute and to be protected from pollution. An equal reduction from current emissions (status quo) is required from all countries.	**Equality and Responsibility** Rights to emit and be protected from emissions are distributed equally, but a country is not deemed to be responsible for its emissions before a chosen base year.
Ability to Pay	The higher a countries ability to pay to reduce emissions, the more mitigation burdens they should adopt.	**Need and Responsibility** The principle of need requires that a country is not obligated to a level of emissions reductions that could threaten its citizen's ability to obtain primary social goods. Similarly, the principle of capability requires that those countries who are able to contribute more should contribute more than those countries that have less capability to contribute.
Polluter pays	Abatement costs for emission reductions should be proportional to emissions (eventually including historic emissions)	**Responsibility** Countries are responsible for all of their emissions. Unlike the 'sovereignty' mechanism, the 'polluter pays' mechanism does not require a status quo level of emissions.

Sources: (see Dellink et al., 2009; Füssel, 2010; Ikeme, 2003; Kontogianni et al., 2006; Lange et al., 2007; Sagar, 2000).

4.1.2 Summary of Distributive Justice Principles

The preceding discussion argues that no one principle of distributive justice is universally accepted as adequate for determining fair allocations. Conceptions of justice are context specific, and while different theories of justice emphasise different principles, the degree to which any theory of distributive justice is seen as fair can only be determined at a societal level (Johansson-Stenman & Konow, 2010). Konow (2001) develops a generalised theory of fairness based on this observation that justice is comprised of three main elements, need, responsibility (classified by Konow (2001) as accountability), and efficiency. These three principles of fairness are all context-dependent.

Therefore, Konow (2001) describes these four elements (i.e. three justice principles and context dependency) as the four sides of distributive justice. Taken together, these four sides of distributive justice can be used to determine fairness in a distribution. It has been argued that people do not understand fairness through its constituent elements, but rather, they construct an overall view of fairness (Ambrose & Schminke, 2009). While perceived fairness is nevertheless a product of the four elements described by Konow (2001), at an individual level, fairness can be said to exist when a situation is perceived to be fair.

4.2 Distributive Justice in Sustainability

The concept of equity has been central to discussions on sustainability since its inception (Pearce, 1987). Discussions on equity are often categorised by their focus on either intergenerational equity or intragenerational equity. Intergenerational equity is concerned with fairness in allocations of resources between generations, while intragenerational equity is concerned with fairness in allocations between competing interests at the present time (Jabareen, 2008). Both forms of equity can be seen as equally important components of sustainability as demonstrated by the definition of sustainable development provided by the Bruntland Report "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987, p. 41).

According to the Brundtland Report, sustainable development requires meeting the needs of *all* people, both present and future, and providing all people with the equal opportunity to pursue a good life (Brundtland, 1987). This point is exemplified by the requirement to provide "an adequate livelihood base and equitable access to resources" (Brundtland, 1987, p. 39).

While both intragenerational and intergenerational equity seem to be given equal weight in the Bruntland definition of sustainability, intragenerational equity has been given less attention in the sustainability literature than intergenerational equity (Agyeman, 2008; Bebbington, 2001; Boyce, 1994; Davidson, 1998; Holden & Linnerud, 2007; Jabareen, 2008; Kallio et al., 2007; Neumayer, 2012; Stymne & Jackson, 2000; Torras & Boyce, 1998). However, intragenerational equity has implications for the practical implementation of sustainability in several important ways.

Intragenerational equity

According to the Brundtland Report, sustainable development requires meeting the needs of all people, and providing all people with the equal opportunity to pursue a better life (Brundtland, 1987). It also requires "an adequate livelihood base and equitable access to resources" (Brundtland, 1987, p. 39). Providing equal opportunities for people can therefore be seen as a central feature of the concept of sustainable development (Lafferty & Langhelle, 1999; Langhelle, 2000). The Brundtland Report places intragenerational equity, understood as equal opportunity and need satisfaction, as the first requirement of sustainability: "development that meets the needs of the present…" (Brundtland, 1987, p. 41).

There are three primary ways in which intragenerational equity influences sustainability that are relevant for agricultural sustainability assessment. First, it has been demonstrated that higher levels of inequality increase environmental degradation (Biel, 2015). Second, equitable decision-making and planning processes can encourage cooperation and commitment to sustainability (Ostrom, 2000). Third, equity concerns have been shown to influence individual's contributions towards a shared goal like sustainability, with perceived inequity reducing contributions (Carlsson et al., 2011).

Environmental Justice

One of the most direct connections between intragenerational equity and sustainability is the relationship between inequality and environmental degradation, which has been discussed extensively under the banner of environmental justice. Where the concept of equity is concerned with a broad conception of justice and fairness, environmental justice has tended to focus on the social patterning of costs and benefits, particularly relating to environmental 'goods' and 'bads', and the associated fairness of this patterning (Walker, 2010).

Links have been identified between income inequality, human capital, economic growth, and the environment, which suggest that intragenerational inequality may have an impact not only on present levels of wellbeing, but also on the wellbeing and sustainability of future generations (Biel, 2015). Boyce (1994) provided one of the broadest explorations of the connection between intragenerational equity and sustainability, arguing that environmental quality is improved through a more equitable distribution of power. This argument is framed in terms of winners and losers and the reasons why winners are able to impose costs on the losers. Power is defined as a combination of political rights, literacy, civil liberties, an income inequality index (Gini), and several geographical factors (e.g. urbanisation level, air quality, and water pollution). Power inequality is directly linked to

both environmental degradation and weakened environmental policies (Boyce, 1994; Boyce et al., 1999; Torras & Boyce, 1998). Boyce (1994) demonstrates that environmentally degrading activities occur when winners, who derive net benefits from an activity, are more powerful than the losers who bear net costs. Three reasons for this are provided:

- The excess environmental degradation driven by powerful winners is not offset by the environmental degradation prevented by powerful losers;
- Inequality raises the valuation of benefits reaped by rich and powerful winners relative to costs imposed on poor and;
- Inequality raises the rate of time preference applied to environmental resources by both the poor and the rich, by increasing their poverty and political insecurity respectively.

Boyce (1994) addresses the hypothesis that the reason why winners are able to impose costs on losers is that, while the losers know they are losing, they lack the power to prevent the winners from imposing on them. Boyce also presents two other possibilities: the losers do not yet exist as they belong to future generations and are unable to defend themselves; and the losers lack information about the costs of environmental degradation. In demonstrating that inequalities adversely impact current generations through environmental degradation, Boyce shows that losers do not only belong to future generations, and therefore, the non-existence of future losers can only partially explain the ability of winners to impose costs on losers. The possibility that losers lack information about the costs of environmental degradation however, is not explored by Boyce (1994), but has been shown by others to be an important factor in explaining the link between inequality and environmental degradation (Baxter, 2014).

In a similar way, Stymne & Jackson (2000) demonstrate empirically that inequalities in the distribution of income have led to a loss in wellbeing in Sweden and the UK, while Agyeman (2008) shows that counties in California that are highly segregated in income and ethnicity have higher levels of air pollutants. The major strands of environmental justice research focus on environmental effects in relation to poverty (Walker et al., 2003), gender (Buckingham et al., 2005; Kurtz, 2007), disability (Charles & Thomas, 2007), and age (Chaix et al., 2006).

These studies all contain a similar theme of considering populations defined in terms of socio-economic characteristics and within defined geographic boundaries. However, this approach to researching the connections between inequality and environmental degradation has been criticised

for having a narrow focus, and misinterpreting cause and effect relationships (Walker, 2009). Pathways of pollutants, which are a common focus of environmental justice studies, are highly complex, and the potential impacts on a community cannot be understood only through simple proximity measures as often used in environmental justice research (Bowen, 2002; Bowen & Wells, 2002; Brown, 1995).

It is argued that to better understand the relationship between adverse environmental effects and inequality requires moving beyond a simple "who gets what" mentality (Pulido, 1996), towards developing a more integrated understanding of how a wider social context, and the preferences of the household or individual, are implicated in the social patterning of environmental effects (Walker, 2009). This requires a more thorough understanding of the values which contribute to disadvantaged and politically marginalised social groups being more highly burdened by adverse environmental affects (Connelly & Richardson, 2005).

While the spatial distribution of environmental 'goods' and 'bads' is still an issue of concern, the scope of environmental justice concerns has moved beyond this geographic and environmental focus to include a large range of social-environmental concerns (Walker, 2009). In doing so the line between environmental justice and the wider concerns of distributional justice which more closely embodies the overarching concept of equity has become less clear. Environmental justice, while initially having a distinct focus on the relationship between the environment and poverty, gender, and race (Walker, 2010), can no longer be said to be distinct from wider socio-economic equity concerns. In widening the scope of interest towards broad distributive justice and sustainability concerns, environmental justice research faces new challenges. Addressing questions of distribution can generate conflict around environmental decisions, as hidden patterns of inequitable effects of different socio-economic groups can be revealed and politicised, particularly because what is just is embedded in different values and understandings of justice (Walker, 2010). It is argued that developing an understanding of the values that underlie different conceptions of distributive justice is an important requirement for understanding the relationship between inequality and environmental degradation; however, there is also a risk that the pursuit of this understanding may emphasise differences and disagreements rather than contributing to agreement and consensus building if care is not taken (Walker, 2009).

Procedural Justice

The second primary way in which intragenerational equity is relevant for agricultural sustainability relates not to outcomes, but to the procedures used to reach those outcomes, known as procedural

justice. The concept of justice has been divided into different sub-categories by different researchers. The most dominant approach to justice has historically been to divide justice into two categories, 'distributive' and 'procedural'.

Procedural justice focuses on the perceived fairness of a decision-making process, and whether it is unbiased, accurate, open to input, and consistent (Leventhal, 1980; Thibaut & Walker, 1975). However, some researchers have divided procedural justice into distinct sub-categories. A three-factor model of justice adds a third category known as 'interactional' justice, which makes a distinction between processes used in decision making, and the experiences of the people interacting to come to a decision (Folger et al.). A four-factor model of justice put forward by Colquitt (2001) further divides interactional justice into two categories, 'interpersonal' justice, which reflects the propriety and respectfulness of communications, and 'informational' justice, which reflects the adequacy and truthfulness of explanations.

Procedural justice has been shown to be an important factor in ensuring that outcomes are perceived as legitimate and fair (Corbera et al., 2007; Dolan et al., 2007; Konow, 2003; Narloch et al., 2013). Konow (2003) describes procedural justice as having two aspects, firstly as the application of just procedures that can help realize just outcomes, and secondly as an act that has value in itself, independent of outcomes.

Sulkin et al. (2001) demonstrate through the use of ultimatum games that if participants are given the opportunity to deliberate, the resulting outcomes are both fairer in terms of distribution, and are perceived to be fairer by the participants. In general, it has been shown that allowing for greater participation, freedom, and information provision in a decision-making processes results in a process that is seen to be more equitable, and receives increased participant support (Anand, 2001). Additionally, transparency is another aspect of procedural justice that is often considered important for ensuring equity (Faravelli, 2007; Konow, 2009).

Amartya Sen has dedicated significant attention to clarifying the distinction between process and outcome in ensuring fairness and equity ideals are realised, and has stressed the importance of process (Sen, 1997, 2011, 2013). Sen (1999, 2013) argues that freedom of discussion and freedom of political participation are necessary prerequisites for any democratic process to work. Sen extends the position of procedural justice to state that the formation of values arising from open public discussion, and the subsequent freedom this entails, may be even more important than identifying individuals' needs, and their relative importance (Sen, 2013). One reason Sen places such importance on processes rather than outcomes is due to the significant role that public discussion

and interactive exchange within society may have on behavioural change (Sen, 2013). This is a highly relevant consideration for sustainability, and for sustainability assessment initiatives which usually entail a change in individual behaviour.

The primary objection to a focus on procedural justice in an undertaking such as sustainability assessment arises from a consequentialist perspective, or the idea that it is the outcomes that matter most and not the process used to reach those outcomes. A consequentialist, or welfarist paradigm, considers the fairness of a situation based on a judgement of solely the results (Ikeme, 2003). Richard Dworkin provides a concise summary of this perspective when he asserts that:

> "justice is a matter of outcomes: a political decision causes injustice, however fair the procedures that produced it, when it denies people some resource, liberty or opportunity that the best theories of justice entitle them" (Dworkin, 1993, p. 140).

The consequentialist perspective is focused on the general good, which is given priority over individual or group rights. However, as studies such as those provided by Anand (2001), Narloch (2012), Sulkin (2001) have shown, the greater good can be subject to the perceived equity of both the final outcomes and processes used to reach them. Therefore, a process that is seen to be inequitable may reduce the overall general good that could have been achieved through a more equitable process.

Behavioural Effects

The third primary way in which intragenerational equity influences sustainability relates to values and the effect that fairness concerns can have on the degree to which individuals are willing to participate in a group undertaking, such as required by an industry level agricultural sustainability initiative. Where a group of resource users are in competition for a limited supply of resources, or opportunities to use resources, perceived inequality in the distribution of these resources or opportunities can lead to social discord and local conflicts (Corbera & Pascual, 2012). Sustainability interventions that are perceived to be inequitable in the way they distribute burdens to participants can create active resistance, and also raise transaction costs, thereby reducing the cost effectiveness of the intervention (Narloch et al., 2013).

Ferraro (2008) demonstrates, using conservation auctions where land owners compete for payments for ecosystem services, that any outcome considered unfair may result in reduced participation rates in future auctions, thereby limiting competition and potentially reducing the efficiency gains of the

conservation initiative. A counter argument to addressing fairness concerns in a sustainability initiative is that it may make the initiative less economically efficient in the short term due do the added costs and effort required to incorporate fairness concerns into the initiative (Narloch et al., 2013). Corbera et al. (2012), however, contends that these short-term costs are outweighed by a more robust system that will command higher levels of social legitimacy in the long term.

Using a series of game-based simulation exercises involving farmers participating in agrobiodiversity conservation initiatives, Narloch et al. (2012) argue that the supply of conservation services in rural communities relies on fragile patterns of collective action built on social norms and preferences that shape fairness ideals at the community level. The successful implementation of a group undertaking, such as agricultural sustainability assessment, can only be sustained if it is able to secure cooperation at a group level through alignment to the group's social norms and fairness ideals (Narloch et al., 2012; Narloch et al., 2013; Prager et al., 2012).

Multiple studies have investigated the connection between justice and task performance (Aryee et al., 2015; Colquitt, 2001; Colquitt et al., 2013; Gilliland, 2008; Shao et al., 2013; Zapata-Phelan et al., 2009). It has been argued that by increasing distributive fairness, it is possible to also increase task motivation and performance (Colquitt & Chertkoff, 2002). Conversely, perceptions of unfair distributive justice results in increased feelings of anger which reduces task performance (Williams, 1999). Equity theory, which is a popular approach for conceptualising distributive justice within organisations, argues that the tension that is produced by negative emotions (e.g. anger) resulting from perceived inequity, motivates individuals to alter their performance and attitudes (Williams, 1999). Equity theory has proposed a two-stage reaction to perceived unfairness in a distributive justice scenario: First, individuals experience a negative emotional reaction, and second, this negative emotional response motivates them to change the situation in order to re-establish equity (Mowday, 1991). This prediction therefore states that as an individual becomes angrier due to a perceived unfair distribution, their performance will decline down to a level that is thought to correct the perceived inequity. The stronger the perceived unfairness, the greater the emotional state, and the stronger the individual's desire to restore equity.

This relationship has significant implications for agricultural sustainability initiatives that are perceived to be unfair, as they could encourage negative responses that may ultimately compromise the viability of the initiative. Williams (1999) found that an individual's perceptions of distributive justice were significantly related to their performance, such that performance increased as equity perceptions increased. Williams (1999) also found that happiness was significantly and positively

related to perceptions of distributive justice, and that sadness was significantly and negatively correlated. Gilliland (2008) further clarifies the effect of perceived unfairness on task performance by demonstrating that extreme experiences of unfairness and fairness are most important for shaping an individual's reaction. Of these two extremes, Gilliland (2008) argues that perceived unfairness has a greater effect on behavioural reactions than does perceived fairness. These findings suggest that perceived extreme injustice will have the largest effect on an individual's behaviour, and should therefore be a significant consideration in any distributive justice scenario.

Motivation has been put forward as an important mediator between perceived justice and task performance (Bell et al., 2006; Zapata-Phelan et al., 2009). Perceived justice can generate a sense of proactivity, whereby workers who feel they are receiving fair treatment expand their perceptions of their role, and adopt new behaviours (Tepper et al., 2001). Perceived justice can also motivate individuals by making rewards seem more predictable and controllable (Thibaut & Walker, 1975). Zapata-Phelan et al. (2009) looked at the connection between procedural justice and task motivation, and found that procedural justice had a significant effect on intrinsic motivation. Procedural justice was also found to have a significant effect on task performance, which was mediated through the mechanism of intrinsic motivation (Zapata-Phelan et al., 2009).

Pascual et al. (2010) suggest that there are multiple institutional factors that influence what is perceived to be equitable in any given social group, which influence the feasibility of what a sustainability intervention is able to achieve. Intragenerational equity concerns can therefore be context specific to any particular social group or intuitional arrangement. Understanding what is perceived to be equitable in any given context is likely to be an important consideration for ensuring the effectiveness of a sustainability initiative.

While intragenerational equity's role in sustainability is still an emerging area of research, a significant amount of attention has been given to the role of equity concerns in international climate change negotiations, which serves as a useful illustration of the wide-ranging challenges involved in addressing equity within the context of sustainability.

4.2.1 Summary of Distributive Justice in Sustainability

The preceding section discussed three ways in which fairness is important for sustainability. Distributive justice concerns have been central to formational works on sustainability such as the Brundtland Report, which predicated sustainability on the ability of future generations to meet their own needs (Brundtland, 1987). DesJardins (2016, p. 119) calls the Brundtland Report an "essay in

distributive justice", in that it judges the distribution of economic goods a services by how well it meets the needs of the least advantaged.

As well as intergenerational equity, intragenerational justice including social equity is also widely recognised as a central requirement of sustainability (Klinsky & Golub, 2016). The commonly cited work by (Gibson, 2006) on developing principles for sustainability assessment includes standards for intergenerational equity, intragenerational equity, and democratic governance, all of which are intimately related to justice concerns. Justice has been found to be a key determinant in the sustainability of specific communities, and striving for justice has been shown to improve outcomes in different sustainability dimensions such as economic performance, and environmental conservation (Agyeman, 2003).

Sustainable development, in its original interpretation (e.g. Brundtland, 1987) focuses on the satisfaction of needs rather than expressed preferences, and in doing so, departs from the quantitative and utilitarian interpretations of economic growth found in standard market accounts (DesJardins, 2016). Rather than seeking to increase overall wealth as a measure of happiness, the distributive justice approach of the Brundtland Report offers an alternative approach to development that focuses on the needs of the least advantaged.

As well as being central to the fundamental concept of sustainability, distributive justice concerns also have relevance for how sustainability issues can be addressed. While distributive justice is often interpreted as being focused on outcome, the procedures used to reach those outcomes are also of significance. This is most evident in the mechanisms that different theories of distributive justice promote to reach fair distributions. An example of this is the 'veil of ignorance' proposed by (Rawls, 1971). It has been shown that allowing for greater participation, freedom, and information provision in a decision-making processes results in a process that is seen to be more equitable, and receives increased participant support (Anand, 2001). This is particularly important when establishing sustainability assessment initiatives in order to get support from the participant group. It has also been argued that fair and robust procedures can in themselves create positive behavioural change (Sen, 2013).

The third key way in which distributive justice can improve sustainability outcomes is through the behavioural effects of fair outcomes. Improving the fairness of a distribution can reduce resistance, lower transaction costs, and improve the effectiveness and support for a sustainability intervention (Narloch et al., 2013). Outcomes that are perceived as fair have also been shown to increase participation rates, which is of significance for a voluntary sustainability initiative (Ferraro, 2008).

One of the most important relationships between distributive justice and sustainability is the connection between perceived fairness in a distribution, and task motivation and performance (Colquitt & Chertkoff, 2002). By ensuring distributions are considered to be fair in a sustainability initiative, it may be possible to enhance the motivation of participants to improve their performance.

4.2.2 Equity Applied to Sustainability: The Case of International Climate Change Negotiations

The role of justice in climate change negotiations is a well-recognised issue (Gardiner, 2010) and epitomizes many challenges of integrating justice and sustainability (Klinsky & Golub, 2016). A vast literature has developed around the implications of different justice perspectives for distributing the burden of global emissions reductions.

International negotiations on the role of each nation in climate change mitigation have involved considerations of intragenerational and intergenerational equity, and the perceived trade-offs in efficiency. Climate change presents a highly complex governance challenge (Levin et al., 2012; Verweij et al., 2006) which requires radical changes in many countries' policies and practices. The intergenerational time lags that exist between mitigation measures, and the effects of those measures, distort cost-benefit calculations by leaving future benefits underrepresented and important stakeholders disenfranchised (Underdal & Wei, 2015). Parks and Roberts (2008, p. 621) argue that large asymmetries between powerful and weak negotiating parties generate conflicts of interest, which "damped cooperative efforts". Under the United Nations Framework Convention on Climate Change (UNFCCC), the distribution of implementation power favours the major emitters which works to reinforce the position of powerful countries (Underdal & Wei, 2015).

Fairness concerns in dealing with power imbalances between the weak and the powerful matter (Dannenberg et al., 2010; Gampfer, 2014; Lange et al., 2010), as for an international agreement to be effective it must be widely perceived as equitable (Winkler et al., 2013). There are generally three aspects of equity concerns in climate change negotiation documents that are common, and rarely disputed (Mattoo & Subramanian, 2012). They are; the responsibility for having contributed to climate change; the capability to address climate change; and the requirement to ensure that meeting basic needs is not compromised by climate change, or climate change mitigation measures. These three aspects of equity are brought together in the UNFCCC's reference to common but differentiated responsibility and respective capabilities (CBDR & RC), which is accepted by 195 states

(Underdal & Wei, 2015). CBDR & RC provides a recognition of general principles of equity in international law. For example, the Rio Declaration states:

> In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command (UN, 1992 Principle 7).

The principle of CBDR & RC in international agreements have been traced back as far as the Treaty of Versailles (1919) under which the International Labour Organisation recognised that "differences of climate, habits and customs, of economic opportunity and industrial tradition, make strict uniformity in the conditions of labour difficult of immediate attainment" (Stone, 2004). The widespread support for CBDR & RC is evidenced by the incorporation of its fundamental principles in multiple international agreements as shown in Table 4-2.

Table 4-2. International Agreements with a CBDR & RC component.

International Agreement	CBDR Component
1972 Stockholm Declaration	"the applicability of standards which are valid for the most advanced countries but which may be inappropriate and of unwarranted social cost for the developing countries."
1972 London Convention	Measures must be adopted by parties "according to their scientific, technical and economic capabilities."
1976 Barcelona Convention	Article 11(3) expressly recognises the special needs of developing countries.
1982 UN Convention on the Law of the Sea	Requires account be taken of "circumstances and particular requirements,", "special conditions", and "the fact that economic and social development and eradication of poverty are the first and overriding priorities of the developing country parties."
1987 Montreal Protocol	Recognises the special situation of developing countries entitles them, provided they meet certain conditions, to delay their compliance with control measures.

1988 EC Large Combustion Directive	Sets different levels of emission reductions for each member state
1991 VOC Protocol	Allows parties to specify one of three different ways to achieve reduction
1992 Maastricht Treaty	"Without prejudice to the principle that the polluter should pay, if a measure [...] involves costs deemed disproportionate for the public authorities of a member state, the Council shall, in the act adopting that measure, lay down appropriate provisions in the form of temporary derogations and/or financial support from the Cohesion Fund."
1992 United Nations Framework Convention on Climate Change	"In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities."
1992 Biodiversity Convention	"biological diversity is a common concern of humankind."
1994 United Nations Convention to Combat Desertification	"Parties […] give priority to affected African country parties, in the light of the particular situation prevailing in that region, while not neglecting affected developing country parties in other regions."

Source: Table informed by Khalfan (2002), Honkonen (2009), and Dellink (2009).

While the concept of CBDR & RC existed in international agreements prior to its application to global environmental agreements (Stone, 2004), it has proven to be particularly well suited to the challenge of global sustainability. Interconnected ecological networks and economic interdependence between countries mean that each country can be subject to the environmental and consumption choices of others. Yet, each country alone does not have the capability to address these issues which require co-operation, thereby promoting the idea of 'common' responsibility (Rajamani, 2000). At the same time as global issues require global co-operation, it has been recognised that the differences in country's capabilities, technology, historic responsibility, and needs (amongst other factors) mean that not all countries have an equal opportunity to address global issues, and therefore, their responsibilities to act should be 'differentiated'. Despite the widespread acknowledgement of the importance of CBDR & RC, what the concept means to each country can differ vastly.

There is widespread disagreement on the extent to which each country should contribute to mitigation measures, which generally revolves around matters of economic efficiency, and intragenerational equity (Lange et al., 2010). Lange (2010) demonstrates that intragenerational equity considerations underpin many of the differences between countries interpretation on which path to climate change mitigation is optimal. The differences are often based on which aspects of equity each country views as most important. For example, as stated earlier, Brazil emphasises responsibility, and argues that historical greenhouse gas (GHG) emissions should be considered when dividing the burden of climate change mitigation amongst countries (Müller et al., 2009). In contrast, the USA deemphasises the importance of responsibility, and argues against historic emissions being a major contributing factor to future mitigation measures partly on the basis that it is unfair to hold a country responsible for unknowingly contributing to a problem (Müller et al., 2009). As a result of the multiple different interpretations of fairness in in the pursuit of climate change solutions, a range of different mitigation mechanisms have been put forward, each based on different principles of equity.

The Egalitarian Mechanism

The egalitarian mechanism is premised on the idea that all people have equal entitlement to the atmosphere and global commons (Heyward, 2007). It incorporates the principle of equal per capita emissions that all people should have equal shares in the atmosphere's ability to absorb greenhouse gas emissions (Lange et al., 2007). While it has appealed to many developing countries which have emitted, and continue to emit, less per capita than developed countries (Najam et al., 2003; Sagar, 2000), it has also attracted criticism, particularly from large emitters such as the USA (Heyward, 2007). An egalitarian approach can lead to an uneven distribution of costs, which would fall mainly on developed countries. However, as the benefits arising from emissions spread beyond the source country through global trade, the allocation of emission rights based on a per capita basis could adversely affect developing countries as well as developed countries (Yu et al., 2011). The egalitarian mechanism provides a starting point for discussions on equity, however egalitarian mechanisms are not generally applied to allocating environmental resources, and many oppose the concept of dividing and allocating the entirety of a resource (Ashton & Wang, 2003).

The Grandfathering Mechanism

The principle of grandfathering states that the right to pollute should be distributed in proportion to a state's past pollution. While it is still expected that a state reduces its pollution, the more the state has polluted in the past, the more it is entitled to pollute in the future. The idea of grandfathering in

relation to climate change has been a popular concept in allocating emission rights; however, it has received very little support as a fair distributive justice mechanism (Baer et al., 2009; Caney, 2005).

While the grandfathering mechanism is similar to the egalitarian mechanism in that it can consider all nations to have equal rights to the atmosphere, it differs in that, rather than redistributing emissions on a per capita basis, it holds current emission levels as the *status quo* based on the concept of historic entitlements. The grandfathering mechanism seeks equal percentage reductions across nations from current emissions, or emissions set at a base year (Lange et al., 2007). The grandfathering mechanism has received greater support from developed countries which have tended to view it as justifiably recognising the current distribution of emissions (Heyward, 2007). Developing countries however have argued against the grandfathering mechanism for institutionalising inequality (Baer et al., 2000) by rewarding high emitters and penalising low emitters. Additionally, as the success of developed nations has been driven by the unrestricted use of fossil fuels, restricting developing countries at the present levels of emissions is seen as entrenching global inequality (Agarwal & Narain, 1991).

The EU Emissions Trading System (EU ETS) initially distributed pollution permits based on the grandfathering mechanism, although it has since moved on to an auction system (Hepburn et al., 2006). Any environmental agreement that references an agent's historical performance when setting performance targets or prescribing limits is reflecting the grandfathering mechanism to some extent.

It can be argued that the grandfathering mechanism rewards irresponsibility by placing less stringent requirements on past polluters than it does on developing entities. In this way, it runs contrary to the notion of historical responsibility by taking the burden of rectifying past problems away from the entities that caused the problems (Neumayer, 2000). Furthermore, the grandfathering principle restricts the ability of the poor to become wealthier through the same polluting activities undertaken by many wealthy developed nations (Caney, 2005). Despite multiple moral and ethical flaws, the grandfathering mechanism has been prevalent in environmental negotiations. One commonly provided justification for its prevalence is that, while it may be unjust, it alone can secure the participation of the world's largest emitters, and is therefore a necessary first step in reducing emissions (Gosseries, 2004). In practice, the grandfathering mechanism can be used as a starting point for negotiations based on a polluter pays mechanism.

The Polluter Pays Mechanism

The polluter pays mechanism, at its most fundamental, requires an equal ratio between abatement costs and emissions (Lange et al., 2007). The polluter pays principle requires that the agent responsible for creating emissions should also be responsible for remedying the damage they cause. The polluter pays mechanism holds that responsibility for mitigation should be apportioned according to relative degrees of responsibility for its causes (Heyward, 2007). The more that is emitted, the greater the liability. In general, the sum that the emitter is responsible for remedying should be sufficient to offset or compensate for the totality of the harm they have caused (Schwartz, 2010).

This mechanism therefore takes account of both current performance, and historical responsibility. The polluter pays mechanism incorporates concerns of developing countries not reflected in the grandfathering mechanism around the need to address a responsibility element. While many developed countries have accepted the polluter pays mechanism to some degree (Heyward, 2007), its implementation has proved contentious due to disagreement over historic responsibility.

Unlike the grandfathering mechanisms, the polluter pays mechanism resonates more closely with everyday situations where someone who has caused harm has a responsibility for correcting it in a manner that is proportional to the harm caused (Miller, 2005). The polluter pays mechanism often incorporates allowances for ignorance and for meeting basic needs (Caney, 2005; Miller, 2004). Regarding ignorance, an emitter is responsible for their past emissions, except in the instance that they were excusably ignorant of the adverse consequences of their emissions, to the extent that they could not be expected to know that their emissions would cause harm. Similarly, exceptions can be granted to emitters on the basis that an agent is compelled to emit in order to meet their basic needs. An agent's allocation of a pollution quota should therefore be sufficient to allow them to meet their basic needs (Caney, 2005; Hyams, 2009).

In practice, the polluter pays mechanism has tended to operate in conjunction with the grandfathering mechanism, which has been used to establish a starting point, or baseline, for emission reductions. The polluter pays mechanism has underlain some important international environmental agreements such as the 1992 Rio Declaration on Environment and Development, and continues to exert influence over international climate change negotiations (Schwartz, 2010; UN, 1992).

The Ability to Pay Mechanism

The ability to pay mechanism requires an equal ratio between abatement costs and the ability of the country to pay (Lange et al., 2007). The burden for mitigating pollution is therefore shifted to the agents that have the greatest capacity to afford it. Central to the ability to pay mechanism is the notion that regardless of who caused the problem, the agents with the greatest capabilities to remedy it should be obliged to do so, despite their own level of culpability (Miller, 2001). Unlike the polluter pays mechanism, the ability to pay mechanism is capable of assigning responsibility to polluters who were historically excusably ignorant, or poor (Caney, 2005).

The conventional method for determining the ability to pay for abatement has been wealth measured in GDP per capita (Ringius et al., 2002). This approach has received support from several countries, including, Poland, Estonia, Russia, and South Korea (Ringius et al., 2002). As countries that have a high GDP face the highest costs under an ability to pay mechanism (Shue, 1999), this mechanism has not received widespread support from developed nations. While the notion that parties who have the most should contribute the most has intrinsic appeal, Shue (1999) cautions that this approach also presents the possibility of disincentive affects arising from the more wealthy parties being faced with large mitigation costs. Pigou (1932) argued that requiring the rich to pay more than the poor would lead to the least aggregate sacrifice. The ability to pay mechanism is underlain by egalitarian ideals in that the wealthy have a lower marginal disutility from paying abatement costs. Therefore, if everyone is expected to make an equal sacrifice, the wealthy should pay a larger share of abatement costs.

The ability to pay mechanism is based in part on the concept of diminishing marginal utility of income, which implies that in terms of utility, the burden of paying for abatement is smaller for high income than low-income individuals (Granqvist & Grover, 2015). Furthermore, the ability to pay mechanism is also based on the utilitarian idea that mitigation should be undertaken at the lowest possible aggregate disutility, thereby creating an even spread of burdens across individuals, but not necessarily an even spread of costs (Stern, 2014).

A distributive mechanism closely related to the ability to pay mechanism known as the beneficiary pays mechanism is sometimes discussed as a distinct mitigation mechanism (Granqvist & Grover, 2015). The beneficiary pays mechanism requires that agents that have benefited from past pollution that has harmed others are responsible for compensating them. While similar to the ability to pay mechanism, the beneficiary pays mechanism emphasises that it is not current wealth that is important, but rather wealth that can be traced to past polluting activities. Essentially, it places

responsibility on those agents that are 'free-riding' on the harmful activities of their ancestors (Gosseries, 2004). For the beneficiary pays mechanism to be applied, a clear connection needs to be established between particular pollution instances and the relative advantage of wealth which would be difficult to do (Granqvist & Grover, 2015). It has been argued that due to several weaknesses in the beneficiary pays mechanism, the ability to pay mechanism makes a more practical and ethically defensible alternative (Granqvist & Grover, 2015; Huseby, 2015; Kingston, 2014).

4.2.3 Summary of Climate Change Example

International climate change negotiations provide one of the most relevant and detailed case studies of the practical implications of distributive justice on a sustainability challenge. A range of different mechanisms have been proposed to reduce GHG emissions. Each of these mechanisms is closely related to one or more theories of distributive justice. Hence, developing a better understanding of the underlying distributive justice principles that contribute to a perception of fairness could provide valuable for establishing sustainability assessment targets that are seen as fair by participants.

How equity is perceived and understood has important implications for the enactment of sustainable development proposals. Two key lessons can be drawn from studying the role of justice in international climate change negotiations that are of direct relevance to understanding the role of justice in agricultural sustainability assessment. First and most importantly, perceived fairness is critically important for solving collective action dilemmas; as no party is likely to voluntarily agree to actions it thinks is fundamentally unfair to its interests (Klinsky & Golub, 2016). Second, no single conception of justice is likely to be accepted by all parties; instead, sustainability assessment will need to account for multiple perceptions of fairness and develop appropriate governance frameworks accordingly.

The different positions of countries, and the mitigation mechanisms they promote in international climate change negotiations (and possibly other sustainable development situations), can be better understood through reference to the theoretical and philosophical distributive justice mechanisms from which they derive. Developing a better understanding where different conceptualisations of intragenerational equity stem from, and how they influence perceptions of fairness, may help the development of sustainable development initiatives by explaining why different actions or measures are considered either acceptable or unacceptable from an equity perspective. At a high level, many of the distributive justice challenges faced in international climate change negotiations have relevance for addressing other sustainability issues. The distribution of sustainability burdens through the allocation of performance targets or the establishment of benchmarking systems

presents a distributive justice challenge to the establishment of successful agricultural sustainability initiatives.

4.2.4 Benchmarking as a site for distributive justice in sustainability

Reference values play an important role in operationalising sustainability indicators. Reference values can be categorised as either absolute or relative. Absolute reference values are specific, quantitative, time-bound targets that can be linked to indicators so that performance can be interpreted clearly on a distance to target basis (Moldan et al., 2012). Absolute reference values are pre-defined and commonly based on science, regulatory requirements, or stakeholder opinions (Acosta-Alba et al., 2012; Bockstaller et al., 2009).

Relative reference values are indirect measures of performance which do not require a pre-defined target to be set. They are often used for trend detection and benchmarking performance within a group (Andersen, 1999; Lebacq et al., 2013). Benchmarking has been defined as the "process of comparing products, services, processes and outcomes with other organisations or exemplars, for the purpose of improving outcomes by identifying, adapting and implementing best practice approaches" (Scott, 2013, p. 1). Benchmarking has been shown to lead to improvements in performance within different organisations (Andersen, 1999; McNair & Leibfried, 1992; Pérez-Lombard et al., 2009; Wainwright et al., 2005). Multiple explanations for these improvements have been offered including: highlighting problem areas and opportunities for improvement; helping to define more practical targets; challenging the organisation's current management; and overcoming managers' doubts around the viability of performance improvement (Henning et al., 2011; Snoo, 2006). Benchmarking undertaken within a peer-group, such as within the horticultural industry, does not require the establishment of absolute targets or thresholds (Christensen & Krogman, 2012; Syers et al., 1995). However, benchmarking is likely to be successful only if it is based on comparisons that are perceived as sensible and fair, with all organisations placed on a "level playing field" (Gasso-Tortajada, 2014). An advantage of peer-group benchmarking is that it does not require the establishment of an absolute reference value such as a threshold (Syers et al., 1995).

Benchmark calculations can take different forms depending on the intended use but may include the group median, a range of top performers, an absolute ranking within a group, or a best practice guideline (Acosta-Alba et al., 2012; Lebacq et al., 2013). Van Passel (2007), for example, describes four ways in which reference values can be set to measure sustainability on a farm:

1. The first is the weighted average return on capital for a sample of farms. This requires calculating the total sum of the value added of all farms in the sample divided by the total resource use of the capital form of all farms.

2. The second involves determining the best performance by a farm against an issue, then combining all the best performance results to create a virtual super farm as a target to compare against.

3. The third is to set a performance target for each issue based on a pre-determined limit.

4. The fourth is to use the unweighted average return on capital calculated as the total sum of return on capital of all farms in the sample divided by the number of farms.

Of the four, only number three requires an absolute target to be set. Whitehead et al. (2016) reviewed 186 sustainability indicators across 12 sustainability assessment frameworks to determine the role of reference values. Of the 186 indicators, only seven per cent (13 indicators) had an associated absolute reference value. Many sustainability indicators do not lend themselves to an absolute target due to high degrees of context dependency. Whitehead et al. (2016) found that absolute targets are not always the most appropriate approach, and that the use of internal benchmarking may sometimes be a more practical means for encouraging improvement. Benchmarking involves the internal comparison of relative performance between farms now (spatial comparison), or changes in their own performance with past years (temporal comparisons). Provided that the metric has been scored in a relatively consistent manner, continuous improvement can result by the comparison a farmer sees with their neighbours or at least other producers facing the same or similar constraints.

In this way, those signalled to be in the bottom quartile of performers may be motivated to improve and climb past their colleagues next season or as they develop their systems. This in turn will potentially trigger renewed efforts of the previous leaders. The underlying model is one of an "improvement escalator" where the overall average performance will climb when farmers compete with each other and become aware that it is indeed possible to improve. In this model, benchmarking is a type of passive incentivisation tool that requires no particular target or plan. It has the advantage of local relevance and naturally fits with the way farmers often monitor their own performance by comparing with their neighbours. Benchmarking oneself against earlier performance is a temporal version of the same internal benchmarking tool. It would be possible to

set targets for rates of improvement, but these were found in Whitehead et al. (2016) to be relatively rare.

The choice of reference value has been shown to have an important impact on the absolute performance level of a farm, but not the relative ranking of sustainability performance amongst farms (Van Passel et al., 2007). Figge (2005) argues that society defines in political processes the 'goalposts' of sustainable development, and suggests that it is these targets that parties need to meet. Examples of these types of societal defined targets include the EU burden sharing agreement and the NEC directive to reduce air emissions (Figge & Hahn, 2005). The imposition of top-down absolute performance targets such as these are likely to lead to disagreement amongst the parties expected to implement them, and may not in turn result in the best sustainability outcomes (Heyward, 2007).

Sustainability assessment at a farm-level may be part of a higher-level sustainability programme, such as at a regional, national, or industry wide level (Hunt et al., 2013). This has implications for both absolute and relative reference values. Absolute targets may be set at a higher level and responsibility for meeting the targets divided amongst participants either equally, or through a distribution mechanism that considers other factors. Similarly, a benchmark could be established for each farm which takes into account factors such as their capability and responsibility. Inflexible benchmarking approaches disregard local contextual circumstances, and the diversity of cultural, economic and environmental drivers that effect an individual's performance (Kato & Ahern, 2011; Nader et al., 2008; von Wirén-Lehr, 2001)

It has been argued that adjusting benchmarking systems to local environmental conditions can improve the fairness of sustainability assessment (Gasso-Tortajada, 2014). The mechanism to improve sustainability performance was hypothesised to be that tuning benchmarking to local conditions would give farmers more favourable and encouraging feedback which would in turn improve sustainability performance (Gasso-Tortajada, 2014). This premise was not directly tested by the researcher, however.

Local agroecology and socioeconomic setting can have a large influence on agricultural production (Cowell & Clift, 1997; von Wirén-Lehr, 2001). Therefore, it has been argued that tuning farming practices to local conditions can significantly improve agricultural sustainability (Hansen & Jones, 1996; Mascarenhas et al., 2010; Van Calker et al., 2005). Benchmarking approaches to sustainability assessment often disregard local socio-economic and environmental conditions that affect an individual's production performance (Kato & Ahern, 2011; Nader et al., 2008; von Wirén-Lehr, 2001).

Gasso-Tortajada (2014) demonstrates that farm sustainability indicators, such as energy and water use efficiency in New Zealand vineyards, can be significantly associated with local agroecological and production related features. As a result, the sustainability of a farm can be strongly correlated to its local environmental conditions. Gasso-Tortajada (2014) argues that in order to improve the fairness and practicality of sustainability assessment, benchmarking systems need to be tuned to local environmental conditions. In practice, this would require a weighting system. For example, a vineyard that requires higher levels of irrigation due to its soil type would have its performance results on the indicator of water use adjusted positively so that it appears to be performing at a similar level to farms with more favourable soil conditions.

Gasso-Tortajada (2014) argues that local tuning such as described above has the potential to improve sustainability performance by providing farmers with more favourable and encouraging feedback. This will in turn motivate them to even higher levels of performance. Gasso-Tortajada (2014) however acknowledges that local tuning may not be beneficial at higher stakeholder scales, and may not be desirable for policy, regulatory, or consumer uses. This approach has implications for sustainability in general as it has the potential to give unsustainable operations a façade of sustainability. The rationale behind local tuning as described by Gasso-Tortajada (2014) is largely related to building trust with farmers and socialising them to the idea of sustainability performance in a non-threatening way. Gasso-Tortajada (2014), like much of the literature, does not consider whether farmers themselves agree that locally tuning sustainability benchmarking on the basis of their own environmental conditions is a desirable approach.

The distribution of responsibilities for meeting sustainability performance targets is of special concern where sustainability assessment initiatives rely on voluntary adoption by participants. Voluntary sustainability assessment initiatives are becoming an increasingly common way to address sustainability concerns (Potts et al., 2014). Rather than adopting externally imposed performance targets, voluntary sustainability assessment initiatives can create relative reference values through a bottom up approach using collaborative processes with the initiative's participants (Hunt, 2014a).

Regardless of external pressures, participants to a voluntary sustainability initiative are unlikely to willingly pursue a sustainability reference value unless they perceive it to be fair (Vaillancourt, 2004). Equity concerns therefore play an important role in the establishment of reference values. When setting relative reference values, it is important that participants feel they are being compared to a similar entity in order to encourage performance improvements.

4.2.5 Summary of benchmarking as a site for distributive justice

Setting sustainability targets whether absolute or relative (as in the case of benchmarking) is a common feature of agricultural sustainability assessment. It has been argued here that there are distributive justice implications for how targets are set, particularly related to the division of targets amongst a diverse group of farmers. Differences in local environmental conditions suggest that farmers are not beginning from an equal position when addressing their sustainability performance. There are distributive justice implications for how and where targets are set, and what contextual information is seen as relevant in the decision-making process. While it has been argued that local tuning of sustainability targets is required to enhance fairness and motivate performance improvements (Gasso-Tortajada, 2014), there has been little research undertaken to incorporate the farmers' perspective on this issue.

One of the key challenges in better understanding the acceptability of different theories of justice is in understanding an individual's underlying ideological beliefs (Faravelli, 2007). This can be aided by the elimination of personal bias through encouraging impartiality in a person's judgement of fairness. By isolating an individual's ideological beliefs on distributive justice, it becomes possible to determine the effect that adding personal consequences has on their perception of justice. It is also feasible to search for principles of justice to which an individual is sympathetic, which may help to overcome any personal bias. In the next sections, research seeking to understand the distributive justice perceptions of individuals is explored.

4.3 Investigating Distributive Justice

In the previous sections, the relationship between distributive justice and sustainability was discussed. It was shown that there are key principles of major distributive justice theories which have direct relevance to sustainability. International climate change negotiations were used to illustrate the role of these principles and it was argued that the establishment of sustainability targets in agricultural sustainability initiatives also has distributive justice implications which have not received a large amount of attention in the literature. The sections which follow consider some of the key elements of distributive justice research which seek to understand the fairness perceptions of individuals. Together these sections seek to establish a foundation of the essential requirements of distributive justice research upon which the thesis is based.

4.3.1 Impartiality and Personal Bias

The notion of impartiality, or generally accepted values, forms the foundation of many philosophical conceptions of distributive justice (Nozick, 1974; Rawls, 1971; Smith, 1776). The biased views of fairness held by individuals have been shown to significantly affect the allocation of resources (Babcock & Loewenstein, 1997). Impartiality is one of the principal virtues of public institutions, and is considered vital to ensuring legitimate decision-making is undertaken (Aguiar et al., 2013). Common to many conceptualisations of fairness is the notion that impartiality creates consensus. Consensus plays an essential role in justifying prescriptive claims for the superiority of a particular set of outcomes, and is critical to the formulation and implementation of policies in most institutions (Carlsson et al., 2011).

The idea that impartiality creates the necessary conditions for fairness is central to the notion of justice being blind, and therefore fair. Obtaining the distributive justice preferences of those who are likely to be affected by the economic consequences of a distributive scenario is vital, yet is often neglected in the literature (Carlsson et al., 2011). Several studies have, however, sought to understand individual preferences for distributive justice principles and mechanisms. There is a large degree of variation in how these studies treat impartiality, who they focus on, and what method they use. While there are several relevant studies to consider, little work has been done on the distributive justice preferences of farmers. Several different impartiality-inducing mechanisms have been developed to reduce personal bias in distributive justice scenarios.

Impartiality-Inducing Mechanisms

Impartiality as a formal concept requires that equal treatment be given to all, so that all are considered equals (Barry, 1995). In order to explore individuals' ideological concerns for different principles of distributive justice, a mechanism is required to ensure that conditions for impartiality are in place. There are two key questions to consider for impartiality. The first is to ask, who should be making impartial decisions, and the second is to ask what information the decision maker needs in order to make a decision. An approach to categorising impartiality inducing mechanisms based on these two questions, after Aguiar et al. (2013), is presented in Table 4-3. Each of these mechanisms will be discussed in more depth through following sections.

Table 4-3. Impartiality-Inducing Mechanisms

	Part information	**Full information**
First-person perspective	Veil of ignorance	Minimax relative concession
Third-person Perspective	Impartial spectator	Ideal observer

Veil of Ignorance

At the centre of Rawls' Theory of Justice (1979) is the concept of the 'original position', a hypothetical scenario designed to elicit the principles of justice that would create a fair society. Rawls proposed a 'veil of ignorance' behind which no person is aware of their individual circumstances such as age, gender, race, talents, social status, or their idea of what makes a good life. When stakeholders agree to a distributive allocation under a veil of ignorance, they have no way of knowing what their share of the allocation will be once the veil is lifted. The veil of ignorance assures impartiality and provides a reminder that our personal interests and prejudices favour partial reasoning (Aguiar et al., 2013). Behind the veil of ignorance, all people are treated with equal concern and can choose principles of justice freely (Rawls, 1971). Distributive allocations made behind a veil of ignorance, according to Rawls, will be based on moral reasoning and will be universally fair. Rawls argues that impartiality can only be assured through the removal of personal interests. The veil of ignorance requires stakeholders themselves be the decision makers and that they have only limited information to base their decisions on, conversely, an ideal observer would meet neither of these conditions.

Ideal Observer

The ideal observer mechanism, while supporting Rawls' argument that impartial decision-making requires the exclusion of personal interests, differs in two key respects. Firstly, It requires that the decision maker is not a stakeholder, and secondly that the decision maker possess complete information. An ideal observer should be capable of making distributive justice decisions that are impartial and universal. The ideal observer is a third-person decision maker who is not only assumed well informed, but is also omniscient and all-knowing (Firth, 1952). While an ideal observer is fully informed, they must also be disinterested and dispassionate (Aguiar et al., 2013; Firth, 1952; Mongin, 2001). It is this stipulation that an ideal observer must be dispassionate, and in being so must exclude potentially relevant information, that underlies much of the criticism of the ideal observer approach. In being disinterested and dispassionate, an ideal observer is unable to reveal

sympathetic preferences (Binmore, 1994; Rawls, 1971). Much like the conditions under Rawls' original position, an ideal observer considers allocations on their general alignment with justice, rather than out of interest for any individuals. What the ideal observer and decisions made behind a veil of ignorance have in common is that decisions are made in a general manner, without any interest in others.

Impartial Spectator

An impartial spectator is a third party, like the ideal observer, however the impartial spectator need only obtain the best possible information (rather than being omniscient, and all knowing), and need not be dispassionate nor disinterested, but rather, she can remain an emotional being.

The impartial spectator is a impartiality-inducing mechanism described by (Smith, 1759) and (Hume, 1777). Smith stated that:

> In all such cases, that there may be some correspondence of sentiments between the spectator and the person principally concerned, the spectator must, first of all, endeavour, as much as he can, to put himself in the situation of the other, and to bring home to himself every little circumstance of distress which can possibly occur to the sufferer. He must adopt the whole case of his companion with all its minutest incidents; and strive to render as perfect as possible, that imaginary change of situation upon which his sympathy is founded. (Smith, 1759, p. 7).

Smith argues that the impartial spectator will be impartial as he is not a stakeholder in the situation, but he must also sympathise with the people involved both cognitively and emotionally if he is to be impartial (Aguiar et al., 2013; Konow, 2009). The impartial spectator is not an omniscient deity figure like an ideal observer, but a compassionate human, with the ability to imagine herself in another's position. Allowing the impartial spectator emotional intelligence, she is better equipped to morally approve or disapprove of a situation. In contrast to the veil of ignorance, the impartial spectator is neither implicated in the outcomes of the situation, nor restricted in her knowledge. She is immersed in the situation with all relevant facts. Smith wrote that:

> Our continual observations upon the conduct of others, insensibly lead us to form to ourselves certain general rules concerning what is fit and proper either to be done or avoided. (Smith, 1759, p. 140).

Smith did not consider a hypothetical scenario whereby actors are denied knowledge of their personal circumstances, nor an omniscient super judge necessary for impartiality, but did consider that that impartial spectator must have no stake in the outcomes of the decision.

Minimax relative concession

In antithesis to all three preceding approaches to moral decision-making Gauthier (1986) argues that outcomes can be arrived at despite participants having a stake in the outcome, and full knowledge of their own position. David Gauthier considers that a moral constraint on the pursuit of individual self-interest is required because cooperative activities almost inevitably involve a prisoner's dilemma (Gauthier, 1986; Sen, 1961). The result of a prisoner's dilemma situation is a sub-optimal outcome. A basic prisoner's dilemma involves two prisoners in separate holding cells who are each told they can avoid jail-time if they implicate the other prisoner. The problem is that if they both implicate the other prisoner, they get a long prison sentence, whereas if they both stay silent they get a short prison sentence. The two most important characteristics of this situation for Gauthier are that; mutual cooperation is preferable to mutual defection and individual defection is preferable to mutual cooperation. Gauthier argues that if individuals dispose themselves to act morally when others are also disposed, they will be able to gain one another's trust and successfully cooperate (Gauthier, 1986). Unlike the other three impartiality-inducing mechanisms, Gauthier does not require either a third-party arbitrator, or that the stakeholders have limited information, arguing instead that each party to the contract should be fully aware of their personal circumstances and holdings. Instead, Gauthier relies on both the Kantian idea that humans have an innate capacity to act morally, and the belief that the market equilibrium can also be seen as an equilibrium of justice which is both impartial and beneficial for all participants (Binmore, 1998; Chiotis, 2015; Gauthier, 1986).

Rather than 'Minimax relative concession' (Table 4-3), Aguiar et al. (2013) include 'ideal speech situation' as a first person perspective under full information; however they do not provide any information to justify its inclusion as an impartiality-inducing mechanism. The ideal speech situation described by Habermas et al. (1990) is not intended to lead to impartial decisions being made, but rather, is intended to create conditions where people can talk as equals. It is therefore procedural, where the other three approaches have both a procedural and outcome focus. Where the other three approaches to inducing impartiality, which have been described, can be explained relatively succinctly, Gauthier's approach requires more extensive consideration. The following section

provides a deeper overview of Gauthier's approach to impartiality which helps to enrich an understanding on the role of bargaining in fair distributions.

Morals by Agreement

Gauthier argues the moral norms that rational contractors will adopt (and comply with) are those norms that would be reached by the participants beginning from a position each has attained through her own actions which have not worsened anyone else, and adopting as their principle for agreement the rule of 'minimax relative concession' (MRC). Gauthier therefore takes a bargaining approach to issues of distributive justice.

Ronald Coase provided one of the most influential theorems in modern economics which describes how bargaining will lead to efficient outcome regardless of initial property allocation so long as there are sufficiently low transaction costs (Farrell, 1987). Coase stated that:

> The delimitation of rights is an essential prelude to market transactions ... the ultimate result [which maximizes the value of production] is independent of the legal decision [without transaction costs] (Coase, 1988, p. 158).

Coase's theorem alone does not yield an optimum liability rule, or efficient specification of property rights (Nelson, 1995). To use Coase's theorem for distributive justice scenarios, additional assumptions are required around the specific bargains that can be made in the pursuit of self-interest. Coase suggested that where there are transaction costs, property rights should be assigned in a way that maximises social product (Coase, 1988). Taking this approach, Posner (1983) recommends the use of judges to resolve bargaining situations by assigning rights to maximise wealth in a hypothetical market. The bargaining solution posed by Gauthier however, makes it possible to reach mutually beneficial outcomes that support the same level of total surplus without the need for external adjudicators.

In situations of social coordination, Gauthier argues that rational actors seek to maximise their utility, while social optimality requires they make concessions to their own claims in order to provide for a greater social good. The idea of MRC is that each bargainer will be most concerned with the concessions that she makes from her ideal outcome relative to the concessions that others make. If she sees her concessions as reasonable relative to the others, considering that she wants to ensure as much for herself as she can while securing agreement (and thereby avoiding the zero-point: no share of the cooperative surplus) and subsequent compliance from the others, then she will agree to

it. Gauthier argues that a reasonable outcome to bargaining is one that minimizes the maximum relative concessions of each party to the bargain. Figure 4-1 below illustrates the concept of MRC.

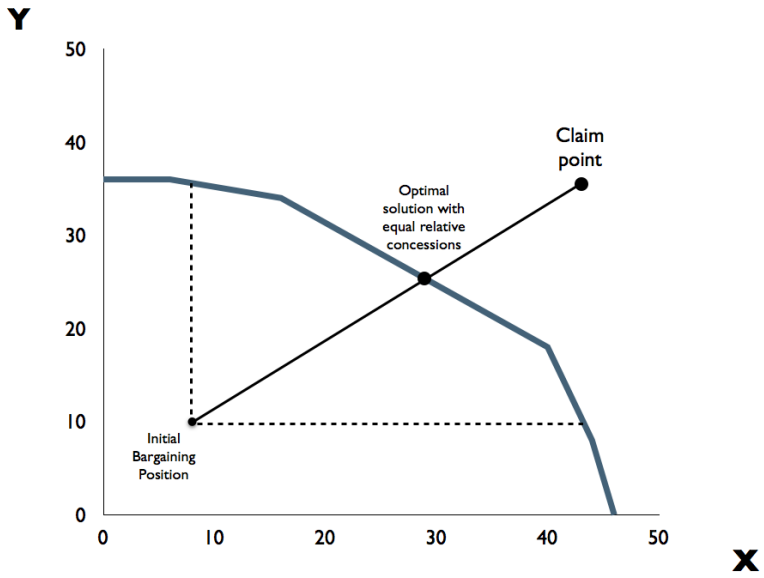


Figure 4-1. Minimax Relative Concession (MRC)

The initial bargaining position is the outcome that parties could expect to obtain without any agreement. The initial bargaining position for the example provided in Figure 4-1 is the status quo positions of both parties. The concept of MRC states that each party to the bargain will initially claim the maximum surplus produced from the cooperative arrangement. This claim is shown as the claim point in Figure 4-1. The claim point is well beyond the boundary of possible outcomes represented by the heavier weight line. Each party will therefore need to make some concessions to their original claim. Gauthier's model states that a line can be drawn from the initial bargaining position to the claim point, and where this line intersects the outcome boundary, this point will represent the optimal solution with equal relative concessions being made. Gauthier's concept of justice and morality has been criticised from multiple angles (Binmore, 1998; Braybrooke, 1987). However, the primary criticisms are around the inability of the theory to apply to any person not contributing to part of the cooperative surplus, which includes a very sizable portion of the population (Braybrooke, 1987). Gauthier provides an approach to impartiality that, while attractive in its reliance on market-based mechanisms and the innate morality of all people, does not address many of the fundamental concerns around inducing impartiality to the same degree that the other three mechanisms

discussed do. While there is a somewhat limited literature considering the ability of MRC to reach impartial decisions, there is a growing body of work that can be analysed to consider the relative merits of the other three mechanisms.

Distributive Justice Preferences and Impartiality

Lange et al. (2007) focuses on the distributive justice preferences of climate change negotiators who can be considered as implicated agents. Lange et al. (2007) survey climate change negotiators to understand their preferences for different climate change burden-sharing mechanisms (e.g. polluter pays or ability to pay). They conclude that the participants demonstrate a bias towards mechanisms that present the lowest cost for the countries they represent, demonstrating that impartiality is important for determining fairness. Lange et al. (2007) do not compare the negotiators' preferences with a distributive justice scenario in which the agents are not implicated, and are therefore unable to say whether the preferences shown by the negotiators actually align with their core ideals of justice.

The majority of studies on individuals' distributive justice preferences are conducted on university students. Exceptions to this include two studies on the general population's preferences concerning climate change burden sharing by Carlsson (2011) and Cai (2010).

Aguiar et al. (2013), for example, conducted an experiment using students to investigate how adopting a different impartiality inducing mechanism effects the participant's preferences. They assigned different participants the roles of implicated stakeholder or impartial party, therefore, like Lange et al. (2007) it is not possible to analyse the changes in an individual's preferences under both implicated and impartial conditions. Nevertheless, they found that the choice of impartiality mechanism could have a large impact on the participants' preferences.

Konow (2008) used students as participants to explore an individual's distributive justice preferences under three different levels from uninvolved to highly implicated. The study found that under uninvolved conditions, participants are less biased, but also that bias can be reduced even in implicated stakeholders through the provision of relevant information. These findings have important implications, both in demonstrating that by removing personal stakes, greater levels of agreement on core justice principles can be reached, and also that even when stakeholders are implicated in a scenario, the provision of information can help participants to converge on less biased solutions.

Another study that adopts the idea that impartiality can reveal fair distributive justice mechanisms was conducted by Faravelli (2007). In this study, Faravelli surveyed students to determine the effect that providing additional contextual information has on the participants' preferences for different distributive justice mechanisms. The study also considered the effect that education has on perceptions of fairness. Like Konow (2008), Faravelli found that the provision of additional information helps participants to converge on a common conception of fairness.

A common theme amongst many of these studies is the use of student samples. In considering the appropriateness of using a student sample for research, a distinction has been made between research topics involving 'fundamental' and those relating to 'proximate' processes, structures and outcomes (Bello et al., 2009; Stevens, 2011). Fundamental social issues are those concerned with basic human nature and are relatively independent of context and life experiences. Proximate issues focus more on specific contexts rather than basic human nature. Bello et al. (2009, p. 364) suggest that:

> "Findings concerning processes, structures and outcomes that are sensitive to the influence of context and life experiences are unlikely to generalize across different segments of the population."

The distribution of resources amongst people is highly context dependent (Faravelli, 2007) and therefore falls under the banner of a 'proximate' issue. While it is common for studies of distributive justice to emphasise the importance of context in determinations of fairness (Faravelli, 2007; Konow, 2001), it is equally common for them to employ student samples for the research. It has been shown that the decisions made by student samples can be significantly different from those made by a practitioner within a specific contextual scenario that the practitioner is involved with (Mintz et al., 2006). In order to understand the role of equity in a real-world scenario it is necessary to conduct research with the people who are directly involved. Extending theories of distributive justice to provide meaningful insights into practical distribution challenges requires moving beyond student samples in a laboratory environment to conducting research with practitioners in the field. This thesis builds off the distributive justice studies undertaken with student samples to investigate the applicability of theoretical distributive concepts justice in the field.

4.3.2 Summary of impartiality and personal bias

The expression 'justice is blind' highlights the significant role that impartiality plays in the search for fair outcomes. Each major theory of justice treats impartiality in a different way, and yet, the

concept of removing personal bias is at the core of many distributive justice theories (Nozick, 1974; Rawls, 1971; Smith, 1776). The preceding sections discussed four different mechanisms that have been put forward as a way to reduce personal bias in order to arrive at a fair outcome. Each mechanism allows different people to be involved, and provides them with different degrees of information. The biased views of fairness held by individuals have been shown to significantly affect he allocation of resources (Babcock & Loewenstein, 1997) and so any study of distributive justice must pay close attention to an appropriate impartiality inducing mechanism.

It has been shown that climate change negotiators are biased towards outcomes that present the lowest cost for their country (Lange et al., 2007). In the context of sustainability assessment, it is therefore unlikely that unbiased perceptions of fairness could be obtained by asking people about their opinion of fairness in a distributive justice situation that they are directly implicated in. It has also been shown that the choice of an impartiality inducing mechanism can have a large impact on people's perceptions of a fair outcome. It is important, therefore, in distributive justice research to ensure that both an impartiality inducing mechanism is in place, and that it is appropriate to the research area.

4.4 Summary of Chapter 4

This chapter expanded on the theoretical discussion provided in Chapter 3 to provide a deeper exploration on the application of distributive justice to the challenge of sustainability. The chapter began by drawing out the primary justice principles which underlie different theories of justice. Three key principles were isolated; need, efficiency, and responsibility (both exogenous and endogenous). It was argued that conceptions of fairness are context dependent and that the degree to which a theory of distributive justice is seen as fair can only be determined at a societal level. It was also argued that the importance that individuals place on different principles of justice within a specific context would influence the perceived justice of a particular allocation. Having established the importance of different justice principles for determining fair distributions, the chapter then outlined the importance of distributive justice to sustainability.

Both inter and intra-generational equity are of central importance to discussions of sustainability. According to the Brundtland Report, sustainable development requires meeting the needs of *all* people, both present and future, and providing all people with the equal opportunity to pursue a good life (Brundtland, 1987). What is considered equitable is necessarily a question of distributive justice. Having established the centrality of distributive justice to sustainability, the chapter then outlined three key mechanisms through which intragenerational equity specifically is of relevance to

agricultural sustainability. The environmental justice literature was drawn upon to demonstrate the relationships between inequality and environmental degradation. Procedural justice literature was brought into the discussion to demonstrate that the procedures used to reach a distribution are an important factor in ensuring that outcomes are perceived as legitimate and fair. And a body of literature investigating the connection between perceived fairness and task performance was drawn upon to demonstrate that perceived fairness in an allocation can have motivational effects which in turn result in performance enhancements. It was argued that if an allocation is perceived to be fair, those people involved in the allocation will be more supportive of the allocation and will perform the tasks required by the allocation to a higher level. This is of high relevance to agricultural sustainability assessment which often requires farmers to perform tasks to enhance their sustainability performance. The literature drawn upon suggests that agricultural sustainability assessment could be enhanced through attention to the perceived fairness of burden allocations.

Having established the importance of distributive justice to sustainability, the chapter then turned to international climate change negotiations to provide an applied example of the importance of distributive justice to a major sustainability challenge. A range of different mechanisms which have been proposed to reduce GHG emissions were outlined and their relationships to distributive justice principles were explained. These mechanisms provide a potential framework for addressing farm level agricultural sustainability challenges. The perceived fairness of these mechanisms to agricultural sustainability is largely unknown and is therefore investigated in more detail within this thesis.

A key site for distributive justice concerns within agricultural sustainability assessment is concerning target setting and benchmarking for sustainability performance. Several challenges for using reference values in agricultural sustainability assessment were discussed and it was argued that there are contextual factors involved which suggest that giving all farmers the same targets would not be fair. Little research has been undertaken on the fairness perceptions of farmers who are expected to address sustainability targets. How targets should be distributed amongst a diverse group of farmers in a manner which is considered fair is not well understood and presents a distributive justice challenge to improving agricultural sustainability assessment.

Chapter 4 explored some of the primary challenges of conducting distributive justice research on a specific sustainability challenge. Impartiality or the elimination of personal bias is considered a fundamental requirement of determining what is fair for a particular distribution (Nozick, 1974; Rawls, 1971; Smith, 1776). An outline of different ways in which impartiality can be induced in

distributive justice research was provided. A range of studies which tested the effects of different impartiality inducing mechanisms in distributive justice scenarios were reviewed. It was argued that research on distributive justice must include an impartiality inducing mechanism. It was also argued that the reliance on student samples in distributive justice research offers little insight into practical distributive justice challenges. In order to overcome this limitation of distributive justice research it will be necessary to research the distributive justice sentiments of people within the context of a specific distributive justice challenge that they are involved in. Chapter 5 now outlines the research methodology and builds a case for the use of a specific type of questionnaire-experimental method to conduct research on the role of distributive justice in a specific allocation challenge.

Chapter 5

Methodology

5.1 Introduction

As sustainability assessment and environmental monitoring become a more prominent aspect of agricultural operations, the challenge of allocating the burdens of environmental improvements amongst a diverse group of people is becoming increasingly important. The focus of the research was therefore on horticulturalists' perceptions of fairness around burden allocation decisions, and how different principles of distributive justice affect their perceptions of fair burden allocations. As explained in Chapter 1, the New Zealand horticultural sector was selected for the study for several reasons including its increasing focus on environmental concerns, its diversity of growers, its nationwide presence, and because it is a stakeholder in a wider sustainability assessment research project known as the New Zealand Sustainability Dashboard (NZSD).

This chapter begins by giving an overview of different methodological approaches to researching distributive justice perceptions. The use of vignettes in attitudinal research on distributive justice is discussed in more detail and key principles for designing vignettes are elicited. The research sought to elicit normative insights into justice perceptions. The chapter then considers three primary research designs that are commonly used to implement a vignette study. Having presented this background information on the use of vignettes in distributive justice research, the primary research questions addressed in this thesis are presented. The design of the vignette experiment used to investigate the justice perceptions of the horticulturalists is then explained and the literature is drawn upon to support the chosen method. Finally, this chapter provides an overview of supporting questions which were also put to the participants, and the sampling and surveying procedure which was used to administer the questionnaire.

5.2 Methodological Approaches in Distributive Justice Research

A range of methodological approaches have been used to investigate distributive justice concerns. This section briefly outlines some of these approaches before a more detailed exploration of vignette-experimental approaches is provided.

Three primary methods have been used to research the distributive justice preferences of individuals or groups in order to generate empirical insights. They are game theoretic experiments,

choice experiments, and questionnaire-experimental designs. Game theory studies human conflict and cooperation within a competitive situation. An example of a game theoretic approach is provided by Chavanne et al (2010). The study investigates the emergence of favouritism amongst third-party decision makers using a student sample. A three-player dictator game is used to consider the relevancy of earning money through either an effortful activity or the random selection. Cappelen et al. (2005a) also use a version of the dictator game using a student sample where the distribution phase is preceded by a production phase. The number of minutes the participants have chosen to work, their productivity, and an exogenously given price they receive for their production is used to determine their result (Cappelen et al., 2005a). Cappelen et al. (2005a) use this experiment to estimate to what extent the participants hold each other responsible for the various factors determining their contribution and the weight participants attach to fairness considerations. Aguiar et al., (2013) also use a student sample in an experimental setting; however, the focus of this study was on determining the applicability of different impartiality inducing mechanisms to distributive justice research. In the laboratory, groups were formed which consisted of three veiled stakeholders and one third-party observer. The task of the participants was to distribute a surplus amongst three stakeholders while various treatments differed in the impartiality inducing mechanism adopted by the individuals making the distribution (Aguiar et al., 2013). Aguiar et al., (2013) find that detached observers propose significantly fairer redistributions than veiled stakeholders or involved spectators. While game theoretic approaches can provide useful insights on distributive justice issues, they are challenging to implement with a diverse audience, as they typically require that participants meet together in a common location.

Another group of distributive justice studies uses choice experiments to determine distributive justice preferences. A key purpose of a choice experiment is to estimate economic values for characteristics (or attributes) of an environmental good, where the environmental good or service comprises several characteristics (Holmes et al., 2017). Carlsson et al. (2011) use a choice experiment to study citizens' preferences for effort-sharing rules of how carbon abatement should be shared among countries. Two different treatments are used, one where the respondents were informed about the country names and one where the country names were replaced with anonymous labels. Thus, the study was able to investigate how fairness preferences differ when contextual information is provided to the participant. Carlsson et al. (2011) find no significant differences between the two treatments, and hence find no evidence of in-group bias in preferences for effort-sharing rules.

Another choice experiment approach to distributive justice research is provided by Cai et al. (2010) who use an online stated preference survey with a student sample. They assessed willingness to pay (WTP) for climate change mitigation and explore the relationship between WTP for climate change mitigation and individuals' opinions about who should be responsible for climate change prevention. Cai et al. (2010) find that WTP is higher when larger cost shares are borne by parties deemed to bear a greater responsibility for mitigation, and when respondents believe (and care) that the impacts of climate change may be borne disproportionately by the world's poor. While choice experiments provide an established method for eliciting preferences, they are typically directed to identifying the value of a good or service, rather than understanding more abstract moral sentiments which are typical of distributive justice inquiries. Choice experiments often present only brief descriptions of the attributes of a good or service that is to be valued (Lagarde & Blaauw, 2009), this brevity can be insufficient for providing context for a distributive justice scenario.

The third primary method used in distributive justice research is the use of questionnaire-experimental, or 'vignette' designs. These designs are discussed in more detail in the next section; however, they typically involve the presentation of a fictional scenario followed by different options from which the participant can respond to the scenario. Amiel et al. (2009) present a student sample with questionnaire-experimental design to compare the distributive decisions of two different observers: detached and involved. Participants are asked through a vignette to imagine themselves in a distributive justice scenario, and select from or evaluate one of two economic policies, which have distributive justice consequences. Another example of a questionnaire-experimental design is provided by Konow (2008) who asks a student sample to allocate fixed resources in six hypothetical scenarios (or vignettes) under different conditions with respect to their role (stakeholder, spectator) and available information (base, relevant, irrelevant). The exposure of respondents to different information conditions and subsequent comparisons of their responses is a common feature of questionnaire-experimental designs. Konow (2017), for example, examines possible effects on fairness views of exposure to five weeks of readings and lectures on distributive justice in a mandatory ethics course. Other studies which use a questionnaire-experimental design with a student sample and vary information effects to determine the subsequent effect on fairness preferences include Faravelli (2007) and Yaari and Bar-Hillel (1984).

While questionnaire approaches without experimental components have been used to understand perceptions of fairness, they are less common. Lange et al. (2007) however, used a worldwide survey which was carried out with the help of a standardized questionnaire and which was sent in to people involved in climate policy. Participants were surveyed on the importance of equity issues in

international climate policy using the following scale: “Very high importance”, “High importance”, “Moderate importance”, “Low importance”, and “No importance”.

As already noted, a common theme throughout most of the research is the use of a student sample. Exceptions are Carlsson et al. (2011) who used a random sample of Swedish citizens and Lange et al. (2007) who used an international sample of climate policy practitioners. This thesis is therefore unusual, since the research participants are not students, but rather horticulturalists. This would have made laboratory experiments particularly challenging to conduct as there are multiple limitations that would impede gathering a representative group of horticulturalists in a single location.

Empirical distributive justice research requires that participants be asked to make moral judgments on a particular distribution. It also requires the controlling of information that is presented to the participants and then varying that information to create experimental conditions. Vignette questionnaire designs can be used to eliminate personal stakes that can contribute to biased expression of views. The incorporation of adequate contextual information alongside provisions to eliminate personal bias within a choice experiment has the potential to result in complicated and time-consuming choice sets. Vignette questionnaires are recognised as being particularly well suited to gathering information on moral intuitions and ethical opinions (Faravelli, 2007; Konow, 2003, 2009; Schokkaert & Overlaet, 1989). The use of vignettes within an empirical social choice framework allows for the reduction of a complete ethical theory to its constitutive building blocks. In this way, it can make complex philosophical concepts more accessible, and allow an exploration of people’s deeply held ethical values. As the research seeks to describe the ethical notions held by people, rather than to describe how people behave, the use of vignette designs is favoured by the research. Vignette designs, which are grouped within questionnaire-experimental methods allow the flexibility to include numerous and very different concepts of justice with the contextual richness that is often helpful for exploring a complex fairness concept (Konow, 2017). Additionally, Goldstein & Weber (1995) have argued that vignettes have proven better at aiding reasoning about complex concepts than presentation of problems in an abstract form. While this section provides some initial justification for the selection of a vignette experimental approach for the research, the following section provides a more detailed account of the applicability of different vignette methods and justifies more extensively why the chosen method was selected for the research.

5.2.1 Vignettes in Distributive Justice Research

An appropriate methodology for researching attitudes towards distributive justice should incorporate contextual richness, account for multiple influential factors, allow for sampling of groups or individuals specifically connected to the distributive challenge, and reduce social desirability bias in response behaviour. The previous section outlined a range of methods used in distributive justice research; however, the use of vignettes in a research design has proven to be particularly well suited to researching distributive justice issues (Konow, 2009).

A vignette is a short hypothetical scenario, which is often presented to research participants to frame questions that are designed to reveal their perceptions, values, social norms, or impressions. The main benefit of vignettes is that they allow contextually rich circumstances, analogous to real world situations, to be presented to participants (Konow, 2009). Goldstein & Weber (1995) show that this contextual richness has a significant positive impact on the ability of people to solve problems in comparison with a problem presented in an abstract form. While vignettes are less common in economics than in psychology, they have been employed in several significant economic studies (Dahl & Ransom, 1999; Kahneman & Tversky, 1979), as well as assuming a prominent place in justice research (Levine, 1993). Responses to vignettes have been shown to closely reflect responses to real world situations (Lanza et al., 1997). The contextual richness of vignettes and their ability to elicit responses from participants that closely reflect responses in the real world, make this method particularly well suited to the proposed research. Vignettes can be used to understand a participant's perceptions of justice in a hypothetical situation, which closely mimics real world issues they are facing. Vignettes allow for the inclusion of contextual information, such as details about effort or needs, which are required to develop a perspective on the fairness of a distributive justice vignette.

An important finding to come out of the empirical research on distributive justice is that beliefs about justice and evaluations of specific outcomes depend on both individual characteristics, social situations, and the type of resources to be allocated (Liebig et al., 2015). The justice of specific allocations can therefore only be assessed based on contextual information (Burke, 2006). Distributive justice considerations are complex, context dependent, and based in a social setting. Four methodological challenges that stem from the complexity inherent in attitudinal distributive justice research can be identified.

First, distributive justice judgements have been found to be highly **context dependent** (Faravelli, 2007), therefore, a lack of contextualisation can result in biased measurements of attitudes towards

distributive justice. This can present problems in both survey-based research as well as behavioural economics research where distributive justice attitudes are analysed through either direct observation in highly abstract and artificial settings or through direct questions. Vignettes help to address this challenge by providing information on the specific context within which a question is being asked. By explaining the context, the decision maker is provided with a higher amount of the typical information that they would base their real-world decisions on.

Second, attitudes towards distributive justice have been shown to be determined by a variety of **different factors**, therefore the importance of these factors (both relative and absolute) need to be determined if conclusions are to be drawn about their role in a distributive justice vignette (Liebig et al., 2015). Vignettes address this challenge by varying the contextual information provided to a participant or between participants. This allows the researcher to consider the effect of different factors on participants' decisions.

Third, the problem of a **social-desirability bias** in response behaviour (Paulhus, 1984) is particularly relevant in justice research as the subject matter can be sensitive (Fitzpatrick & Stephens, 2014) or prone to the respondent answering in a manner they feel to be politically correct, rather than from their true beliefs (Hainmueller et al., 2015). Vignettes address this challenge by abstracting the participant form the question being asked. Distributive justice vignettes typically present the participant with a fictional scenario and ask the participant to pass judgement on the vignette as an outsider. The participant is not asked about his or her own personal circumstances, but rather, their opinion on a fictional scenario. This abstraction from the question being asked allows the research to address sensitive topics indirectly thereby reducing the potential for a social-desirability bias.

Fourth, attitudinal investigations into distributive justice are often conducted in experimental situations with students (Faravelli, 2007; Konow, 2008). This is problematic in distributive justice research as evidence suggests that individual attitudes towards justice are influenced by **socio-cultural factors** and past individual experiences (Liebig et al., 2015). Hainmueller et al. (2015) found that using a student sample of respondents provided poor predictions of real-world outcomes in a distributive justice vignette. Vignettes can be administered to participants remotely through means such as a paper or online survey. This allows for a wider range of participants to be brought into the research who would be unlikely to take part in a laboratory-based experiment.

5.2.2 Vignette Research Designs

Vignettes are fictional scenarios presented to a decision maker who is then asked to make a judgement about the vignette (Barter & Renold, 1999; Finch, 1987; Taylor, 2006). Vignettes are commonly brief written descriptions of a situation intended to stimulate key features of a real-world scenario (Atzmüller & Steiner, 2010; Evans et al., 2015; Schoenberg & Ravdal, 2000). Evans et al. (2015, p. 162) describe the content and characteristics of a vignette as consisting of up to three different aspects, based on their function in the survey design:

> (a) experimental aspects, which are systematically manipulated across vignettes to assess their effect on the dependent variables; (b) controlled aspects, which are kept consistent (i.e., identical or similar) across vignettes in order to eliminate extraneous variance; and (c) in some cases, contextual aspects, which demonstrate some variation across vignettes in order to provide verisimilitude (e.g., nonessential details that enhance the ‘‘personhood’’ of a vignette character), but are not thought to exert a causal influence on the dependent variables.

As a result of these aspects, the vignette method integrates experimental principles with those of the survey (Gatskova, 2013). Vignettes are often constructed from previous research, practice knowledge, theory, or preliminary qualitative studies (Taylor, 2006). A vignette typically takes the form of a paragraph of text. Each sentence appears in a fixed order and contains factors that are relevant to the participant’s decision.

The majority of vignette designs follow the basic logic and variations of other experimental designs in that different levels in the independent variable are operationalised as different conditions (i.e. vignettes) and are presented to participants (Evans et al., 2015). The basic methodology for administering vignettes varies and includes:

- Within-subject designs where a set of multiple vignettes are presented to all participants,
- Between subject designs, where a group of participants are presented with the same vignette while other groups of participants are presented with different vignettes, and
- Mixed designs in which participants are randomly distributed amongst different groups, and presented with different sets of vignettes within those groups (Atzmüller & Steiner, 2010).

Vignettes can be used in a research design in multiple different ways. Three of the most relevant approaches to justice research are; vignettes followed by open-ended questions; vignettes applied in a factorial experiment; and, vignettes applied in a factorial survey. Three of the main approaches to vignette studies are described below.

5.2.3 Qualitative Response Vignettes

The use of vignettes followed by open-ended questions is most prominent in the fields of health and psychology research; however, examples can be found in other areas of research. An example of vignettes paired with open-ended questions used to address attitudes towards economic and policy concerns around housing is provided by Elsinga (2011). In this study, three vignettes were presented to the respondents, each vignette followed by one or two questions. For example (Elsinga, 2011, p. 366):

> *Vignette 1*
>
> *A young man and a young woman, both of whom still live with their parents, are thinking about buying a house. The woman has a relatively secure job as a primary school teacher. The man's work is less secure, and he has had a series of temporary jobs, although some have lasted as long as a year.*
>
> *Questions*
>
> *What do you think about their plan to buy a house?*
>
> *Which conditions should be met for them to buy?*

A coding framework was developed by the researchers, and a comparative analysis was undertaken of the responses. The analysis of the responses was primarily qualitative, and the findings reported contained multiple quotes from respondents which were then explored in detail alongside existing theory. A similar approach was taken by Fitzpatrick & Stephens (2014) in a study of attitudes towards homelessness. Fitzpatrick & Stephens (2014, p. 221) developed four primary vignettes, for example:

Vignette 1. Behavioural Transgression

A middle aged man (50 years old) is due to leave prison after 5 years. At present, he has no housing or job organised for when he leaves and no family to turn to. He has a history of homelessness and alcohol abuse.

Respondents were encouraged to describe their attitude towards the fictitious character in the vignette, and express what they thought would happen, and what should happen in respect to the character in the vignette in their respective countries (Fitzpatrick & Stephens, 2014). Analysis of the findings was undertaken through qualitative comparisons of the responses. Both Fitzpatrick & Stephens (2014) and Elsinga (2011) expressed a desire to limit the amount of detail provided in the vignettes so as to "allow the issues of greatest concern to interviewees to be identified, and to provide scope to explore a range of relevant vignettes in the in-depth discussions" (Fitzpatrick & Stephens, 2014, p. 220).

A study by Schoenberg & Ravdal (2000) into attitudes of elder care residents in regard to health and care services took a different approach to the previous two studies by providing longer vignettes with more contextual information, followed by multiple questions. For example (Schoenberg & Ravdal, 2000, p. 68):

Vignette #1

Ms Robinson, who has diabetes, lives with her 85-year-old husband, Arnold, who had a bad stroke and needs a lot of help with his personal needs (like getting to the bathroom). The couple has been together for 60 years and has some family members including two children who live in the same town, but not right next door. After Arnold's stroke, Ms Robinson took over all of the responsibilities around the house. She gets worried because the monthly checks don't seem to cover even the basic needs. When Ms Robinson `fell out' from her high sugar last month, problems started setting in. The doctor told Ms Robinson that now she should have someone looking after her - that she shouldn't be trying to lift her husband out of bed or fixing the meals or even driving the car for fear of another `falling out'. Ms. Robinson always thought she could handle everything that came along her way, but now that she isn't doing well, she doesn't know where to turn.

Questions

1. *What advice would you give to Ms Robinson/Mr Johnson?*

2. *What is it about that particular service or helper that makes it useful for an older person?*

3. *In your opinion, when (under what conditions) should an older person use a service or helper like the one you just recommended for Ms Robinson/Mr Johnson?*

4. *What is it about Ms Robinson/Mr Johnson's situation that makes it good for her/ him to use the service or help that you suggested?*

5. *What kinds of things might make it hard for Ms Robinson/Mr Johnson to follow up on your advice and use this service or helper?*

The interviewers first read the respondents two vignettes, and then asked five semi-structured questions related to their attitudes and awareness of the vignettes. The respondents were also probed to explore their responses in more depth. Analysis was then undertaken through a coding scheme and qualitative analysis of the responses.

Other qualitative approaches to vignette studies are more restrictive in the responses they elicit, so that a deeper quantitative analysis can be undertaken alongside the qualitative analysis. An example of this approach is provided by Emanuel et al. (1996), who investigated the attitude of respondents towards euthanasia and physician-assisted suicide. Respondents were presented with four vignettes describing a fictitious patient, followed by a question. For example (Emanuel et al., 1996, p. 1806):

Vignette 1.

A patient develops metastatic cancer, which invades the bones and causes excruciating pain. Current levels of morphine, nerve blocks, and other treatments are failing to control the pain completely.

Question

Would it have been all right for the doctor, upon request from the patient, to administer intravenous drugs, such as potassium, intentionally to end the patient's life or to prescribe drugs so the patient could end his or her own life by overdose?

Analysis of the results was then undertaken through both statistical (e.g. stepwise logistic regression and bivariate correlations), and qualitative methods. All of the qualitative response vignettes described in this section were conducted by interviews, either face to face or over the telephone.

5.2.4 Full Factorial Design

Unlike qualitative methods, experimental research designs seek to correlate outcomes of a decision with input factors in a measurable way. The decision outcome is known as the dependent variable, and is measured in relation to the factors being studied. The influencing factors are known as the independent variables, which are studied to understand their effect on the decision. Experimental methods commonly simplify a decision to produce verifiable conclusions about particular aspects of the decision under study. Where there are multiple factors influencing a decision, it can be complex to determine which of the factors are exerting an observed influence.

In a factorial design, the researcher constructs vignettes which will be judged by respondents (Dülmer, 2007). A factorial design requires that each respondent rate the level of a specified outcome variable (such as fairness, wage level, or healthiness) related to a fictitious agent (such as a person, a group, or a company), which has been described in terms of potentially relevant factors such as age, work effort, needs, or habits (Jasso, 2006).

The level or presence of different factors within the sentences is randomly varied between each vignette. In this way, the factorial design contains the important elements of an experimental design, in that the independent variables (the factors) that are presented to the decision maker are both controlled by the researcher as well as being randomly assigned. By allowing each factor in the vignettes to vary independently with respect to its levels, factor orthogonality is achieved across the vignette 'universe' (i.e. all possible combinations of dimension levels) (Wallander, 2009). A vignette universe consists of the (Cartesian) product of the levels attached to the dimensions.

For example, a vignette that contains two independent variables, each consisting of three levels, allows a maximum of $3^2 = 9$ vignettes to be constructed. These nine vignettes represent the completely crossed 'vignette universe' (Rossi et al., 1974). If all nine vignettes are judged by each participant, the given variables stand according to their composition, orthogonal to each other (Dülmer, 2007). This approach is considered to be a full factorial design (Collins et al., 2009), or a factorial experiment (Taylor, 2006). Table 5-1 illustrates a 2x2 and

Table 5-2 a 3x4 factorial design with every possible combination illustrated by letters of the alphabet. A factorial experiment requires that every combination of factors be presented to participants in sufficient number to measure the effects of each factor (Alexander & Becker, 1978).

Table 5-1 2 x 2 Factorial Design

Need	**Responsibility**	
	High	Low
High	A	B
Low	C	D

Table 5-2 3 x 4 Factorial Design

Need of Water	**Responsibility**		
	High	Medium	Low
<1000ltr pa	A	B	C
1000-2000ltr pa	D	E	F
2000-3000ltr pa	G	H	I
>3000ltr pa	J	K	L

Alternatively, and more commonly, the full set of vignettes is divided amongst a group of respondents, so that not every respondent answers every vignette (Konow, 2017), but overall, the full set of vignettes are considered. For example, as part of a study on elders' attitudes towards different behavioural and pharmacotherapy treatments, Burgio et al. (1995) presented 144 respondents with a single vignette and three associated questions, from a total pack of 12 vignettes. Each vignette contained three factors (i.e. independent variables), two of which had three levels and one of which had two levels; additionally, each vignette contained three outcomes to select from (dependent variables).

Where experimental vignettes (full factorial designs) often use a separate vignette for each change in condition, factorial surveys allow for variations in the experimental variables within each vignette and for each participant (Wallander, 2011). Factorial surveys have a well-established history in justice research partly due to their ability to meet the five methodological challenges discussed previously.

5.2.5 Factorial Surveys

In contrast to a factorial experiment, factorial surveys do not require the number of factors to be limited. Everyday decisions rely on a complex multiplicity of factors. The factorial survey works within this complexity and allows respondents to make 'everyday' types of decisions. The factorial survey was first developed by Rossi et al. (1974) as a distinct design.

Central to the factorial survey is the use of vignettes, sometimes referred to as factorial objects (Rossi & Nock, 1982). The factorial survey has been referred to as a hybrid technique combining the factor orthogonality (i.e. perfect non-association between dimensions) characteristic of balanced multivariate experimental designs, with a high level of complexity and contextual richness more commonly obtained through sample survey procedures (Rossi & Nock, 1982; Wallander, 2009).

The factorial survey design provides a method for analysing the ways in which multiple independent variables influence a decision. The number of factors in the vignettes is often five to ten, but may be over twenty. Where a factorial *experiment* (Ashton, 1999) requires limiting the number of factors involved, a factorial *survey* (Rossi et al., 1974) places no strict limitations on the number of factors. For example, a study by Caro et al. (2011) presented 115 respondents with 4 vignettes each, for a total of 460 vignettes rated. The vignettes had five dimensions that varied from two to four levels each, plus an additional two binary dimensions for a total factorial object universe of 1,152. Overall, 40 percent of the total pool of vignettes were responded to. This is an important characteristic of factorial surveys and vignette methodologies in general, as it is argued that they allow for a more realistic portrayal of the multitude of factors faced by people in their everyday life.

The participants are required to complete tasks (dependent variable) in the form of a question or questions at the end of each vignette. Taylor (2006) suggests the decision may be framed as:

• Categorical (e.g. requires referral or does not);

• Ordinal (e.g. 'the probability of a further violent incident is negligible/low/medium/high/very high'); or

• Interval (e.g. the level of concern about a specific risk to the client rated on a scale from nought to nine).

By randomising both the factors within the vignettes and the allocation of vignettes to respondents, the factorial survey aims to achieve the robustness of an experimental method. The decision that

needs to be made (the dependent variable) is measured for different combinations of the factors (independent variables) in the vignette. A factorial survey however, does not require that every possible combination of every factor be measured. By allowing a larger range of factors to be studied than a factorial experiment would, the factorial survey comes closer to reflecting the complexities of real decision-making (Taylor, 2006). By drawing a sample of vignettes randomly from the vignette universe, rather than having respondents judge all possible combinations of dimension levels (i.e. a factorial experiment), a large number of factors and factor levels can be included in the design, enhancing the realism of the vignette (Rossi & Nock, 1982). As approximate factor orthogonality is present in the samples of vignettes judged by the respondents, it is possible to measure the unique effect of the factors which are usually highly correlated (Wallander, 2009).

5.3 Objective of the Research and Associated Research Questions

The research presented in this thesis had an overarching primary objective:

> *Research Objective. To develop a set of axioms, based on perceptions of fairness, which could be used to aid the creation of sustainability policies or initiatives that can better achieve their objectives and garner the support of those expected to implement them.*

The research is intended to aid in developing industry level sustainability programmes that are better tailored to the perspectives of the participants, thereby improving their likelihood of being accepted and supported by the programmes intended participants. Two primary research questions were formulated to achieve the research's primary objective.

5.3.1 Research Question 1: Fairness Sentiments

> *RQ1. In the absence of contextual information which explains why one person is more efficient than another, how do horticultural stakeholders' perceptions of fairness align with theories of distributive justice?*

The research is based in a long history of formal philosophical and economic theories of distributive justice as outlined in Chapter 3. Formal theories of justice however, need to account for the moral intuitions held by those who could be affected by them (Schokkaert & Overlaet, 1989). The research seeks to develop the practical applicability of distributive justice theories for the challenge of agricultural sustainability through improving an understanding of farmers' alignment to different justice theories. The research asks participants to consider a range of fairness issues related to cost

sharing, burden sharing, and target setting in sustainability assessment. Each of these issues relates directly to theoretical conceptions of justice, and can be used to explore the fairness sentiments of the participants.

The control vignette in the research therefore provides no contextual information on the character; instead, it requires growers to select an outcome allocation they consider fair without knowing why one grower is more efficient than another is. In the absence of contextual information, growers are required to solve a distribution problem according to their own personal attitudes. This reveals the grower's perceptions of the fairness of a distribution and reveals axioms used by the grower under the condition of restricted information.

The literature is mixed on the effect of a fairness bias on participants' conceptions of justice. The research tests the degree of self-serving bias through the justice principle of efficiency. The control vignette requires respondents to consider trade-offs between industry efficiency and the burdens placed on an individual grower. Different theories of justice present different predictions of how a grower will behave when faced with these choices. The research question tests the alignment of the participants' justice perceptions with major theories of justice. The research also tests the generalisability of student sample studies to a wider audience by drawing comparisons to previous studies which employed a similar method (Faravelli, 2007; Yaari & Bar-Hillel, 1984).

5.3.2 Research Question 2: Fairness Principles

> *RQ2. When presented with contextual information which explains why one person is more efficient than another, do horticultural stakeholders perceptions of fairness change, and how are their responses predicted by distributive justice theories?*

The research hypothesises that when presented with contextual information surrounding a distribution problem, the growers' perceptions of fairness will subsequently change in accordance with the predictions of different justice theories. The research tests the extent to which context (i.e. need, responsibility, and efficiency) affect the choices of the growers. To test this hypothesis, the response of the grower to a fairness vignette providing contextual information was compared to their response to the same vignette without the contextual information.

Like Faravelli (2007), the research was interested in how contextual information affects perceptions of justice. The research developed the contextual information to be presented to participants from two main sources. The first source of information was the major theories of distributive justice (Adams, 1965; Bentham, 1879; Dworkin, 1981a; Feinberg, 1970; Nozick, 1974; Rawls, 1971; Sen,

1973), as outlined in Chapter 3. Each of the major theories of justice is based on one or more principles of justice. The second source of information was the literature on climate change negotiations, which was used to refine the theoretical justice principles into a list of principles that were highly relevant to burden sharing challenges around environmental change mitigation (Heyward, 2007; Lange et al., 2010; Stern, 2014; Underdal & Wei, 2015). The result of this refinement was the selection of four key principles of justice for which the effect on horticulturalists perceptions of fairness were tested; need, exogenous responsibility, endogenous responsibility, and efficiency.

While some studies show that participants select distributive justice mechanisms to benefit themselves (Lange et al., 2010), others find no self-serving bias (Carlsson et al., 2011). Faravelli (2007) finds that a respondent's education level and type affect their fairness preferences. The research hypothesised that demographic characteristics would affect perceptions of fairness. To test this hypothesis the research compared the responses of growers across multiple horticultural industries, with different levels of education, age, income, and other demographic and attitudinal factors. The research was particularly interested in the impact of the horticulturalist's income (as a measure of power) on their fairness preferences. The field of environmental justice has drawn multiple connections between wealth and environmental outcomes (Biel, 2015). It has been argued that wealthier people favour distributive justice outcomes that shift the burden of environmental effects onto the less wealthy (Boyce, 1994). The research sought to understand a range of potential predictors of fairness perceptions, but paid additional attention to the effect of wealth on fairness preferences due to its significance in the literature.

5.4 Design of a Vignette Experiment for Horticultural Respondents

The are several steps to the implementation of a vignette experiment (Atzmüller & Steiner, 2010): (i) construction of the total vignette population, (ii) determination of the number of vignette sets and vignettes per respondent, (iii) construction of vignette sets, (iv) sampling of respondents and collection of data, and (v) analysis of vignette data and interpretation of results.

Some key design principles for constructing vignettes can be distilled from the literature, much of which was produced early in the development of the vignette method and which has changed little since its first inception. The vignette method relies heavily on the story presented to the participant, therefore, the story must appear plausible and real to participants (Neff, 1979). Stories should not depict overly eccentric characters or unusually disastrous events, and instead should present more mundane occurrences (Finch, 1987; Hughes, 1998). The vignettes need to contain enough context

for respondents to understand the situation, but remain vague enough that participants are forced to define the problem in their own terms (Finch, 1987). The stories should be constructed so that they align with the personal experiences of the intended participants to enhance engagement and relevance (Barter & Renold, 1999). Targeting and tuning the vignette to the needs of its intended audience is an essential requirement of a robust vignette experiment. A postgraduate university student respondent and a horticulturalist require very different approaches to constructing an appropriate vignette, which has implications for the complexity and density of the stories they can be presented.

In developing the vignettes used in this thesis, several meetings, workshops, presentations, and unstructured interviews were conducted from October 2016 to February 2017 to ensure that the vignettes were tailored to the personal experiences of the intended participants. Some of the more significant interactions that took place in the development of the vignettes included:

- October 2015. A conference call was held with several agricultural sustainability researchers in order to socialise the research method.

- November 2015. A workshop was held with 18 agricultural sustainability researchers, stakeholders, and consultants in Christchurch. The proposed research was presented feedback was received on the implementation of the survey.

- February 2016. A workshop was held in Dunedin with domestic and international academics and horticultural industry consultants. The proposed research and method were presented and a break out group of participants was brought together to refine the survey content.

- July 2016. The proposed research and method were presented at The 12th European IFSA Symposium will at Harper Adams University, UK. This provided the opportunity to incorporate a broader international perspective in the research.

- September 2016. The proposed research and method were presented to Horticulture New Zealand at their head office on Wellington. In attendance were the business manager and quality systems manager as well as consultants from the wine, kiwifruit, and agricultural research industries.

- September 2016. A draft survey was sent to the Quality Systems Manager at Horticulture New Zealand who provided feedback on the surveys likely ease of comprehension by growers, as well as some content suggestions.

- October 2016. A workshop held in Zespri's main office in Tauranga. Present at this workshop were the Market Access Manager at Zespri International; a Market Assurance Analyst at Zespri International; and the Kiwifruit Research Leader at The AgriBusiness Group. The workshop discussed the content and implementation of the proposed survey.

- October 2016. Interviews of approximately two hours each were held with two kiwifruit growers on their orchards in the area of Te Puke in the Bay of Plenty region. The interviews elicited a deeper understanding of the fairness challenges faced by growers, and on how to construct a survey that could be easily understood by practitioners.

- February 2017. The draft survey was sent to four growers, two horticultural consultants from the wine and kiwifruit industries, the director of an agribusiness consultancy, and five academic researchers with significant experience in agricultural sustainability issues and in conducting farm surveys. Feedback was received, and changes were made before the final survey was sent out in March 2017.

These interactions helped to determine both the content of the vignettes as well as to formulate and test the questions which followed the vignettes and the research design. Discussions with growers in particular had a large influence on the selection of an appropriate method. Additionally, as the method was developed, it was tested on multiple audiences through the interactions listed above. This allowed the method to be specifically tailored to the intended audience to aid clarity and ensure the findings were robust. Having established a base set of requirements, the literature was consulted for an appropriate vignette method which would meet the needs of the research. In a seminal paper on evaluating the performance of several distributive justice mechanisms, Yaari and Bar-Hillel (1984) quantified several distributive justice theories as a two-person distribution vignette. Yaari and Bar-Hillel (1984) followed a full factorial design as described previously. Their method was based on a typical distributive justice challenge, that is, a fixed collection of well-defined, quantitatively measurable and perfectly divisible entities is to be divided amongst certain individuals, who have no prior claims on these entities (Yaari & Bar-Hillel, 1984). This type of problem is an everyday occurrence that can range from deciding who should receive a scholarship to university through to who should get the last piece of a pizza. The intent of the research is to explore the rules that determine how a distribution should be undertaken.

An entity is often thought of as a good or a commodity to be distributed. However, an entity can also be a bad having the property that, all things being equal, individuals prefer having less of it rather than more. In the context of environmental certification or sustainability assessment, the burdens

imposed upon farmers in order to enhance the environment are often seen as a bad in that, all things being equal, the farmer would prefer to have less burdens rather than more. The vignette approach to distributive justice research developed by Yaari and Bar-Hillel (1984) and later adapted by others (e.g. Faravelli, 2007; Konow, 2009), provided an apropriate foundation on which to develop the vignette experiment for the horticulturalists.

Distributive justice concerns centre on the rules and manner in which this division should be undertaken. This general type of distribution problem forms the basis of the research. The entities being distributed are goods or services with the property that, *ceteris paribus*, an individual would prefer to have either more or less of them. If the entities being distributed are bads, such as unpleasant duties, then an individual would rather have less than more of the entity. If the entities are goods, such as financial incentives, then an individual would rather have more than less of the entity. In order to simplify the consideration of distributive justice preferences, this thesis restricts attention to problems involving the division of a bundle of burdens (bads) between two individuals.

5.4.1 Structure of the vignette experiment

The research presented in this thesis used a between-subject design in which contextual information on fairness principles was varied between groups (Marescaux et al., 2016). The research used a full factorial design for the vignette experiment with the vignettes varying on three factors each with only one factor level ($3^1 = 3$ vignettes) and a control vignette. Thus, there were four unique vignettes in total. Each participant answered the control vignette, and one of the remaining three vignettes. The participants were therefore divided into three groups according to the second vignette they received. All four vignettes are attached as Appendix A. They are referred to here as Vignette 1 (base treatment), Vignette 2.1 (need treatment), Vignette 2.2 (exogenous responsibility treatment), and Vignette 2.3 (endogenous responsibility treatment). Every respondent undertook vignette 1 and only one of Vignettes 2.1, 2.2, or 2.3. Vignettes 2.1, 2.2, and 2.3 were allocated to 1/3 of the sample each.

All four vignettes presented to the participants were formally identical. Burdens were to be divided between two individuals. The vignettes were simplified in comparison to many other similar studies using vignettes. In contrast to other studies, the respondents were practitioners in the field rather than students in a lab. The time requirements and complexity of the vignettes were therefore a more critical consideration for response rates than they would be for a student sample.

All respondents were presented with the following distribution challenge which is explained in detail below:

Imagine you are a packhouse manager in the Australian apple industry who needs to meet this 12% target.

You only have two growers, Sarah and Steve, and the following information:

Sarah - A cut in water use will have a **large impact** on production, but a cut in energy use **no impact**.

Steve - Cuts in water or energy use will have a **moderate impact** on production.

Question: All three options below will meet the 12% target, which option do you think is the **fairest**?

Options (please check only one option)		**Energy and Water Cuts**	**Reduction in apple Production**
Option 1 ‘All things equal’ ☐	Sarah	-6% Water / -6% Energy	-2.4%
	Steve	-6% Water / -6% Energy	-2.4%
			Industry Total Apple Reduction **-4.8%**
Option 2 ‘Equal Outcome – Unequal Cuts’ ☐	Sarah	-4% Water / -12% Energy	-1.6%
	Steve	-8% Water / -0% Energy	-1.6%
			Industry Total Apple Reduction **-3.2%**
Option 3 ‘Unequal outcomes – Efficient cuts’ ☐	Sarah	-0% Water / -12% Energy	0%
	Steve	-12% Water / -0% Energy	-2.4%
			Industry Total Apple Reduction **-2.4%**

The vignette begins with the following statement:

> *Imagine that the Australian government has asked the horticultural sector to reduce its water and energy use by 12% each.*

The vignette is intended to place the participant in a familiar context, by making it relatable to their working relationship with the horticultural sector. However, it is also intended to remove any direct perceived threat to the participant by placing the vignette in an Australian context. This is to help mitigate some of the potential for biased answers, while maintaining familiarity in the vignette. The participant is given the following role in the vignette:

> *Imagine you are a packhouse manager in the Australian apple industry who needs to meet this 12% target. You only have two growers, Sarah and Steve…*

The participant is given the role of a packhouse manager, a role that they are highly likely to understand, and yet, are less likely to be directly employed as due to the small number of packhouses across the horticultural industry in comparison to the number of individual horticultural operations. They are also given a target to reduce industry wide electricity and water consumption by 12 percent. To aid convenience, they have only two growers to consider Sarah and Steve, who constitute the industry. The participants are all presented with the following information on the two growers:

> *Sarah - A cut in water use will have a large impact on production, but a cut in energy use no impact.*
>
> *Steve - Cuts in water or energy use will have a moderate impact on production.*

The two characters face different levels of burdens, from the cuts. Consistent with the general distributive justice problem described previously, an individual character is interested only in reducing their burdens, in other words, receiving less bads. The respondents are asked to choose a solution among the three provided so that the distribution is fair with the following prompt:

> *All three options below will meet the 12% target, which option do you think is the fairest?*

The challenge provides no contextual information on the growers' circumstances; instead, it only provides information only on the effect of environmental mitigation targets on the growers' production levels. For each vignette, participants were given three potential solutions to the

challenge and were asked to select one. Each solution presented both a loss to an individual's utility (measured in decreased apple production) and an overall loss of utility at an industry level (measured in total industry apple reduction).

The first was a utilitarian solution. The utilitarian solution resulted in the lowest overall loss of utility to the industry, yet the most unequal distribution of burdens. The second option was based on John Rawls' Difference Principle. While the loss of overall utility was higher under a Rawlsian solution than a utilitarian solution, the distribution of burdens was more equitable. The third, egalitarian, solution resulted in an equal loss of utility each grower in the vignette, however it also resulted in the highest overall loss of utility.

In addition to the distribution challenge described above, a range of other quantitative and qualitative questions were asked about personal characteristics and opinions on environmental mitigation and cost sharing mechanisms.

5.4.2 Contextual Information

Three different versions of the survey were distributed amongst the participants. Each survey contained two vignette questions. The two questions were identical in all respects with the exception that the second vignette question added some additional contextual information. The first vignette question (Vignette 1) was the same for all participants, while there were three different types of contextual information that were presented to different participants in the second question (Vignette 2).

All three versions of Vignette 2 maintained this same base information, but then added some additional contextual information. This contextual information was added to provide some explanation of why one character in the vignette may not be able to mitigate some aspects of his environmental performance as easily as the other. Vignette 2.1 added contextual information on the 'needs' of one of the characters:

> *Steve's orchard is newly established and is struggling to make a profit.*

This contextual information establishes that Steve may have higher needs than other growers. This contextual information is included to help explain why Steve may be less efficient than Sarah on some aspects of his environmental performance.

Vignette 2.2 added contextual information on a matter of 'exogenous responsibility' which may be impacting one of the characters:

Steve's local environment makes it difficult for him to reduce his water use

This contextual information establishes that there are environmental factors outside of Steve's control which may be impacting his ability to make environmental improvements. Like the previous vignette, this information is included to help explain why Steve may be less efficient than Sarah on some aspects of his environmental performance.

Vignette 2.3 added contextual information on a matter of 'endogenous responsibility' which may be impacting one of the characters:

Steve has put no effort into improving his water use

This contextual information establishes that there are internal factors within Steve's control which may be influencing his environmental performance. Again, this information is included to help explain why Steve may be less efficient than Sarah on some aspects of his environmental performance

Each respondent was presented with Vignette 1 and one of either Vignette 2.1, 2.2, or 2.3. For the purpose of the analysis, the participants' responses to Vignette 1 were used to determine base fairness perceptions in the absence of contextual information as well as group the participants by their selection. The first group was comprised of participants who selected a Rawlsian distribution, the second was those who selected an egalitarian distribution, and the third was those who selected a utilitarian distribution. The research was concerned with whether the contextual information provided in the second vignette affected the participants' perception of what was a fair allocation of burdens between the two characters in the vignette. The research considered how fairness perceptions changed, and sought to understand which independent factors influenced the likelihood that an individual would change or maintain the fairness perceptions in the presence of additional contextual information.

5.5 Other Questions

In addition to the vignette experiment, the survey collected additional information considered relevant to the analysis of fairness perceptions. The additional information collected was used as the explanatory variables in the analysis. The first question of the survey determined whether the

respondent was directly involved in a horticultural operation which was a requirement for participation in the research. The survey also asked whether they were involved in an environmental certification at present, and whether they considered this programme to be voluntary. All environmental certification in the horticultural industry in New Zealand is, in principle, voluntary at present. This question was included to investigate whether there were any relationships between whether the respondents considered their environmental certification to be voluntary, and their perceptions of fairness in a distribution. Section 4.2 outlined a range of literature which argued that there is a relationship between procedural aspects of establishing an initiative and the perceived fairness of outcomes. By stating that their environmental certification was not voluntary, respondents would be suggesting a level of coercion within their environmental certification. The research was interested in whether a negative procedural influence such as perceived coercion would have an influence on the perceived fairness of a distribution.

The participants were also asked two additional questions directly related to distributive justice in environmental certification. First, they were asked to use a sliding scale to allocate the percentage costs of on-farm environmental improvements between the land owners and the general public. The intention of this question was to get a base understanding of the respondents' willingness to accept the costs of environmental mitigation. This question was included to allow comparisons to the environmental justice literature which suggests inequality in the sharing of environmental burdens creates adverse environmental outcomes (Boyce, 1994). This question also provides a point of comparison to the vignette questions which did not use money as a unit of measurement.

Second, the participants were asked to rank from most to least fair, three different mechanisms which are commonly used to allocate the costs of environmental mitigation. The three mechanisms were: the 'polluter pays' mechanism, which places the burden of responsibility on those causing damage; the 'ability to pay' mechanism which places the burden of responsibility on those with the greatest capacity to pay for mitigation; and, the 'existing use rights' mechanism, which places a larger burden on new growers/producers than it does on existing growers/producers. This question was included to explore the relevance of research on the distributive justice implications of international climate change negotiations to farm level sustainability assessments. The additional data gathered on both demographic characteristics and fairness perceptions was used to enhance the predictive power of the burden allocation models which were developed.

Based on the data collected in the survey nine null hypotheses were investigated through a statistical analysis:

H_1 : the choice of a particular option is unrelated to type of horticultural enterprise.

H_2 : the choice of a particular option is unrelated to the education level of the participant.

H_3 : the choice of a particular option is unrelated to the age of the participant.

H_4 : the choice of a particular option is unrelated to the size of the farming operation.

H_5 : the choice of a particular option is unrelated to income of the participant.

H_6 : the choice of a particular option is unrelated to whether the participant had some form of environmental certification.

H_7 : the choice of a particular option is unrelated to whether the participant considered their environmental certification to be voluntary or not.

H_8 : the choice of a particular option is unrelated to the participants choice of a fair burden sharing mechanism.

H_9 : the choice of a particular option is unrelated to the perceived fair allocation of costs to the land owner.

A range of demographic data was also elicited on age, income, horticultural industry, education, orchard size and region.

5.6 Final Survey and Sampling

Participants

Several discussions were held with horticultural industry representatives about strategies for distributing the survey to farmers as outlined in Section 5.4. Due to the limitations of distributing the survey through the horticultural industries internal mechanisms, the research took the approach of contacting growers directly.

Several public information sources were pieced together in order to create a sample. The initial challenge was to identify horticultural operations. Land information New Zealand hosts a GIS

mapping tool[1] which includes a horticultural land layer. This tool was used to identify blocks of horticultural land. Having established parcels of horticultural land, Google Maps[2] was then used to identify households or processing facilities on the land. The next challenge was to identify street addresses for the households. Google Maps provides street addresses, however these addresses tend to be inaccurate in rural locations, or are accurate for the land but not for the household. New Zealand Post's address locater tool[3] was therefore used to crosscheck the Google Maps addresses to ensure that it was in fact a valid address for postal purposes. Finally, in order to address the recipient of the survey by name, it was necessary to identify the landowner. Land ownership records are publically available upon request through Land Information New Zealand[4]. The names of the landowners were obtained for each of the identified addresses. The complete process is illustrated in Figure 5-1 below.

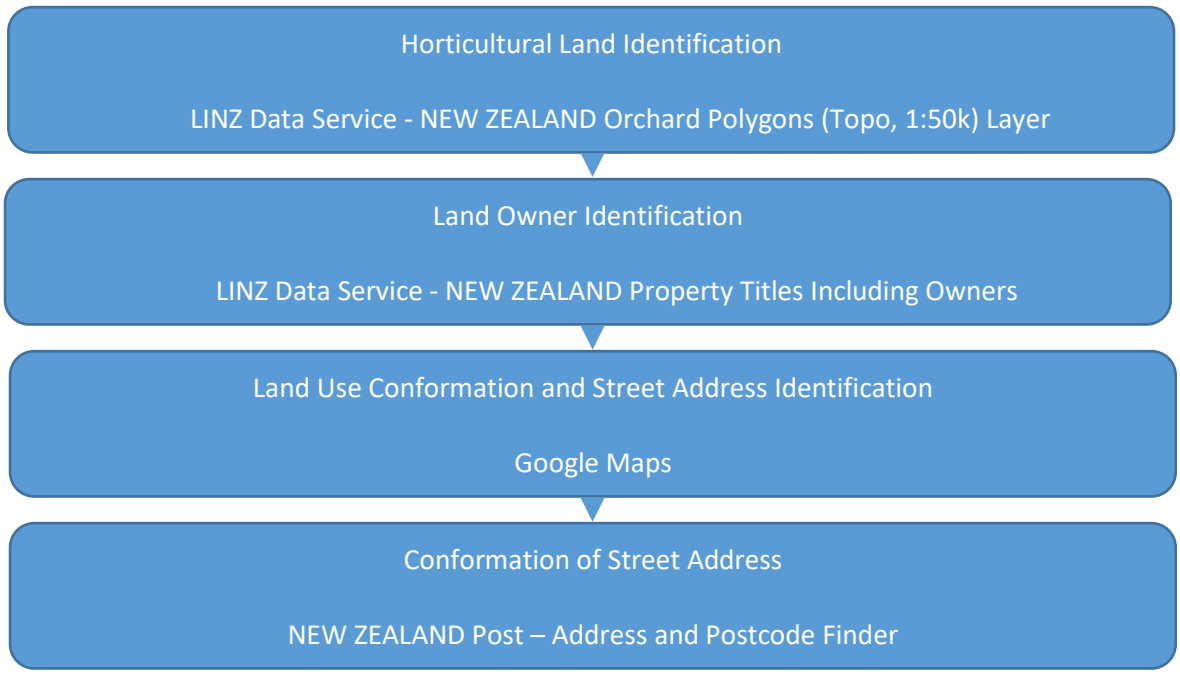


Figure 5-1 Participant identification process.

[1] https://data.linz.govt.New Zealand/layer/307-New Zealand-orchard-polygons-topo-150k/
[2] https://www.google.co.New Zealand/maps
[3] https://www.nzpost.co.New Zealand/tools/address-postcode-finder
[4] https://data.linz.govt.New Zealand/layer/805-New Zealand-property-titles-including-owners/

Through this approach, it was possible to identify and contact the desired sample directly. A postal survey was sent out to 600 addresses of which 136 addresses were invalid and were subsequently returned. Invalided addresses were subtracted from the total number of surveys sent when calculating response rates (Brennan, 1992). The total sample on which the response rate was calculated was therefore 464 recipients. The research sought to achieve a sample size of 90 responses (a response rate of 20 percent). Ninety responses were expected to provide approximately 30 responses for each of the three vignettes. A minimum of 15 responses per vignette was considered necessary do determine whether new contextual information could change fairness perceptions, and indicate the direction of the change.

The survey was mailed out on 21st March 2017 and a reminder card was sent four weeks later. The respondents were able to reply to the paper-based survey with a freepost return envelope. An example of the complete survey can be found in Appendix A.

The survey recipients received one of three different sub-versions of the survey. For each version of the survey, three sub-versions were created which contained the same content, but varied the order of outcome choices in the vignette experiments to help mitigate potential ordering effects (Kjaer et al., 2006). Figure 5-2 clarifies the survey version structure.

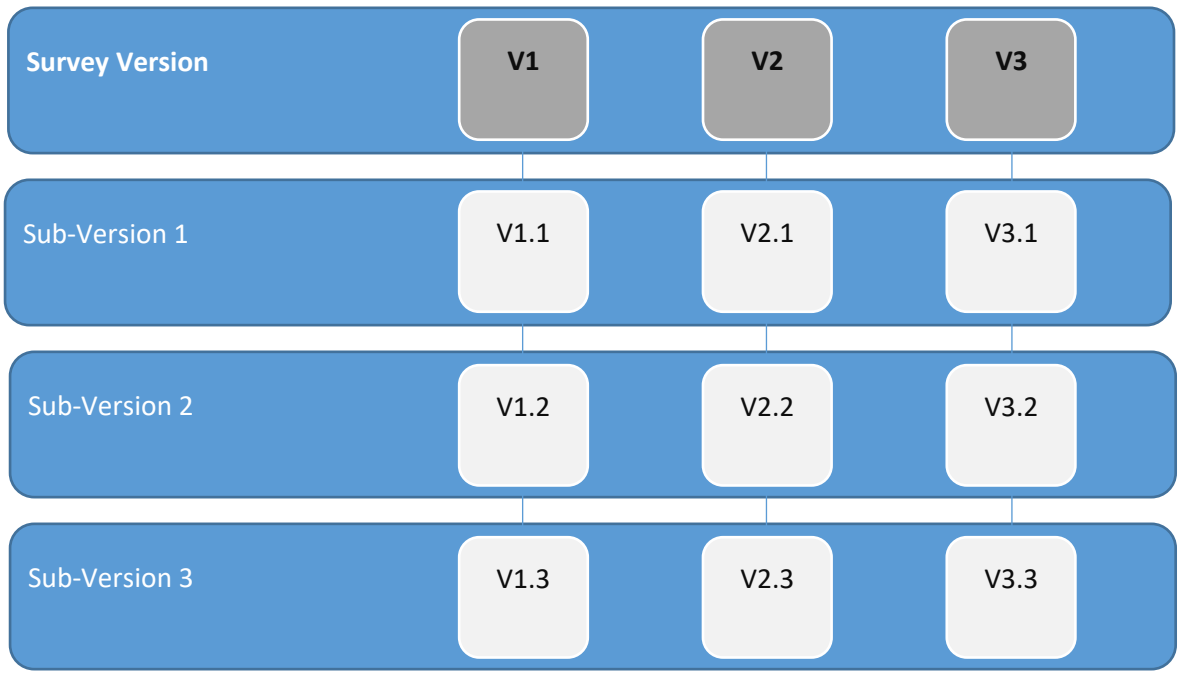


Figure 5-2 Survey version structure

5.7 Summary of Chapter 5

This chapter described methodological techniques for distribute justice research and the final survey that was constructed to meet the research's primary objective through addressing the two key research questions. First, the attitudinal questions set the context for the survey and allowed the research to define unique characteristics of the users. Second the first vignette question was used to establish a baseline measure of fairness preferences for the respondents, which was subsequently used to establish the respondent's group. Third, the second vignette question introduced contextual information to the respondents as was used to assess the effect of different principles of distributive justice on the respondent's fairness preferences. Finally, the survey gathered data on respondent demographics. This data was used to construct different models to predict farness preferences based on a range of variables. The next chapter presents the data analysis and results for this survey.

Chapter 6

Results and Discussion

6.1 Introduction

This chapter presents the data-analysis and discussion of the results from the environmental burden sharing survey. The chapter begins with a descriptive analysis of the survey respondents and demographics of the sample. After describing the participants, the chapter then presents and discusses the results that addressed the first research question. This section includes results from the initial exploratory questions and the control vignette. The following section addressed the second research question by presenting the results and discussion from introducing contextual information within the vignettes, and providing a within-subject analysis of contextual information effects. This section also establishes a set of axioms which could be used to guide the development of industry level sustainability benchmarking or target setting systems.

6.2 Survey Responses and Sample Demographics

6.2.1 Number of responses

The overall response rate for the mail survey was 20 percent. Ninety-three responses were obtained from horticultural operations. Of the total responses, 89 were complete and four contained partial responses that were useable. An additional six surveys were returned that were unusable. Figure 6-1 provides a map of the responses. Due to the high level of cognitive challenge presented by the vignettes, and the commonly low response rates achieved in similar surveys (Pullman et al., 2009) a response rate above 20 percent was not expected for the research.

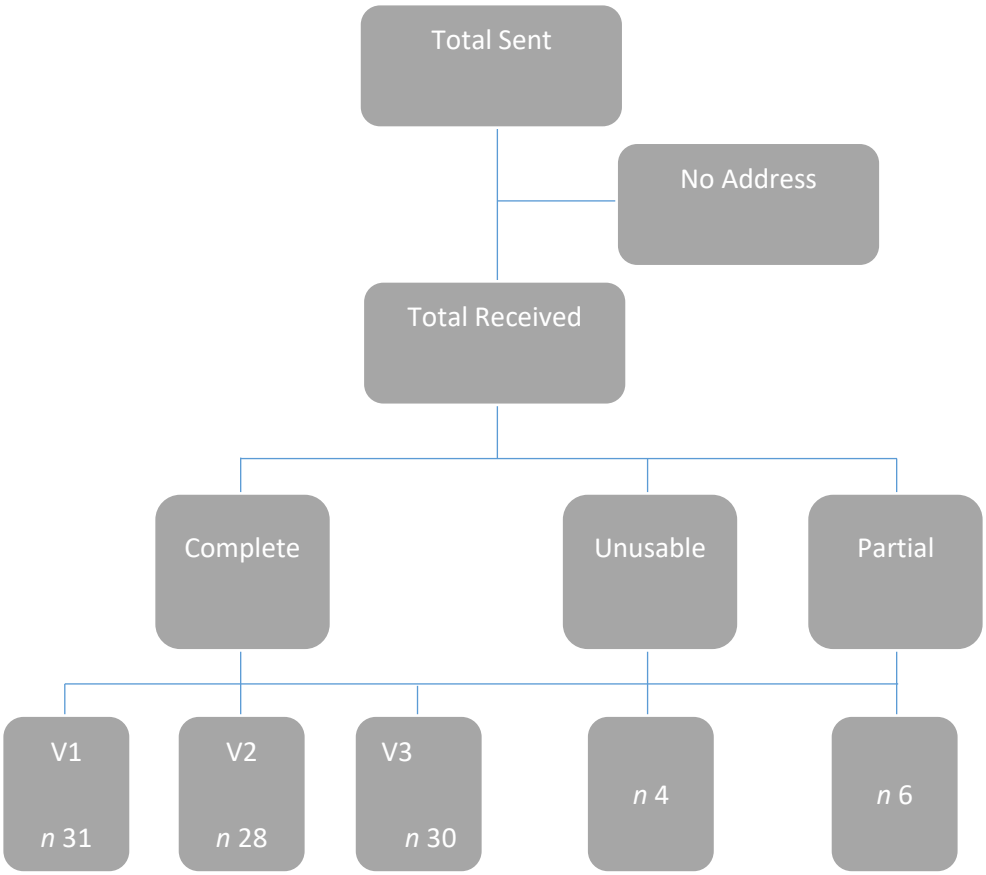


Figure 6-1 Map of responses.

6.2.2 Description of a typical respondent

A typical respondent was between 55 and 65 years of age; held an undergraduate diploma, certificate or degree; had a gross income of between $70,000 and $120,000; worked on a 12 hectare orchard; had some form of environmental certification, and lived in Marlborough, the Bay of Plenty, or Otago. There was very little variation between samples in respect of the respondents to the three versions of the survey. Responses were collected from a range of horticultural industries and regions as shown in Table 6-1 and Table 6-2. A comparison between the respondent sample and the wider horticultural industry shows that the respondent sample is reflective of typical horticultural operations in New Zealand (Statistics New Zealand, 2012).

Table 6-1 Number of respondents by industry

Industry	Count
Berry	3
Kiwifruit	18
Other (e.g. citrus, avocados)	7
Pip fruit	14
Stone fruit	13
Wine	34
Unknown	4

Table 6-2 Number of respondents by region

Region	**Count**
Auckland	3
Bay of Plenty	18
Canterbury	4
Gisborne	7
Hawke's Bay	6
Marlborough	21
Nelson	8
Northland	7
Otago	13
Waikato	3
Wellington	1
Unknown	2
Total	93

6.3 Research Question One results and discussion – Fairness Sentiments

6.3.1 Cost and Burden Sharing Results

In addition to the vignette experiment, the survey contained several questions intended to provide a deeper understanding of the respondents' contexts, and their explicit views on burden sharing. These questions considered existing environmental certification, cost sharing for environmental mitigation, and burden sharing mechanisms.

Certification and Voluntary

There are multiple different private certification standards used across the horticultural sector. They include standards such as; NZGAP, ZespriGAP, and Sustainable Wine New Zealand (SWNZ). The participants were asked if they belonged to one of these programmes, and whether they considered these programmes voluntary. The major environmental certification schemes being run within the horticultural sector are private standards or industry-led standards. There is currently no regulatory requirement at a national level for a horticultural operation to have environmental certification. However, environmental certification may be required for the orchardist to be able to sell their fruit. The question on whether the participants considered their environmental certification to be voluntary therefore seeks to explore how the private and industry-led standards are perceived by the participants. Table 6-3 presents the results from this question.

Table 6-3 Environmental certification status of respondents

	Certified		**Voluntary**	
	Yes	No	Yes	No
Count	78	11	33	45
Percentage	88	12	42	58

The majority (88 percent) of respondents had environmental certification. In terms of whether they considered their certification voluntary, the majority (58 percent) believed it was not. There was a large degree of variation in responses between industries, particularly around whether they considered their certification voluntary or not. Table 6-4 presents the results.

Table 6-4 Environmental certification by industry

	Percent Certified	Percent Voluntary
Berry	100	100
Kiwifruit	100	0
Other	57	50
Pip fruit	79	27
Stone fruit	77	20
Wine	97	70

The majority of all product groups had some form of environmental certification. The lowest was the 'other' category which comprised more smallholder type operations and may not be selling at a large commercial scale. There was a large degree of variation in the percent of respondents who

considered their environmental certification to be voluntary between the industries. Particularly striking is the contrast between the kiwifruit and wine industries. While both industries assess environmental performance in a similar way through an industry-led standard, no kiwifruit grower considered their standard voluntary, while 70 percent of the wine growers did. This is despite the vast majority of both groups being certified under voluntary schemes.

Cost Sharing

Participants were asked to use a sliding scale to allocate a proportion of costs for on-farm environmental improvements between the landowners (commonly themselves) and wider society. The most common allocation (43 percent) was a 50/50 sharing arrangement of costs between the landowner and wider society. Respondents were evenly split between those who indicated that wider society should bear more of the costs for on farm environmental improvements (28 percent) and those who indicated that landowners should bear more of the costs for on farm environmental improvements (28 percent). There was some variation between industries as shown in Table 6-5. For example, for those respondents who did not select the 50:50 sharing arrangement, a higher proportion (39 percent) of wine growers thought that the landowner should pay less of the cost for on farm mitigation, and the general public should pay more, than did the kiwifruit respondents (22 percent)

Table 6-5 cost sharing by industry

	% Below 50%	50:50	Above 50%
Berry	0	50	50
Kiwifruit	22	22	39
Other	67	33	0
Pip fruit	0	38	62
Stone fruit	25	50	25
Wine	39	39	21
All Industries	**29**	**42**	**29**

Burden Sharing Mechanisms

Respondents were given three different burden-sharing mechanisms based on common approaches to allocating environmental mitigation costs, accompanied by short explanations and asked to rank them in terms of their fairness:

- ‘Polluter Pays’ - The people who cause environmental damage pay the most
- ‘Ability to Pay’ - The people with the most money pay the most
- ‘Existing Use Rights’ - New growers/producers pay relatively more, while existing growers/producers pay relatively less

Table 6-6 presents the respondents preferences for the three burden sharing mechanisms. Many of the respondents selected only the fairest mechanism rather than providing a ranking for all three. However, of the 36 respondents who provided a ranking for all three mechanisms, 78 percent selected the ability to pay mechanism to be the least fair, 22 percent selected existing use rights to be the least fair, and none selected the polluter pays mechanism. There was little variation between industries in the results.

Table 6-6 Preference for fairest burden sharing mechanism

	Polluter Pays	**Ability to Pay**	**Existing Use Rights**
Percent of responses	86	0	14

6.3.2 Discussion of Cost and Burden Sharing Results

The findings suggest that the majority of respondents believe that placing additional burdens on some growers in order to ensure that all members of the industry are addressing the challenge of environmental mitigation to some degree is fair. This willingness to adopt responsibility for environmental mitigation is also reflected by the majority of growers (75 percent) allocating 50 percent or more of the costs of on-farm environmental mitigation to the landowners. It is further reinforced by the majority preference (86 percent) for a polluter pays system of distributing environmental costs, rather than a grandfathering system of existing use rights. A larger number of respondents selected a polluter pays mechanism than allocated 50 percent or more of the costs of environmental mitigation to the landowners. This could be explained by an identified tendency for individuals to take personal responsibility for desirable outcomes, and externalise responsibility for undesirable ones (Anderson et al., 2017; Campbell & Sedikides, 1999). It could be argued that some respondents may not believe they are generating pollution and therefore not likely to be affected by a polluter pays mechanism. This position could rationalise support for both a polluter pays system and a low allocation of mitigation costs to the land owners.

The findings on cost and burden sharing may be better interpreted through comparisons with internationally debated concepts of fairness. CBDR & RC, as discussed in Chapter 4 defines a set of general principles of equity in international law, which can serve as a point of comparison for the findings of the research. CBDR & RC is grounded in the distributive justice principles of responsibility and capability. Responsibility is framed in terms of a party being responsible for the environmental effects they produce as well as the mitigation of those effects. Capability can be understood as a party's socio-economic and technological status, which would allow them to address environmental concerns. Another way of understanding capability is needs, in that a party with low capability has higher needs, and a party with high capability has lower needs. CBDR & RC recognises that every party has a different level of responsibility for addressing environmental issues, and that this level of responsibility is a function of past actions and present circumstances (Rajamani, 2000). As international climate change negotiations have demonstrated, developing a shared approach to addressing environmental issues involves dividing the burdens of responsibilities and cost amongst a diverse group of actors. Three primary burden-sharing mechanisms have emerged globally based on different interpretations of what CBDR & RC means in practice. An egalitarian approach of assigning equal responsibility to all parties is not considered amongst the three approaches as it fails to align with the fundamental principles of CBDR & RC, in that it treats both responsibility and capability as equal, whereas CBDR & RC explicitly confirms that they are not (Baer et al., 2009).

The results of the present research demonstrated significant support for a polluter pays mechanism. The polluter pays mechanism, at its most fundamental, requires an equal ratio between abatement costs and emissions (Lange et al., 2007). This means that the sum the emitter is responsible for should be sufficient to offset or compensate for the totality of the harm they have caused (Schwartz, 2010). The polluter pays mechanism aligns closely to everyday situations, in which a person who has caused some harm is expected to be held responsible in a manner that is proportional to the harm caused (Miller, 2005). While 86 percent of respondents selected the polluter pays mechanism to be the fairest, only 28 percent of respondents thought that landowners should be responsible for the majority of costs for on farm environmental mitigation.

An initial analysis seems to reveal a potential contradiction between the selection of cost sharing preferences and burden sharing mechanisms. The cost sharing preferences of the respondents seem to place only partial responsibility on the party responsible for creating the environmental harm. However, in international climate change negotiations, the polluter pays mechanism apportions responsibility for mitigation according to relative degrees of responsibility for its causes (Heyward, 2007). The respondents may therefore agree with the general principle of polluter pays, but not

necessarily for past environmental damage. On-farm environmental mitigation often requires addressing issues that have been developing over a period of time. The results suggest that while the growers are willing to adopt responsibility for environmental issues they have knowingly contributed to, they may not feel the same level of responsibility for meeting the costs of past environmental damage.

The polluter pays mechanism often incorporates allowances for ignorance and for meeting basic needs (Caney, 2005; Miller, 2004). Ignorance can be understood as being unaware that an action contributed to an environmental harm. While providing an allowance for meeting basic needs may be understood as providing an allowance for the ability of a party to pay for environmental mitigation. Taken together, these factors provide a potential explanation for why many growers selected a polluter pays mechanism as being the fairest, while not allocating the majority of on farm environmental costs to the land owner. The polluter pays mechanism is commonly understood as a requirement that the polluter should pay for environmental mitigation, however, their past responsibility and capability to pay needs to be accounted for (Caney, 2005; Miller, 2004). In this way, the responses seem to align closely to the internationally supported concept of CBDR & RC which requires a consideration of both responsibility and needs when allocating burdens.

The research therefore confirms the general applicability of the CBDR & RC principles at a farm-level, and the polluter pays burden mechanism as a fair mechanism for allocating burdens. However, the research also raises a caution that general support for these concepts does not mean support for the landowner meeting all environmental mitigation costs. However, other potential factors may influence the selection of a burden sharing mechanism. The research considered these issues in more detail by delving deeper into how responsibility and needs effect the allocation of burdens. The findings from the next parts of the research therefore begin to develop a more nuanced understanding of how burdens should be divided up, beyond the highly generalised findings that the growers support the ideas of CBDR & RC and a polluter pays mechanism, but do not accept responsibility for all environmental mitigation costs.

6.3.3 Vignette 1 Results: Allocation of Burdens – Control Vignette

Eighty-four respondents undertook the initial distribution challenge. Participants were asked to select the fairest distribution based on three different options. Each option presented the participant with different trade-offs to each of the two growers and the industry as a whole, as outlined in Table 6-7

Table 6-7 Trade-offs in the allocation mechanisms

Allocation Mechanism	**Impact on grower A**	**Impact on grower B**	**Impact on industry production**
Utilitarian	None	Moderate	Minor
Rawlsian	Minor	Minor	Moderate
Egalitarian	Moderate	Moderate	Major

Responses were split relatively evenly between the three theoretical perspectives Table 6-8. The largest number of respondents (39 percent) perceived the Rawlsian allocation to be the fairest, followed by the utilitarian allocation at 32 percent, and the egalitarian allocation at 29 percent.

Table 6-8 Respondents' selection of allocation mechanisms

Allocation	**n**	**%**
Utilitarian	27	32
Rawlsian	33	39
Egalitarian	24	29
Total	84	100

The majority of respondents (68 percent) chose to trade off some overall industry production (efficiency) in order to allocate burdens between the growers in a way that they perceived to be fairer. This suggests that for the majority of respondents, production efficiency was not their foremost concern in setting sustainability targets. Chi-square tests using SPSS 24 were undertaken to investigate the relationship between allocation choice and a range of other variables. Nine null hypotheses were analysed, a list of which is included in section 5.5. Only one null hypothesis was unable to be rejected by the findings:

H_9: the choice of a particular option is unrelated to the perceived fair allocation of costs to the land owner.

Given the value of the test statistic, χ^2=9.29, the null hypothesis H_9 can be rejected (p=0.015). This suggests that a selection effect does exist. Participants who allocated less than 50% of costs to the landowner were more likely to favour a utilitarian solution. No relationship was found between respondents who selected an egalitarian or Rawlsian solution and their allocation of costs between landowners and general society.

Of the respondents that selected a utilitarian distribution, 52 percent thought that landowners should pay less than half of the costs for on-farm environmental mitigation. In contrast, only 18 percent of respondents that selected an egalitarian or Rawlsian distribution took this same position. Despite a large degree of variation in how respondents with different beliefs on fairness chose to distribute the costs of on-farm environmental mitigation with the general public, there was a large degree of consensus around the fairest distributive justice mechanism for allocating burdens amongst growers.

6.3.4 Discussion of Control Vignette Results

Despite a large degree of variation in how respondents with different beliefs on fairness choose to distribute the costs of on-farm environmental mitigation with the general public, there was a large degree of consensus around the fairest distributive justice mechanism for allocating burdens amongst growers.

The results are supported by Konow (2017) who finds that a large majority of respondents supported allocating resources in a way that satisfied the needs of some people, even if doing so reduced the ability of others to raise their living standard. The horticulturalists indicated a willingness to provide a more even distribution of burdens amongst the two fictional characters, despite the negative effect of this allocation on maximising both industry utility and the utility of one character.

Similarly, Faravelli (2007) found that over 70 percent of respondents to a vignette experiment selected a resource allocation that sacrificed one person's ability to maximise their individual utility to create a more equitable distribution. Like the results presented here, Faravelli (2007) found that in the absence of any contextual information on the individual character's circumstances, a Rawlsian allocation was the most preferred. However, Faravelli (2007) found that a Rawlsian allocation, which was preferred, by 40 percent of respondents was closely followed by an egalitarian allocation which

was preferred by 38 percent of respondents. In this thesis, 39 percent of the horticulturalists selected a Rawlisan allocation, 32 percent selected a utilitarian allocation, and 29 percent an egalitarian allocation.

Despite this, there are more similarities than differences between the results of Faravelli (2007) and the results presented here. In both cases, the majority of respondents preferred to trade-off some utility at both an aggregate level and an individual level in order to enhance the equity of allocations. And, in both cases a Rawlsian allocation was preferred.

Herne & Suojanen (2004) demonstrate that if participants are given the opportunity to discuss a choice situation, then a greater number of them will select a Rawlsian allocation than if they make a choice without consulting others. The research presented here was conducted through a survey that sought to minimise the participant's connection to the vignette by taking on the perspective of an impartial spectator (Konow, 2009). It is possible; therefore, that the selection of a Rawlsian allocation could have been even more common if the respondents had been given the opportunity to discuss their choice with their peers.

The preferences for a Rawlsian allocation and to some extent an egalitarian allocation can be explained in part through the effect of risk attitudes. Rawls (1971) argues that a risk adverse stakeholder would propose a more egalitarian ex-post distribution in order to protect himself against a bad outcome. This position relates from decisions made under a 'veil of ignorance' in which the stakeholders must make a decision on resource allocation, for which they themselves will be bound to, without knowing their own individual circumstances which could affect the allocation they will receive. Rawls (1971) suggested that as most people are naturally risk adverse, they would select an egalitarian distribution of resources to mitigate the risk they themselves would be the recipient of a poor outcome after the allocation has been made.

Aguiar et al. (2013) demonstrates empirically that risk adverse subjects promote ex-post equality through their allocation preferences, whereas risk-loving participants propose distributions that are more unequal. Aguiar et al. (2013) also find that, under conditions of impartiality, the social preferences of individuals do not affect an individual's allocation decisions. This reinforces the argument that risk aversion is potentially the major influencing factor in the allocation preferences of participants.

In addition to assessing behavioural determinants of distributive justice preferences such as risk aversion and social preferences, other studies have looked at a range of personal or demographic

characteristics for potential influence on allocation preference. Konow (2009) finds that while some personal characteristics such as age and ethnicity exert some influence over distributive justice preferences, taken together, personal characteristics only accounted for 3-8 percent of the variance in distributive justice preferences. Konow (2017) investigates whether there are significant differences in the fairness preferences of students who have received traditional instruction in philosophical ethics, in comparison to students who have not. The study concludes there are no differences, and disciplinary instruction in ethics has no significant effect on fairness preferences.

Faravelli (2007) also considers whether disciplinary differences in a student sample affect distributive justice preferences, focusing on the differences between economics and sociology students. Faravelli (2007) finds that while both groups demonstrate similar rates of preference for a Rawlsian allocation, there is a significant difference between their preferences for an egalitarian or utilitarian allocation. Economics students demonstrated a greater preference for utilitarian allocations than sociology students who demonstrated a greater preference for egalitarian allocations.

Taken together, these studies demonstrate that there is little effect from demographic characteristics on distributive justice preferences. However, behavioural traits such as risk aversion may be exerting an influence over distributive justice perceptions.

Like the studies described above, the research for this thesis found little connection between personal characteristics and distributive justice preferences. One significant difference between the research and all the studies discussed in this section is that the research sample consisted of practitioners, while all the described studies used a student sample. The research sample consisted of a far broader age range than the student samples, and consisted of more variation in work type (which partially mirrors disciplinary training), income, and education level. Despite this expanded set of demographic characteristics, and using a non-student sample, the research reflects the previous studies in that it found only one significant correlation between the demographic characteristics of the respondents and their distributive justice preferences.

Income Effect

In general, utilitarian allocations were preferred by respondents in a higher income bracket, while those in a lower income bracket preferred either a Rawlsian or an egalitarian allocation. One of the concerns of the research was to investigate whether there was a relationship between income and distributive justice preferences. This line of investigation was based in the environmental justice

literature which posits a relationship between wealth and environmental degradation whereby the wealthy and powerful are in a position to shift the burden of mitigating environmental harm onto the less wealthy and less powerful (Urkidi & Walter, 2011).

In addition to considering personal characteristics, the analysis was extended to consider whether, given a particular fairness preference, there were any correlations with other allocation preferences of respondents. As described in the previous section, participants were asked to distribute the costs of environmental mitigation between landowners and the general public. A significantly larger proportion of respondents who selected a utilitarian allocation also stated that they thought landowners should be responsible for less than 50 percent of on farm environmental mitigation costs. This finding helps in part to explain the selection of a utilitarian allocation with the concept of risk aversion (Herne & Suojanen, 2004). Horticulturalists who perhaps expect that they would face lower on farm costs for environmental mitigation would expect to face lower risks, and therefore, the stakes of selecting a utilitarian allocation would be lower.

The results demonstrate a connection between income, fairness preferences, and cost allocation preferences that would support findings from the field of environmental justice (Boyce et al., 1999). The results suggest that income is correlated with fairness preferences in that those in a higher income bracket, on average, prefer less egalitarian allocations. An exception is the very highest income bracket ($220,000 - $270,000) which tended to prefer a Rawlsian allocation. Furthermore, those who prefer a utilitarian allocation chose to allocate environmental mitigation costs less equitably by reducing their own costs at the expense of others. Conversely, on average, respondents in lower income brackets tended to prefer an egalitarian allocation, and allocated environmental mitigation costs more equally. These findings support the environmental justice proposition that greater wealth could result in greater inequality of environmental outcomes. The results suggest that caution should be taken when developing environmental mitigation initiatives to ensure that input is obtained from stakeholders across a wide range of income brackets.

6.4 Research Question Two Results and Discussion – Contextual Information

6.4.1 Vignette 2 Results: Allocation of Burdens – Contextual Information Vignette

The provision of contextual information resulted in participants changing their fairness preferences under all vignettes (Table 6-10). This first result suggests that in general, contextual information is highly relevant to fairness perceptions, and that fairness perceptions are not fixed. This finding provides validation for the research's deeper investigation into how contextual information effects fairness perceptions

All three groups demonstrated a very similar percentage of respondents who changed their fairness preferences between Vignettes 1 and 2 after being supplied with new contextual information. An average of thirty one percent of the Rawlsian and utilitarian groups changed their preference, while an average of 28 percent of the egalitarian group changed their preference between Vignettes.

Each of the three allocations the respondents were able to select from involved trade-offs both for the individual growers and for the industry Table 6-9.

Table 6-9 Trade-off effects of switching from one allocation to another

Direction of Change	**Trade-offs in burdens**		
	Steve	Sarah	Industry
Rawlsian → Utilitarian	▲	▼	▼
Rawlsian → Egalitarian	▲	▲	▲
Egalitarian → Utilitarian	•	▼	▼
Egalitarian → Rawlsian	▼	▼	▼
Utilitarian → Rawlsian	▼	▲	▲
Utilitarian → Egalitarian	•	▲	▲

Table 6-10 below summarises the results of the contextual vignettes. The largest change under Vignette 2.1 was away from a utilitarian preference (-43 percent). This was compensated for by an increase an egalitarian (11 percent) and Rawlsian (13 percent) selections. The Rawlsian allocation provided a more favourable outcome for grower Steve who was described as having higher needs, while the egalitarian allocation did not change Steve's outcomes from the utilitarian option, but instead kept them the same while worsening the other grower Sarah's outcomes. No respondent shifted from a Rawlsian or egalitarian selection to a utilitarian selection.

Table 6-10 summary of changes in burden allocation selection

Group	Rawlsian	Egalitarian	Utilitarian	Total shift
Vignette 2.1				
Rawlsian (15)	14	1	0	1 (7%)
Egalitarian (9)	1	8	0	1 (11%)
Utilitarian (7)	2	1	4	3 (43%)
Total	17	10	4	31
Total change	+2 (13%)	+1 (11%)	-3 (-43%)	5 (16%)
Vignette 2.2				
Rawlsian (10)	8	1	1	2 (20%)
Egalitarian (8)	0	7	1	1 (13%)
Utilitarian (10)	0	4	6	4 (40%)
Total	8	12	8	28
Total change	-2 (-20%)	+4 (50%)	-2 (-20%)	7 (25%)
Vignette 2.3				
Rawlsian (10)	2	4	4	8 (80%)
Egalitarian (11)	0	4	7	7 (64%)
Utilitarian (9)	1	0	8	1 (11%)
Total	3	8	19	30
Total change	-8 (-70%)	-3 (-27%)	+10 (111%)	16 (53%)
			Total Respondents	89
			Rawlsian overall shift	11/35 = 31 %
			Egalitarian overall shift	9/28 = 32%
			Utilitarian overall shift	8/26 = 31%

All three groups presented a relatively equal percentage of change based on new contextual information being provided. In every group of cells, the largest number is the filled by growers who did not change their fairness perceptions. The following section explores changes in the participants' selections in more detail.

6.4.2 Effect of Contextual Information

The research was concerned with whether or not the selection of a particular burden allocation was influenced by contextual information on one of the fictional growers.

Contextual Information on Need

Thirty-one participants provided a fairness preference before and after being presented with additional contextual information on the high needs of one of the characters. The provision of this information resulted in a 16 percent shift in the participants' selection of a fair solution. The provision of information on need however had a significant association with a change in the selection of both a Rawlsian ($\chi^2(1, N=84) = 10.23, p = .001$) and utilitarian ($\chi^2(1, N=84) = 10.16, p = .001$) allocation, but not for an egalitarian allocation. Cramér's V measures the degree of relation between two sets of variables on a scale between 0 (no association) and 1 (perfect association). The provision of information on the high needs of one of the fictional growers was associated with an increase in the selection of a Rawlsian solution ($\phi_c = 0.35, p = 0.001$). An inverse yet equal association ($\phi_c = -0.35, p = .001$) was found with selection of a Utilitarian solution which decreased with the provision of the contextual information on need.

6.4.3 Contextual information on exogenous responsibility

Twenty-eight participants provided a fairness preference before and after being presented with additional contextual information on endogenous responsibility. Twenty five percent of participants changed their preferences between the first and second vignettes after receiving information on exogenous responsibility; however, the shifts in fairness preferences demonstrated less consistency than under the other two treatments. No statistically significant association was found between the provision of information on the environmental constraints of one of the fictional growers, and the selection of a particular solution. The largest change was an increase in an egalitarian selection (+50%). This was driven by a 20 percent reduction in both a Rawlsian and utilitarian selection. There were no respondents who shifted to a Rawlsian allocation which would have benefited grower Steve who was disadvantaged in the vignette. Forty percent of participants who first selected a utilitarian allocation shifted to an egalitarian allocation. While the provision of exogenous responsibility information resulted in a larger change in selection under the second vignette than did the provision of information on need, the responses of the participants did not follow any clear trend and resulted in an almost even distribution of selections across all three solutions.

6.4.4 Contextual information on endogenous responsibility

Thirty participants provided a fairness preference before and after being presented with additional contextual information on endogenous responsibility. Upon receiving contextual information on the low level of effort contributed by one of the fictional growers, the majority (53 percent) of respondents changed their fairness preferences. This was the largest effect found and was the only case in which the majority of respondents changed their fairness preferences, with 80 percent of the Rawlsian group changing. The utilitarian allocation increased by 111 percent, driven by a 70 percent reduction in the Rawlsian allocation and a 27 percent reduction in the egalitarian allocation. Any shift away from a Rawlsian allocation represented an increase in the burdens imposed on the low effort grower, therefore, the majority of change was towards increasing the burdens on this grower.

The provision of information on need however had a significant association with a change in the selection of both a Rawlsian ($\chi^2(1, N=84) = 8.842, p = .003$) and utilitarian ($\chi^2(1, N=84) = 14.236, p = .000$) allocation, but not for an egalitarian allocation. The Cramér's V test statistic ($\phi_c = -0.41, p = .000$) reveals that the provision of information on the low effort of one of the fictional growers had the strongest association with the selection of a particular solution, in this case the utilitarian solution. There was also found to be a strong negative association ($\phi_c = -0.32, p = 0.003$) with the selection of a Rawlsian allocation after the participants learnt of one fictional grower's poor level of effort

Consistency is a significant factor

While many of the respondents changed their selection of a fair allocation after being presented with contextual information, a still larger number did not. The Rawlsian group were the least likely to change their selection overall ($\chi^2(1, N=84) = 37.96, p = .000$). Cramér's V ($\phi_c = 0.67, p = 0.000$) reveals that, despite the large Rawlsian group change under Vignette 2.3, the selection of a Rawlsian allocation under the control vignette was strongly associated with the selection of a Rawlsian allocation under the contextual information vignettes. The Rawlsian group was followed by the egalitarian group which also demonstrated an aversion to changing their selection between the two vignettes ($\chi^2(1, N=84) = 25.01, p = .000$). The size of this effect was smaller than the Rawlsians, but still represents a strong association ($\phi_c = -0.55, p = .000$). The utilitarian group demonstrated the highest propensity to change their selection after receiving new contextual information $\chi^2(1, N=84) = 18.19, p = .000$. However, the association between their selection of a utilitarian allocation under the first vignette and the contextual information vignettes was still found to be moderately strong ($\phi_c = -0.465, p = .000$).

6.4.5 Discussion of contextual information results

Need

The results from the 'need' vignette align with the findings of Faravelli (2007) which found that the provision of contextual information on need resulted in the majority of respondents preferring a Rawlsian allocation of resources. Additionally, Faravelli (2007) found a utilitarian allocation to be by far the least preferred option where contextual information was provided explaining the higher needs of one person over another. The results also align with those of Yaari and Bar-Hillel (1984) which found that 82 percent of respondents preferred a Rawlsian allocation when contextual information on needs was provided. Yaari and Bar-Hillel (1984) also found a small decrease in preference for a utilitarian allocation and a small increase in preference for an egalitarian allocation. The findings of Yaari and Bar-Hillel (1984) align closely with the research.

Exogenous Responsibility

Faravelli (2007) considered exogenous differences related to the physical abilities of one of the characters. One character in the experiment was described as not having the physical abilities required to derive more utility from a set of resources. Faravelli (2007) found that with the introduction of information on exogenous differences, the preferences for an egalitarian or utilitarian distribution diminished in favour of a Rawlsian distribution. The results from the horticulturalists did not follow this pattern. Instead, preferences for a utilitarian or a Rawlsian allocation decreased by an equal measure, while preferences for an egalitarian allocation increased. The egalitarian allocation became the most preferred allocation overall after the provision of exogenous responsibility information.

The findings suggest that it is not only relevant whether responsibility can be exogenously attributed or not, but instead, the type of exogenous responsibility may be critical to fairness preferences. In the case of the horticulturalists, they were presented with an environmental constraint as an exogenous responsibility context rather than a physical health or ability constraint. The results suggest that a grower may be held more responsible for being located in an area that is not as advantageous to horticulture, despite the environmental factors being beyond their control. It has been argued that people find it fair to hold others responsible for factors beyond individual control if these factors are considered to be outside of their control (Cappelen et al., 2005a). It is possible that there is a connection between a farms location and a perception of discretionary choice which may allow responsibility to be attributed in this situation. Precedent for this perspective is provided by

the Brazilian Proposal in international climate change negotiations. The Brazilian Proposal argues that despite governments having no awareness of the adverse effects of GHG emissions (i.e. no discretionary responsibility), they are nevertheless still responsible for these emissions despite these emissions being largely a result of exogenous circumstances (Cappelen et al., 2005a).

There is the potential that the vignette was not seen to be wholly exogenous, and that the grower had made a discretionary choice to be located in a more environmentally challenging location. However, in the vignette created by Faravelli (2007), the characters exogenous constraint was related to their inability to swim, which is a learned ability that also has a discretionary component. It may be concluded therefore that disadvantageous circumstances outside of the control of an individual may not alone be enough to compel a Rawlsian allocation. The majority of respondents that did change their preferences after receiving exogenous responsibility information shifted from a utilitarian allocation to an egalitarian allocation. While this shift did not reward the disadvantaged party, like under the need vignette, it did result in a more equitable allocation of burdens between the two parties.

While seemingly unusual, Konow (2001) reports similar findings. Konow (2001) presented respondents with two vignettes, Plan X under which two farmers receive half each of a plantation's profits of $100 each, and Plan Y. Two different variants of Plan Y are presented to different respondents, under variant A the farmers earn $150 each, while under variant B, one farmer earns $100 and the other $200. Konow (2001) finds that under variant A most respondents select plan Y, while under variant B most respondents select Plan X (a Pareto inefficient solution). This finding is reflected by the horticulturalist's responses. In both situations a large proportion of respondents select a Pareto inefficient solution (i.e. an egalitarian allocation). Konow (2001) hypothesises that because, in the vignette, one farmer cannot be held responsible for her inability to make more money, respondents may peruse equality at the cost of efficiency. Unlike Konow (2001), the research provided respondents with an option to reward the struggling farmer and still achieve a Pareto efficient distribution (i.e. the Rawlsian allocation). Despite this option, many respondents still selected the less efficient egalitarian distribution. Konow (2001) argues that it is significant that respondents do not prioritise a Pareto efficient allocation. The research reinforces this finding by suggesting that not only did many of the respondents move to an inefficient allocation to enhance equality, they did so despite having the option to reward the struggling farmer while maintaining an efficient allocation. Konow (2001) argues that the move towards an inefficient allocation was partly driven by a desire to ensure the struggling farmer was not held accountable for matters outside of her control. However, the research adds another layer to this discussion, suggesting that the desire

for equality may not rely only on an attempt to rectify an imbalance between two farmers with exogenous responsibility factors outside of their control. If this was all that was involved, it would be expected that a greater number of respondents would have selected the Rawlsian allocation which corrected for the responsibility issue. Instead, the desire for an egalitarian allocation under some circumstances appears to transcend responsibility concerns alone.

Endogenous Responsibility

Faravelli (2007) found that with the provision of endogenous responsibility information, preferences for both Rawlsian and egalitarian allocations decreased in favour of a utilitarian allocation. This finding is reflected in the responses from the horticulturalists. While both studies find that the utilitarian allocation was the most preferred in the context of endogenous responsibility information, Faravelli (2007) found a Rawlsian allocation to be the second choice followed by an egalitarian allocation last. The results from the horticulturalists however demonstrated a far greater shift away from a Rawlsian allocation than from an egalitarian allocation. The outcome of this was that a Rawlsian allocation was the least preferred, by a significant margin, followed by an egalitarian allocation, which saw a smaller shift towards a utilitarian allocation. An equal number of the Rawlsian group selected an egalitarian allocation after the provision of endogenous responsibility information, as did select a utilitarian allocation.

The provision of information on endogenous responsibility relating to effort had the most significant effect on fairness preferences out of all three treatments, resulting in a 53 percent shift in preferences. This compares to a 25 percent shift for exogenous responsibility information and a 16 percent shift for information on need. An early study by Schokkaert and Overlaet (1989) found introducing information on differences in effort produced a far larger effect on resource allocation preferences than did any other contextual information treatment they considered.

One significant difference between the results reported here and other studies is that the respondents were horticultural stakeholders rather than students. A possible hypothesis to explain the strong response to the endogenous responsibility treatment may be based on a desire to protect the reputation of the industry. The poor environmental performance of one grower in the industry can create repercussions for the industry as a whole that may affect other growers. This might provide some justification for the apparent preference to punish poor performance in comparison to a lesser response towards assisting growers who may be struggling, but are not posing a risk to the industry as a whole. This study was unable to test this possible hypothesis.

Consistency over Context

Despite many participants changing their selection of a fair burden allocation after receiving contextual information, the largest number of participants in two of the three vignettes did not change their selection. However, one of the two vignettes where participants' selections remained largely constant was the need information treatment. Theory predicts that under this vignette the Rawlsian allocation would be preferred (Rawls, 1971). As the largest group of participants under the control vignette selected a Rawlsian allocation, less change between the control vignette and the need information vignette would be expected. Despite this explanation, there was a large number of respondents overall who did not change their fairness preferences when faced with contextual information which different theories of justice argue should have affected the participants selections. There are multiple strands of research which examine how individuals process and react to new information that may challenge their previous decisions or attitudes. Cognative dissonance theory provides a theory of why an individual may hold on to an existing belief despite being provided with contradictory information. Cognitive dissonance theory argues that when individuals hold two or more beliefs that are contradictory, they will feel an unpleasant state—dissonance—until they are able to resolve this state by altering their cognitions (Festinger, 1962). Festinger (1962) argues that because this state is unpleasant, individuals seek a way to reduce this unpleasantness through discrepancy reduction. This may involve the following behaviours (Hinojosa et al., 2017, p. 174):

- Attitude change toward the behaviour (e.g., attitude changes to become more in line with the behaviour engaged in).
- Behaviour adjusted to align with attitude, values, or past behaviour.
- Escalation of commitment to justify the effort/commitment that has already been invested.
- Trivialization of the importance of the original behaviour may occur when attitudes are resistant to change.
- Selective information processing will occur to support prior decisions, choices, or other cognitions that are resistant to change.

It is beyond the scope of this thesis to explore the psychology behind the participants' decisions. Rather the thesis seeks to establish a set of axioms relevant to improve sustainability assessment. It is sufficient therefore to note here that a significant body of work exists which can provide an

explanation for why an individual may not change their selection of fairness preferences despite the provision of new relevant information. However, despite this strand of research it is equally significant to note that many participants did not change their selection, and this commitment to a chosen interpretation of fairness is of significance to incorporating fairness ideals into sustainability assessment. While contextual information was shown to have a significant effect of the distribution of burdens, so too did consistency. In developing a set of axioms to explain fairness in sustainability assessment, the responses of the participants who did not change their fairness preferences despite the provision of relevant contextual information need to be taken into account.

6.4.6 Rules for governing a fair distribution

As outlined in Chapter 3, the approach to investigating distributive justice adopted in this thesis is based in social choice theory. The results are analysed here within a social choice theory framework in order to bring the results together into an explanatory model of justice. The axiomatic approach to discovering an appropriate distributive justice mechanism developed by Yaari and Bar-Hillel (1984) can be applied to summarise the findings from the vignette experiments. Figure 6-2 presents an overview of the axiomatic approach.

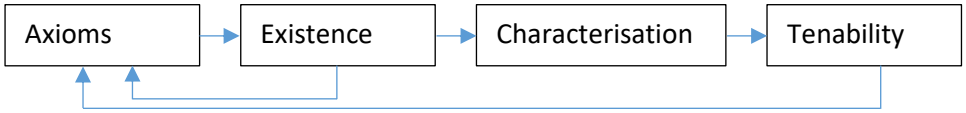


Figure 6-2 Axiomatic approach to distributive justice

The approach begins by defining properties or *axioms* that a distribution mechanism should have. The research defined a single axiom being that, *a distribution is fair if it is perceived by the grower to be fair*. Perceived justice was used as the likelihood of a sustainability assessment initiative being accepted by growers is directly influenced by their perceptions of fairness (Valentine et al., 2007).

The second step in the axiomatic approach is to investigate whether a distributive mechanism *exists* which satisfies all of the axioms. Three distributive mechanisms where tested by the research based on their ability to satisfy the primary axiom. They were a Rawlsian mechanism, egalitarian mechanism, and a utilitarian mechanism. The axiomatic approach requires that each of these mechanisms is *characterised* in terms of its ability to satisfy the axiom. This characterisation of the distributive mechanisms was undertaken in Chapters 3 and 4. Finally, the axiomatic approach requires that then distributive justice mechanisms be tested for their *tenability* in satisfying the axiom. The tenability of each distributive mechanism to satisfy the axiom was tested through the

vignette experiments. The vignette experiments provided the following insights on the tenability of each of the three distributive mechanisms:

- When a grower is challenged by adverse financial conditions the Rawlsian and egalitarian mechanisms become more tenable while a utilitarian mechanism becomes less tenable.
- When adverse environmental conditions are challenging a grower, an egalitarian mechanism becomes more tenable, while Rawlsian and utilitarian mechanisms become less tenable
- When a grower has put a low amount of effort into improving their environmental conditions, Rawlsian and egalitarian mechanisms become less tenable and the utilitarian mechanism becomes more tenable.

The tenability of each of the distributive mechanisms was shown to be directly affected by contextual circumstances. Therefore, different distributive mechanisms have a larger potential to satisfy the fairness axiom depending on contextual circumstances. Each of the three distributive mechanisms was found to be the most tenable solution under certain contexts. The results suggest that tenability is contextual, and that if contextual circumstances are accounted for, there is a greater likelihood that the fairness axiom will be satisfied. Within a sustainability assessment context, the implication is that, in order to enhance distributive justice, different distributive mechanisms should be used depending on the contextual circumstances of a grower.

Jasso et al. (2016) provide a framework for considering the totality of distributive justice processes which provides a useful basis for considering the fairness implications of different distributions. While the axiomatic framework provided by Yaari and Bar-Hillel (1984) helps to identify the essential axioms that should underlie a distribution for a particular group, the distributive justice framework provided by Jasso et al. (2016) can be used to provide an overview of how these essential axioms sit within the context of all possible fairness outcomes for a given distribution (Figure 6-3). This helps to clarify the trade-offs inherent in selecting a more or less tenable distribution by making explicit the justice consequences of a particular distribution and the different factors which led to those consequences.

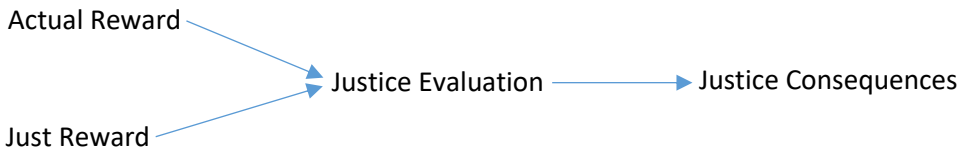


Figure 6-3 'The world of distributive justice' (Jasso et al., 2016, p. 202)

Jasso et al. (2016) describes three parties being involved in the distributive justice process, the Allocator, the observer, and the rewardee. The observer determines what constitutes a *just reward* for the rewardee, the allocator assigns the *actual reward,* the observer then *evaluates* the fairness of the reward which determines the *justice consequences.* For the research's vignette experiments, the participants played the dual role of observer and allocator while the rewardee was a fictional character. Table 6-11 below applies the framework of Jasso et al. (2016) to the research findings adding in the contextual information conditions which effected the justice evaluation.

Table 6-11 Justice evaluation and consequences of results

Actual Reward	Context	Just Reward[1]	Justice Evaluation[2]	Justice Consequences
Rawlsian	Need	Rawlsian	(+2)	Moderately Positive
	Negative Exogenous Responsibility	Egalitarian	(-2)	Moderately Negative
	Negative Endogenous Responsibility	Utilitarian	(-3)	Strongly Negative
Egalitarian	Need	Rawlsian	(+1)	Slightly Positive
	Negative Exogenous Responsibility	Egalitarian	(+2)	Moderately Positive
	Negative Endogenous Responsibility	Utilitarian	(-1)	Slightly Negative
Utilitarian	Need	Rawlsian	(-2)	Moderately Negative
	Negative Exogenous Responsibility	Egalitarian	(-1)	Slightly Negative
	Negative Endogenous Responsibility	Utilitarian	(+3)	Strongly Positive

[1]Respondents preferred allocation for context
[2]Score determined by percentage change from reward under 'no context' vignette to reward under contextual information vignettes 0-9% = (1), 10-19% = (2), 20-29+% = (3).

The *just reward* for each situation is stated to be the reward that the largest number of participants considered fairest. For each *actual reward* there is a single *just reward* which produces the highest justice evaluation and by extension, the most positive justice consequences. In line with Yaari and Bar-Hillel (1984) these cases can be seen as the most appropriate axioms for fair distributions.

The advantage of considering the research results within the framework provided by Jasso (2006) is that it gives a clearer picture of the fairness consequences of each allocation for different contextual circumstances. This in turn can help guide establish the fairness of setting different levels for a benchmark or target under different contextual conditions.

6.5 Summary of Chapter 6

This chapter has presented and discussed the results of the research under two primary headings based on the two research questions. The first research question asked:

> *RQ1. In the absence of contextual information which explains why one person is more efficient than another, how do horticultural stakeholders' perceptions of fairness align with theories of distributive justice?*

First, the results on the burden sharing mechanism and cost distribution questions were considered. In regards to the cost-sharing question, the results revealed that the majority of respondents (75 percent) thought that land owners should bear at least 50 percent of the costs for on-farm environmental improvements. The results from the burden sharing mechanism question revealed that the majority of respondents (86 percent) supported a polluter pays system as the fairest mechanism for distributing on-farm environmental costs. Taken together these results suggest a willingness of the respondents to absorb much of the burden of on-farm environmental improvements. Alone these results suggest the respondents consider that accepting a level of responsibility for on-farm environmental improvements is fair. The vignette grouped energy and water issues together. It is possible that participants have different perceptions of fairness for these two different issues, however, the study sought to understand an overall perception of fairness in relation to environmental issues. This aggregation of different types of issues helps to to understand overall fairness perceptions. While these results contributed to answering RQ1, by adding the results of the control vignette to the analysis, the research was able to provide a more detailed answer to the first research question. It was found that the majority of respondents (68 percent) selected a resource allocation which sacrificed one person's ability to maximise their individual utility in order to create a more equitable distribution. The largest group of respondents (39 percent) selected a

Rawlsian allocation. Taken together, the results suggest that horticulturalists in general do not favour efficiency maximisation or strict equality in distributive justice vignettes. This suggests alignment to theories of justice which take other principles such as need and responsibility into account, particularly a Rawlsian theory of justice which recognises and compensates for individual differences.

The second research question addressed in this chapter asked:

> *RQ2. When presented with contextual information which explains why one person is more efficient than another, do horticultural stakeholders' perceptions of fairness change, and how are their responses predicted by distributive justice theories?*

The first part of this question asks, when presented with contextual information which explains why one person is more efficient than another, do horticultural stakeholders' perceptions of fairness change? The results suggest that they do. Under each treatment in which contextual information was introduced explaining efficiency differences in the fictional growers, some respondents changed their selection of a fair distribution. These changes ranged from a 16 percent shift when information on need was presented to a 53 percent shift when information on endogenous responsibility was presented. Contextual information based on different principles of distributive justice was shown to have an effect of fairness sentiments in an agricultural sustainability scenario.

The second part of the question asked how are their responses predicted by distributive justice theories? Under two vignettes (need and endogenous responsibility), the theoretical distributive justice literature predicted the direction of change in fairness sentiments. However, under the exogenous responsibility vignette the results did not closely align with the expectations of the major theories of distributive justices considered in this thesis. Neither did the exogenous responsibility results conform to other similar studies of distributive justice. This finding has potential implications for on-farm sustainability assessment which are discussed in more detail under policy context in the following chapter.

Finally, the results were brought together under a social choice theory framework to provide a clearer picture of the fairness consequences of each allocation for different contextual circumstances. By adopting a framework provided by Jasso et al. (2016) it was possible to explore the justice consequences of each allocation based on the findings of the contextual information

vignettes. The evaluation provided in Table 6-11 provides a rubric which could be applied to the development of an on-farm environmental initiative in order to consider its likely perceived fairness.

Chapter 7

Conclusions

7.1 Introduction

Sustainability presents a global challenge to society. Socio–ecological systems are challenged by a range of issues including the over exploitation of natural resources, the degradation of ecosystems, wealth inequalities, climate change, and human conflicts – amongst other serious issues (Brandt et al., 2013). Sustainability is particularly relevant to agricultural systems which face challenges on multiple fronts. Adequate food and nutrition need to be provided to global populations, distribution and access needs to be enhanced, and food supply will need to roughly double in the next few decades (IAASTD, 2009; Pelletier & Tyedmers, 2010). At the same time, agriculture will need to slow the rate of biodiversity and habitat loss, reduce unsustainable water use, prevent water pollution from agricultural chemicals, and cut greenhouse gas emission by at least 80 percent (Foley et al., 2011).

Recent trends in agriculture have included a greater monitoring and assessment of agricultural production with sustainability assessment frameworks to demonstrate sustainability performance to stakeholders (Hunt et al., 2013; SAFA, 2014; SAI, 2013; TSC, 2016). The horticulture industry is particularly relevant to agricultural sustainability as growers are intense resource users across relatively small areas of land (Lea-Cox et al., 2010). The New Zealand horticultural sector encompasses a diverse array of farming operations. Horticultural operations have traditionally relied on market-based assurance schemes to demonstrate their environmental credentials; however, growing complexity in how sustainability is understood has led to the exploration of more comprehensive sustainability assessment systems within the horticultural sector.

In order to understand the pursuit of sustainability at a farm level it is helpful to provide some definition of what sustainability entails. The capitals theory approach to sustainability is suited to this purpose (Solow, 1986). Two competing interpretations of sustainability (weak and strong) offer different interpretations of what sustainability requires. Central to both of these interpretations however is the notion that sustainability can be understood through the trading off of different types of capitals (Daly, 1991). Where weak sustainability allows for direct substitution of any capital for another, strong sustainability does not allow for the exploitation of non-renewable resources without these resources being directly offset. For example, the use of coal should be offset by

investment into renewable energy. At the centre of both interpretations is the notion of intergenerational equity and a consideration of what capitals will be made available to future generations. Despite the lack of a common interpretation of the requirements of sustainability, there exists a strong drive towards adopting sustainability practices at an enterprise level. There are multiple drivers for increased organisational sustainability. These drivers included market demands, societal pressures, regulatory requirements, and internal business sustainability practices. In response to these drivers, there has been a proliferation of sustainability indicator frameworks intended to facilitate sustainability performance assessment and communication to stakeholders.

The assessment of sustainability however, presents multiple challenges and the development of sustainability indicators has been a topic of extensive debate (Bell & Morse, 2008). The New Zealand Sustainability Dashboard (NZSD) is an example of a sustainability indicator framework intended to assess the sustainability performance of agricultural enterprises. The NZSD framework draws on internationally recognised sustainability frameworks and their key generic sustainability performance indicators to ensure that overseas consumers can benchmark and verify the sustainability credentials of New Zealand exports (Hunt et al., 2013). The NZSD framework is closely aligned to the Sustainability Assessment of Food and Agriculture systems (SAFA) framework developed by the Food and Agriculture Organisation (FAO) of the United Nations (see SAFA, 2014), while also remaining locally grounded to ensure it is relevant to New Zealand society, ecology, and land care.

Multiple questions have arisen in the NZSD from both researchers and growers about the use of benchmarking in their sustainability assessment. Equity concerns in benchmarking have been raised by growers who feel that they face unique (often geographic or climatic), conditions that mean a direct comparison of their performance to other growers is unfair. While approaches to sustainability assessment that employ benchmarking have been developed and applied to agricultural sustainability (Figge & Hahn, 2004; Van Passel et al., 2007), there is has been little empirical research into how benchmarking can accommodate equity concerns such as those raised in the NZSD.

The role of equity in the distribution of sustainability targets is addressed by the field of distributive justice. The normative foundations for equity concerns in sustainability are often based on philosophical and moral theories of distributive justice, particularly a Rawlsian interpretation of social contract theory (Common & Perrings, 1992; Norton, 1989; Pearce, 1987; Penn, 1990). Theories of distributive justice address the fair distribution of resources between individuals.

Distributive justice is comprised of normative principles designed to guide the allocation of the benefits and burdens of economic activity (Lamont & Favor, 2008). There are several major theories of distributive justice, defined by the principles of fairness that they emphasise. These theories include egalitarianism, Rawlsian justice, utilitarianism, desert-based theories of justice, equity theory, and libertarianism. Principles of equality, need, utility, efficiency, equity, and responsibility can be seen throughout the different theories, emphasised to a greater or lesser extent. The lack of a unified theory of distributive justice indicates that the importance given to each of these fairness principles is not consistent throughout society. If perceived fairness is to be studied amongst a specific group of people, the analysis of collective decision making is required.

Social choice theory provides a theoretical basis from which the diverse views of individuals can be interpreted. Social choice theory provides a theoretical framework upon which a study of individual's perceptions of justice can proceed. Social choice theory provides for an analysis of collective decision-making which attempts to connect the values or opinions of a given group of people to derive a collective verdict. Social choice theory acts as a bridge between philosophical conceptions of distributive justice, and the distributive justice perceptions of a group. Through the aggregation of the preferences of individual members of a group, social choice theory seeks to create social preferences that reflects its general opinion or will (Gaertner, 2009).

There are three key principles of fairness that underlie many distributive justice theories; need, efficiency and responsibility (both exogenous and endogenous). Conceptions of fairness are context dependent and the degree to which any theory of distributive justice is seen as fair can only be determined at a societal level through the aggregation on individual preferences. The importance that individuals place on different principles of justice within a specific context can influence the perceived justice of a particular allocation. As the different principles of distributive justice change within different contexts, so to do individuals' perceptions of fairness.

Distributive justice is a central issue in sustainability, particularly in relation to discussions of inter and intra-generational sustainability. Different bodies of research establish connections between distributive justice concerns and matters relevant to sustainability. The environmental justice literature demonstrates relationships between inequality and environmental degradation. Studies of procedural justice demonstrate that the procedures used to reach a distribution are an important factor in ensuring that outcomes are perceived as legitimate and fair. A body of literature investigating the connection between perceived fairness and task performance then demonstrates that perceived fairness in an allocation can have motivational effects which in turn result in

performance enhancements. This point has a high degree of relevance for agricultural sustainability assessment as it suggests that those people involved in a sustainability initiative would be supportive of the burdens they are expected to assume and perform the required tasks at a higher level if they perceive the burdens to be fairly allocated.

International climate change negotiations provide an applied example of the importance of distributive justice to a major sustainability challenge. Ranges of different mechanisms have been proposed to reduce GHG emissions which serve to illustrate the relationship between a major sustainability challenge and distributive justice concerns. The usefulness of considering international climate change negotiations lies in the relationship between the proposed abatement mechanisms and theories of distributive justice. These mechanisms provide a potential framework for addressing farm level agricultural sustainability challenges. The perceived fairness of these mechanisms applied to agricultural sustainability is largely unknown and was investigated in more detail within this thesis. In keeping with a consideration of applied sustainability challenges, the thesis considered the role of target setting in agricultural sustainability assessment, which raises many of the same distributive justice challenges as international climate change negotiations. There are contextual factors involved which suggest that giving all farmers the same sustainability targets would not be fair (Gasso-Tortajada, 2014). However, little research has been undertaken on the fairness perceptions of farmers who are expected to address sustainability targets.

A relationship can be established between distributive justice, sustainability, and farm-level sustainability assessment. Investigating fairness concerns amongst a group of people around sustainability and farm level sustainability assessment can aided through the adoption of a social choice framework which facilitates an analysis of collective decision-making processes. Within this framework, impartiality or the elimination of personal bias is considered a fundamental requirement for determining what is fair for a particular distribution (Nozick, 1974; Rawls, 1971; Smith, 1776). There is a range of studies that test the effects of different impartiality inducing mechanisms in distributive justice research. The impartial spectator method of inducing impartiality, as described by (Smith, 1776), is a commonly applied technique for reducing personal bias in distributive justice research.

There are multiple methods which have been used to conduct distributive justice research. These methods can be categorised into three main groups; game theoretic experiments, choice experiments, and questionnaire-experiments sometimes referred to as vignette experiments. Of these three, the use of vignettes (a questionnaire-experimental approach) is the most commonly

used method applied to empirical distributive justice research. The use of vignette experiments was considered the best method for the aims of this thesis, and a vignette method was subsequently adopted for the research.

Vignette questionnaires are recognised as being well suited to gathering information on moral intuitions and ethical opinions (Faravelli, 2007; Konow, 2003, 2009; Schokkaert & Overlaet, 1989). They are used to access the ethical notions in people's minds, rather than to describe how people behave (Yaari & Bar-Hillel, 1984). This thesis used a vignette survey method to elicit people's preferences in New Zealand's horticultural production sector for different burden sharing allocations under different informational conditions. The vignette approach has several aspects which made it well suited to the research. Vignette surveys blend elements of experimental approaches with survey characteristics which allows for quantitative findings to be drawn from highly abstract qualitative issues. The method allows the problem to be abstracted from the respondents' personal circumstances. The vignette survey used in the thesis placed the respondent in the position of an impartial spectator, passing judgement over a case in which they have no personal stake. This approach helps reduce personal bias on the part of the respondent. The removal of personal bias form judgements of fairness is a key requirement of justice research, typified by the common idiom 'justice is blind'.

There are multiple different vignette experimental methods; however, a full factorial vignette design was determined to be the most appropriate for the thesis. A full factorial design requires that each respondent rate the level of a specified outcome variable (such as fairness, wage level, or healthiness) related to a fictitious agent (such as a person, a group, or a company), which has been described in terms of potentially relevant factors such as age, work effort, needs, or habits (Jasso, 2006). The level or presence of different factors within the sentences is randomly varied between each vignette. In constructing the vignette set for this thesis a full factorial design for the vignette experiment was used with the vignettes varying on three factors each with only one factor level (3^1 = 3 vignettes) and a control vignette (1 vignette). To administer the vignette experiment a between-subject design was used in which contextual information on fairness principles was varied between groups.

This research focused on the role of fairness in allocating environmental targets within a specific agricultural industry in order to improve sustainability. While sustainability performance assessment initiatives are growing in prominence within New Zealand agricultural industries, a knowledge gap exists around how best to tailor these initiatives towards the sentiments of their intended

participants. The research sought to improve the effectiveness of sustainability initiatives by investigating how farmers would allocate environmental improvement targets under different contexts.

Two primary research questions were investigated:

> *RQ1. In the absence of contextual information which explains why one person is more efficient than another, how do horticultural stakeholders' perceptions of fairness align with theories of distributive justice?*
>
> *RQ2. When presented with contextual information which explains why one person is more efficient than another, do horticultural stakeholders perceptions of fairness change, and how are their responses predicted by distributive justice theories?*

The research was concerned with both farmers' conceptions of fairness without contextual information, and under different contextual information conditions. The contextual information conditions were based largely on normative philosophical theories of distributive justice which describe conditions under which it is fair to deviate from strict equality in an allocation. Three distributive justice principles were used to construct the contextual information vignettes. The first was 'need'. A common argument in distributive justice is that people with higher needs should receive proportionally more support than those with lower needs. This support could be in the form of increased benefits such as welfare payments or subsidies, or decreased burdens such as tax breaks or debt forgiveness. The second distributive justice principle was exogenous responsibility. Another argument in some theories of distributive justice is that people should not be responsible for adverse or advantageous circumstances over which they have no control. For example, people born with a disability or people who benefited from past wrongdoings of their ancestors. In practice, the principle of exogenous responsibility can require that disadvantaged parties receive additional support, and advantaged parties are not punished for their rewards. The third distributive justice principle was endogenous responsibility. The desert-based theories of distributive justice emphasis that people should be rewarded for their effort. Endogenous responsibility can be understood as responsibility, whether positive or negative, which arises from circumstances over which an individual has control. This is as opposed to exogenous responsibility which arises from circumstances over which an individual has no control. Each one of these three distributive justice principles were used to create fictional contextual information for a character in the vignettes.

The research sought to answer two primary research questions, and in doing so, address the higher-level objective. The first research question was concerned with developing an understanding of the alignment of the participants' justice perceptions with major theories of justice. In the absence of contextual information, growers are required to solve a distribution problem according to their own personal attitudes. This reveals the grower's perceptions of the fairness of a distribution and reveals axioms used by the grower under the condition of restricted information. The second research question sough to understand the effect of contextual information on fairness preferences. The purpose of this question was to develop a more nuanced understanding of how fairness perceptions change under different situations which commonly arise in agricultural sustainability assessment initiatives. The findings from investigating this question can then be used to develop a more nuanced set of axioms to inform the development of sustainability assessment initiatives. The primary objective of the research presented here was to develop a set of axioms, based on perceptions of fairness, which could be used to aid the creation of sustainability policies or initiatives that can better achieve their objectives and garner the support of those expected to implement them. A suitable mechanism through which the findings of the research could be implemented in an industry level sustainability initiative is through a benchmarking or target setting system. The results have direct practical implications for how and where a benchmark or a target should be set, as well as implications for the processes used for setting these benchmarks or targets. The implications of adopting different allocation mechanisms under different policy contexts were outlined in Table 6-11 in Section 6.4.6, which is reproduced below. These implications are expanded upon in section 7.4 as a key policy implication of the research.

Table 6-11 Justice evaluation and consequences of results

Actual Reward	Context	Just Reward[1]	Justice Evaluation[2]	Justice Consequences
Rawlsian	Need Negative	Rawlsian	(+2)	Moderately Positive
	Exogenous Responsibility Negative	Egalitarian	(-2)	Moderately Negative
	Endogenous Responsibility	Utilitarian	(-3)	Strongly Negative
Egalitarian	Need Negative	Rawlsian	(+1)	Slightly Positive
	Exogenous Responsibility Negative	Egalitarian	(+2)	Moderately Positive
	Endogenous Responsibility	Utilitarian	(-1)	Slightly Negative
Utilitarian	Need Negative	Rawlsian	(-2)	Moderately Negative
	Exogenous Responsibility Negative	Egalitarian	(-1)	Slightly Negative
	Endogenous Responsibility	Utilitarian	(+3)	Strongly Positive

[1]Respondents preferred allocation for context
[2]Score determined by percentage change from reward under 'no context' vignette to reward under contextual information vignettes 0-9% = (1), 10-19% = (2), 20-29+% = (3).

In developing the primary objective for the research, the practical relevancy of the research for improving sustainability assessment initiatives was emphasised. The research was aligned with the New Zealand Sustainability Dashboard (NZSD), which is developing tools to improve sustainability assessment in New Zealand agricultural enterprises. The research therefore sought to produce results which would have direct applicability in enhancing sustainability assessment initiative development under the NZSD. Additionally, the research sought to add to the literature on welfare economics, distributive justice theories, and applied environmental policy. The research drew on previous studies but reframed the hypotheses in a novel way. Notably, the participants were horticulturalists, and while hypothetical, the implicated distributive justice vignettes they were presented with is very similar to situations they are currently confronting. This is in contrast to other studies (Aguiar et al., 2013; Faravelli, 2007; Konow, 2008) that present highly abstract, hypothetical vignettes to students, and ask the participants to imagine themselves in that situation. Additionally, the research was concerned with the fair allocation of burdens rather than benefits. While the literature emphasises that distributive justice challenges are as important for the allocation of

burdens as they are for benefits (Yaari & Bar-Hillel, 1984), the majority of vignette experiments have asked respondents to allocate benefits rather than burdens (e.g.Faravelli, 2007; Yaari & Bar-Hillel, 1984).

7.2 Summary of the results

A novel process was developed to identify respondents. Horticultural land was identified with a GIS mapping tool provided by Land Information New Zealand (LINZ). Google maps satellite images were then used to locate households or processing facilities on the land. Having identified a house or building and a possible street address using Google, New Zealand Post's address locater tool was used to confirm postal addresses. Having established the location of a house or building on horticultural land, and obtaining a postal address, land ownership records for the identified properties were obtained from LINZ so that the surveys could be personalised to the landowners. While this process for identifying potential participants was found to be effective, approximately 23 percent of the addressees were found to be invalid, and those surveys were returned by the postal service.

A total of 464 surveys potentially reached their intended recipients. Ninety-three responses were received which provided a response rate of 20 percent. The sample obtained aligned closely with typical demographics for the horticultural industry as presented in census data from 2012 (Statistics New Zealand, 2012) and a farm survey conducted in 2007 (Fairweather & Mulet-Marquis, 2009). The respondents also reflected the Ministry for Primary Industry's horticultural monitoring programme's[5] representations of typical horticultural operations.

The majority of respondents (88 percent) had some form of environmental certification. Of these respondents, 42 percent considered their environmental certification to be a voluntary undertaking. The initial questions in the survey were related to the costs of on-farm environmental improvements. Participants were asked to apportion costs between a landowner and the general public. The most common allocation (43.2 percent) was a 50/50 sharing arrangement of costs between the landowner and the general public. Respondents were evenly split between those who indicated that wider society should bear more of the costs for on farm environmental improvements

[5] http://www.mpi.govt.New Zealand/news-and-resources/open-data-and-forecasting/agriculture/

(28.4 percent) and those who indicated that landowners should bear more of the costs for on farm environmental improvements (28.4 percent).

The participants were then asked to select the fairest burden sharing mechanism for allocating environmental mitigation costs. Three options were presented; 'Polluter Pays' – whereby the people who cause environmental damage pay the most; 'Ability to Pay' – whereby the people with the most money pay the most; and 'Existing Use Rights' – whereby new growers/producers pay relatively more, while existing growers/producers pay relatively less. The polluter pays mechanism was considered the fairest by 86 percent of respondents, with 14 percent of respondents selecting existing use rights, and no respondent selecting ability to pay.

The first vignette considered fair burden sharing arrangements in the absence of contextual information. The vignette described a fictitious scenario in which the respondent was asked to distribute sustainability targets between two growers. The intention of this vignette was to develop a baseline understanding of the respondents' conceptions of fairness. Thirty nine percent of respondents selected a Rawlsian allocation as being the fairest. The Rawlsian allocation involved an unequal distribution of targets between the two fictitious growers, but resulted in equal outcomes. The next most common selection was a utilitarian allocation at 32 percent. The utilitarian allocation involved an even more unequal allocation of targets between the fictitious growers, and resulted in unequal outcomes. The least preferred allocation was the egalitarian allocation at 29 percent. The egalitarian allocation provided for an equal allocation of targets between the fictitious growers, and resulted in equal outcomes, however, it was also the most inefficient in terms of its impact on production efficiency. A relationship was found between participants' choice of a fair cost sharing arrangement and their perceptions of a fair share of burdens under the first vignette. Participants that preferred the utilitarian allocation were more likely to allocate less that 50 percent of on-farm environmental improvement costs to the landowner. Additionally, participants in higher income brackets were more likely to favour a utilitarian allocation.

The second set of vignettes considered the effect of different types of contextual information about the fictitious growers on perceived fairness. The first contextual vignette considered the effect of information on the higher financial needs of one of the fictitious growers. Fifty five percent of respondents considered the Rawlsian allocation to be the fairest after being presented with contextual information on needs. This represented an increase of 16 percent from the control vignette. Thirty-two percent of respondents considered the egalitarian allocation to be the fairest,

and 13 percent of respondents considered the utilitarian allocation to be the most fair, a 19 percent decrease from the control vignette.

The second contextual vignette presented contextual information on exogenous responsibility. One of the fictitious growers was described as facing adverse environmental conditions that made it more difficult for him to meet his water use targets. Under this vignette, the egalitarian allocation received the most support at 43 percent. This represented a 14 percent increase from the control vignette. The Rawlsian and egalitarian allocation received the same level of support at 28.5 percent each. Both of these allocations decreased in popularity from the control vignette.

The third contextual vignette presented contextual information on endogenous responsibility. One of the fictitious growers was described as having put a low level of effort into improving his water use. Under this scenario, the utilitarian allocation was preferred by 63 percent of respondents. This result represents a 31 percent increase over the base vignette. Both the egalitarian and Rawlsian allocations fell in popularity, the Rawlsian allocation falling to only 10 percent support, a 23 percent reduction from the control vignette.

7.3 Policy Context

The research has provided findings with immediate practical relevance for the enhancement of agricultural sustainability assessment in New Zealand. Multiple New Zealand primary industries are either establishing sustainability monitoring and reporting initiatives, or are enhancing and expanding existing initiatives. As sustainability agendas have progressed, so too have robustness requirements on sustainability assessment methods. It has become increasingly common to link specific, quantitative, time-bound targets to sustainability indicators so that performance can be interpreted clearly on a 'distance-to-target' basis (Moldan et al., 2012).In addition to target setting, internal benchmarking has also grown in prominence, as digital platforms give farmers greater ability to compare their performance against others through online dashboards. Experience from the NZSD project has revealed that one of the foremost concerns of farmers faced with new sustainability targets, or benchmarking systems, is fairness (Hunt, 2014b).

Farming is influenced by an extensive array of factors both within and out of a farmer's control. The context within which a farmer operates influences not only the ease of achieving a sustainability target, but also the relevancy of comparing her situation against another farmer within her industry. The ability to work proactively towards achieving a task and the facilitation of new behaviours are likely to be critical factors in the establishment of a successful sustainability assessment initiative.

Farmers' perceptions of fairness are therefore critical to designing a sustainability initiative with a higher likelihood of facilitating behaviour change and achieving desired outcomes.

The research surveyed horticulturalists in an attempt to establish axioms which could form the basis of fair target setting and benchmarking systems within a sustainability assessment initiative. The implications for sustainability initiatives are summarised here under four sections. The first concerns a fair distribution of costs. Sustainability initiatives often entail costs for farmers; therefore, the distribution of costs within a sustainability initiative can be a source of tension. The second section deals with fairness sentiments. Fairness sentiments are used here to mean the participants' base perceptions of a fair distribution in the absence of contextual information. Understanding these fairness sentiments provides some guidance of the participants' innate willingness to trade off some level of production efficiency for enhanced equality. Agricultural sustainability initiatives often do not contain the complexity required to differentiate distributions based on contextual factors; therefore, fairness sentiments can be used as a guide for improving fairness outcomes in more simple sustainability initiatives. The third section is concerned with how a more nuanced sustainability assessment initiative could account for differing contextual circumstances amongst farmers. These findings could be used to inform the development of a sustainability initiative which is more closely tailored to the participants fairness perceptions, and therefore more likely to instigate positive change. Finally, the fourth section considers the implications of the research for benchmarking systems, particularly relating to differing environmental conditions, which are a common inclusion in many agricultural sustainability initiatives.

7.3.1 Farily Distributing the Costs of Environmental Mitigation

The majority of respondents considered a 50/50 share of costs for on-farm environmental mitigation between farmers and the general public to be the fairest arrangement. This finding has interesting implications for industry sustainability initiatives. The majority of agricultural sustainability initiatives in New Zealand are implemented at an industry level, and do not have a regulatory component. The findings suggest that the majority growers of growers (75 percent) expect that the general public should be contributing at least 50 percent to their on-farm environmental mitigation costs. This finding highlights the tension concerning actions that are taken on private land but with public consequences. At present, the majority of primary industry sustainability initiatives in New Zealand do not have any provisions to collect funding from the general public to help improve their environmental outcomes. The findings suggest that greater levels of public private partnerships for improving on-farm environmental outcomes would be considered desirable by growers, and would

improve perceived fairness outcomes. These types of arrangements are common in European Union countries. For example, in the United Kingdom farmers can receive agri-environmental payments, often for some form of 'payment for environmental services' (Dobbs & Pretty, 2008). The neoliberal structure of New Zealand farming however means that these forms of payments are not readily available to farmers by way of subsidies. The findings suggest that the European Union approach to public funding for improving on-farm environmental outcomes could be considered a fairer approach by the participants.

In addition to cost distributions, the participants were asked to consider fair burden sharing mechanisms for mitigating adverse environmental effects. They were presented with three mechanisms: polluter pays, ability to pay, and existing use rights (grandfathering). Of these, the polluter pays mechanism received the vast majority of support. This finding raises a seemingly interesting contradiction with the findings on costs sharing. The distributive mechanism which best supports the farmer in not paying for the majority of on-farm environmental improvements is the existing use rights mechanism. However, the seeming contradiction between support for a high degree of public contributions to on-farm environmental improvements, and support for the polluter pays principle, as the fairest way to distribute environmental improvement burdens is explainable in terms of responsibility. It is commonly accepted that the polluter pays mechanism apportions responsibility for mitigation according to relative degrees of responsibility for its causes (Heyward, 2007). If the respondents do not feel responsible for past actions which have created a need for on-farm environmental improvements, then they are able to justify that the polluter pays principle only applies to current and future actions, for which they are willing to take responsibility. Ignorance of wrongdoing can be used to justify a lack of responsibility under a polluter pays mechanism (Caney, 2005; Miller, 2004).

There are two primary implications for sustainability initiatives based on the cost distribution findings from the research. The first is that the participants considered a much higher level of public cost sharing for on-farm environmental improvements than they currently receive would be fairer. This is particularly relevant for correcting the adverse effects of past actions. The second is that the polluter pays mechanism is considered the fairest to apportioning costs for ongoing environmental improvements.

7.3.2 Determining a Fair Starting Point

The research examined the base fairness sentiments of the respondents where they were provided no contextual information to explain the production and environmental efficiency differences

between two fictitious growers. The finding from this enquiry, which has the most practical implications for the establishment of a sustainability assessment initiative, is that the participants did not prioritise production efficiency. Sixty eight percent of participants selected either a Rawlsian or an egalitarian allocation to distribute environmental target burdens between two growers. Only 32 percent of respondents selected the utilitarian allocation which maximised overall production efficiency. This finding demonstrates that when establishing a sustainability initiative, fairness concerns may be more important to the participants than production efficiency impacts.

Another key finding is that fairness preferences are highly varied. There was found to be only a 10 percent difference in support for the least popular allocation (egalitarian) and the most popular allocation (Rawlsian). It is not possible therefore to recommend any one method for allocation the burdens amongst farmers in developing a sustainability initiative. Instead, it is essential that any process used in developing a sustainability initiative consider a diverse range of opinions from across the industry. The method used by the research was specifically designed to reduce personal bias. It is possible that responses would be different if the growers were asked how burdens should be allocated to them. Therefore, the findings of the research can serve as a useful reference in the establishment of an agricultural sustainability initiative, to contrast directly implicated responses with responses made under conditions of impartiality.

7.3.3 Individual's Contextual Circumstances Matter

If sustainability initiatives are to be better aligned to the fairness preferences of their intended participants, then they will need to account for contextual circumstances. It has been argued that contextual circumstances are highly relevant to a distribution challenge (Faravelli, 2007; Yaari & Bar-Hillel, 1984). The research considered how contextual circumstances affect how the participants would distribute sustainability burdens. All three contextual information vignettes had an effect on some participants' perceptions. When the higher financial needs of one fictitious grower was a factor, a shift occurred in those who had initially selected a utilitarian allocation to then selecting a Rawlsian allocation. This shift recognised that the grower with higher needs should be given a higher level of support, even if this had a production efficiency effect. When one fictitious grower was described as being faced with adverse environmental conditions, there was a 20 percent shift in both the Rawlsian and utilitarian groups towards an egalitarian allocation. This shift suggests these respondents felt that adverse environmental conditions provide a rationale for treating everyone equally, despite the adverse efficiency effects of doing so. When one fictitious grower was described as having contributed little effort to improving his environmental performance, the majority of

respondents selected a utilitarian allocation which prioritised overall production efficiency and placed relatively high burdens on the poor performing grower.

There are three clear implications from the findings for the development of a sustainability initiative which is better tuned towards the fairness preferences of the growers. The first is that sustainability burdens could be distributed on a means tested basis, so that those who struggling financially are given a lower burden. There is a large degree of precedent for this approach in the international climate change literature (UN, 1998). The second implication is being faced with adverse environmental circumstances did not provide an imperative for reducing sustainability burdens. Very few respondents reacted to the adverse environmental context information by reducing the effected parties' sustainability burdens. The third implication is that a lack of effort to improve environmental conditions resulted in the strongest response witnessed. The fictitious grower implicated for a lack of effort was subsequently given a higher level of burdens by the respondents than before they were presented with this contextual information.

7.3.4 Implications for Sustainability Performance Benchmarking Systems

While the research found that all types of contextual information presented to the participants had an effect, it is the environmental conditions information presented under the exogenous responsibility vignette which has the most immediate implications for benchmarking in sustainability assessment. New Zealand agricultural industries such as the wine and kiwifruit industries already have systems in place for benchmarking one grower against another. A feature of these systems is that they differentiate growers based on physical features of their operations such as soil type, or operation size. This results in only growers with similar physical characteristics being compared to each other. This is done to improve the relevancy and fairness of the benchmarking systems to the growers. It has been argued that adjusting benchmarking systems to local environmental conditions can improve the fairness of sustainability assessment (Gasso-Tortajada, 2014), however this premise was not directly tested by Gasso-Tortajada (2014). The mechanism to improve sustainability performance was hypothesised to be that tuning benchmarking to local conditions would give farmers more favourable and encouraging feedback which would in turn improve sustainability performance (Gasso-Tortajada, 2014). The findings from the thesis investigating fairness preferences related to differing environmental contexts however, do not support this conclusion.

When presented with information that one fictitious grower faced adverse environmental conditions, only 20 percent of respondents selected an allocation that favoured the disadvantaged grower. Furthermore, the number of respondents who selected this allocation actually decreased

between the control vignette and the adverse environmental conditions vignette. The overall outcome of the grower's selections after being presented with this contextual information was an increase in burdens on both the affected and the unaffected grower, but also a higher degree of equality overall. The reaction to being presented with contextual information on adverse environmental conditions was therefore to increase equality, at a cost to both growers, and overall industry production. This finding raises a warning that tuning benchmarking systems to local environmental conditions in a way that favours environmentally challenged parties may not be perceived as fair by growers.

The setting of sustainability targets presents a highly complex challenge, and yet, the establishment of context specific sustainability targets could substantially enhance the analytic capability of sustainability indicators. The research stepped back from defining actual targets for sustainability indicators, instead addressing a more fundamental challenge around the need to establish a set of rules or a framework within which targets can be developed. The research, in accordance with the state of agricultural sustainability assessment in New Zealand, considered sustainability at an industry level. At present, the horticultural industry in New Zealand is considering how responsibility for achieving a target set at an industry wide level can be divided up amongst growers fairly. This requires the establishment of some fundamental rules or guidelines.

While benchmarking does not require the establishment of an absolute performance target, it does raise the same fairness concerns. Comparing relative performance in an equitable way requires accounting for a range of distributive justice principles. The research demonstrated that need, exogenous responsibility, and endogenous responsibility are all relevant when allocating environmental mitigation burdens. This has implications for both establishing a burden sharing arrangement to meet absolute targets, and for establishing a comparison system for relative benchmarking. In the first case, an individual's sustainability target can be adjusted based on their needs, exogenous responsibility, and endogenous responsibility. In the second case, an individual's relative position in a benchmarking system could be adjusted based on the same understanding of their needs, exogenous responsibility, and endogenous responsibility. In both cases, a farmer's needs, exogenous responsibility, and endogenous responsibility would be used as a weighting system. The research has revealed some general principles for this weighting system in the horticultural industry. Primarily, a grower's endogenous responsibility should be given the highest weighting in determining their environmental mitigation burdens. Need and exogenous responsibility should also be accounted for, but with a lower weighting.

The research analysed how the respondents allocated burdens upon receiving contextual information on an environmental limitation of one of the growers. Vignette 2.2 informed respondents that one grower faced environmental constraints that made it difficult for him to reduce his water use. Based on Gasso-Tortajada (2014), an acceptable response to this constraint could be to reduce the emphasis on this grower's water use performance in their sustainability reporting results. The respondents were asked to allocate sustainability targets to the fictitious growers in one of three ways. Each way had different implications for the burdens the environmentally disadvantaged grower would face. Of the three allocation mechanisms, the Rawlsian mechanism is the most favourable to the disadvantaged grower, while the Utilitarian and Egalitarian mechanisms both entail allocating the disadvantaged grower a high level of burdens. Only 20 percent of respondents selected the Rawlsian option. Surprisingly, the number of participants selecting a Rawlsian solution decreased by 20 percent from the control vignette after receiving information on the grower's environmental constraints. While the Egalitarian and Utilitarian mechanisms both allocated the disadvantaged grower the same amount of burdens, the Utilitarian mechanism resulted in a lower overall burden at an industry level by decreasing the burden on the non-disadvantaged grower. The selection of the Utilitarian mechanism also decreased by 20 percent, while selection of the Egalitarian mechanism increased by 50 percent. Table 7-1 summarises the most commonly perceived just allocation of the different contextual circumstances.

Table 7-1 summarises the most commonly perceived just allocation of the different contextual circumstances.

Table 7-1 Just allocation for contextual circumstances

Context	Just Allocation
Need	Rawlsian
Negative Exogenous Responsibility	Egalitarian
Negative Endogenous Responsibility	Utilitarian

The perceived just allocation aligns to a different theory of justice depending on the contextual information provided. These results demonstrate the importance of considering these contextual factors when establishing environmental targets which align to the farmers perceptions of fairness.

The respondents did not reward the grower facing environmental constraints with more favourable burdens, suggesting that the respondents did not believe that a grower facing environmental

challenges should be given more favourable treatment in a sustainability assessment. This finding argues against the premise of Gasso-Tortajada (2014) that a benchmarking system would benefit from adjusting grower's performance results in accordance with their local environmental conditions. Furthermore, the response of many of the participants to learning about one grower's environmental constraints was to select an egalitarian allocation. Within the context of a benchmarking system, this would suggest they believe that all growers should receive the same treatment regardless of their environmental constraints.

7.3.5 Policy Reccomendations

The results of the thesis raise several key policy recommendations related to agricultural sustainability assessment. The primary policy recommendations can be summarized as:

- When regulators develop environmental policy, which seeks to improve on-farm environmental outcomes, this research has shown that the majority of growers consider that at least half of the costs should be borne by the public, while the other half should be borne by the landowner. This finding has implications for policy makers at all levels of government, for example, this finding would be relevant for the creation of a National Policy Statement on an environmental issue, which would be implemented through regional policy.

- When establishing a mechanism to allocate environmental mitigation targets amongst growers, effects on the growers' production are not be the primary concern. Rather, achieving an equitable allocation of environmental burdens across a range of growers is of greater importance than limiting production impacts. This is particularly for industry bodies in the development of their sustainability assessment initiatives.

- The financial circumstances of a grower is important when setting environmental mitigation targets. This research showed that on average the growers surveyed considered that growers who are struggling financially should be given lower burdens. The distribution of costs for environmental mitigation is important for both regulatory and industry policy makers.

- Challenging environmental conditions do not provide grounds for reducing environmental mitigation targets. The majority of growers considered that despite some growers being disadvantaged by local environmental conditions, these circumstances do not provide adequate grounds for lowering their environmental mitigation burdens. At a regional policy

and planning level, this suggests that some land uses may not be appropriate in some locations, and that restricting land uses accordingly may be considered fair.

- Growers who demonstrate a low level of effort in their environmental mitigation activities should be given additional burdens. An on farm environmental initiative should have the capability to punish those participants who demonstrate a low level of personal responsibility for their environmental mitigation efforts. Agricultural industries are sensitive to reputational effects. When setting a policy agenda at an industry level it should be noted that growers expect other growers to contribute an appropriate level of effort to environmental mitigation.

Taken together, these recommendations provide guidance for the establishment of environmental policy or environmental initiatives which would align more closely with farmers perceptions of fairness. These recommendations apply to both the bottom up grower led creation of industry environmental initiatives as well as top down government regulations. The alignment with fairness sentiments would increase the likelihood that the policy or initiative would be well accepted and therefore operate more efficiently.

Based on these recommendations, a policy or initiative would consider the contextual circumstances that each farmer within operates within, and would adjust their burdens in accordance with three key contextual recommendations:

1. Farmers who are struggling financially should receive lower burdens.
2. Farmers who contribute little effort should receive higher burdens.
3. Local environmental conditions should not affect burden allocation.

The policy or initiative would also seek to develop deeper public-private partnerships in order to spread the costs of environmental mitigation more evenly between the public and landowners. Finally, when allocating environmental mitigation targets, the policy or initiative should not place productive efficiency concerns above the need to allocate burdens equitably amongst farmers.

7.4 Limitations

The research had several limitations which are discussed below. There were limitations related to the choice of participant group, many of these issues being methodological, such as the need to simplify the vignette method used, the relatively small pool of total respondents to survey, and

challenges around getting the survey to the intended audience. There were also limitations in explaining the reasons for the participants' responses due to the type of information gathered by the survey.

Vignette questions presented to students tend to be long and complex, presenting a difficult cognitive challenge (Faravelli, 2007; Yaari & Bar-Hillel, 1984). The target audience for the research being horticulturalists was considered to have less time or patience for answering complex survey questions. Survey fatigue is a common problem facing researchers of New Zealand agricultural industries which must be carefully managed (De Silva & Forbes, 2016). In response to these constraints, vignette studies which use general public, professional, or practitioner samples tend to present much more simple vignette questions (Elsinga, 2011; Emanuel et al., 1996; Fitzpatrick & Stephens, 2014) to the participants than do studies which use student samples. This need for simplicity limited the number of variables which could be included in the research's vignettes. While the research vignettes were able to cover the primary justice principles, there exists a wider array of burden sharing mechanisms which could potentially have been explored with a more complex vignette. This simplification, while successful in achieving the desired response from participants, was nevertheless a necessary limitation of the research.

Obtaining physical addresses for farmers in New Zealand is difficult. Address lists which used to be available for purchase by researchers can no longer be obtained for privacy reasons. Additionally, due to survey fatigue and for privacy reasons, agricultural industry bodies are reluctant to provide contact information for the farmers they represent. The thesis developed a novel method for obtaining contact information for horticulturalists; however, this method was limited in the number of addresses which could be identified. While a response rate of 20 percent was achieved, which was considered sufficient to conduct the research, the number of responses limited the extent of statistical analyses which could be performed on the data. The thesis therefore provides an exploratory investigation into distributive justice perceptions in farmers. In doing so, the thesis provides a basis upon which broader investigations of distributive justice could build on.

As in all normative studies of distributive justice, the research sought to generate statements on distributive justice which can be used as guidelines for behaviour. However, the research was limited to a sample of horticulturalists. While this group was chosen in part due to their diversity of agricultural operations, it is not known whether the findings of the research are applicable to other non-horticultural agricultural enterprises. The research is therefore limited in its ability to make general statements on fairness across New Zealand agricultural industries. While it is not uncommon

for distributive justice studies to generalise findings from one sample population to make general statements on justice, the results of the research reveal differences between the sample's responses and both theoretical and experimental treatments of distributive justice. These findings suggest that caution should be taken when extrapolating the findings to make general statements on the nature of justice. It has been argued by some that it is not possible to define justice independently form its social context (Klinsky & Golub, 2016). As social understandings of the nature of fairness are neither static nor universal, it has proven impossible so far to generate a commonly accepted understanding of justice (Miller, 2002). Despite this limitation, there are core principles of justice to which the research aligns which have application across multiple agents and realms of time and space. Furthermore, the research findings have direct applicability to the sustainability assessment policies of a major agricultural industry in New Zealand.

Like other studies (e.g. Konow, 2009) the research found few correlations between fairness preferences and demographic characteristics. However other studies have shown that there are psychological characteristics, such as risk aversion (Aguiar et al., 2013), and situational characteristics such as the ability to discuss allocations (Herne & Suojanen, 2004), which exert a greater influence over fairness preferences. Studies that investigate these additional characteristics often do so in a laboratory setting. As the research was conducted through a survey, there were limited opportunities to collect data on a wider range of potential explanatory variables.

The research focused on fairness perceptions as the primary determinant of the acceptability of different scenarios. Fairness perceptions are potentially influenced by a large range of factors. This thesis raised risk aversion, cognitive dissonance, organisational justice, and political persuasions as potential contributors to an individual's fairness perceptions. The degree to which each of these factors affected the grower's fairness perceptions was not tested. The research sought to understand fairness as an overall measure of justice, rather than investigating underlying psychological factors that may influence fairness perceptions. It is possible however that studying these underlying factors could be beneficial in determining what is likely to be perceived fair.

7.5 Future Research

This research could be extended to a number of future research directions. This section focuses on directions future research could take based on three main themes, sample population, distributive justice variables, and scope. Recent calls have been made to "examine predictors of justice perceptions not only in general but with regard to specific situations" (Klinsky & Golub, 2016, p. 381). While the research directly addressed this challenge, there remains a vast multitude of

different target populations and contextual situations which have not been considered. The research was limited to a sample of horticulturalists. Future research could apply the same method to other agricultural industry sectors to determine the generalisability of the findings to New Zealand agriculture. There would also be value in conducting the research with Māori participants who potentially have a different perspective on fairness in burden sharing. A comparison to specific Māori participants could yield important insights into the generalisability of distributive justice principles across different cultural contexts.

Environmental issues can be highly politicised. Future studies could consider the influence this politicisation has on notions of fairness in environmental outcomes. Ideology or a commitment to a specific notion of fairness was shown by the research to be a significant factor in individual's preferences for a particular distribution. The research did not consider what is driving this commitment to a particular interpretation of a fair distribution. It was hypothesised that the strong response to the endogenous responsibility treatment may have been based on a desire to protect the reputation of the industry. This hypothesis was not tested by the research, but would pose an interesting potential topic for further research.

As discussed in the limitations section, demographic characteristics provide little explanatory power over fairness perceptions. Therefore, future studies could more deeply consider what lies behind an individual's fairness preferences. An investigation of non-demographic characteristics such as political ideology, risk aversion, and situational awareness in relation to fairness preferences may yield some explanation for a commitment to particular fairness preferences. As well as considering a wider range of socio-temporal characteristics of the participants, future research could also add different characteristic information to the fictitious characters in the vignettes to determine the effect these have on fairness perceptions. The research focused on justice principles such as responsibility, need, and efficiency as these are key principles of distributive justice. However, future studies could expand this line of enquiry to investigate additional moral challenges such as questions of equal access to resources, the possibility of a ceiling on consumption, discounting rates for environmental resources, and public private relationships in environmental mitigation.

The research was conducted at a farm-level, however environmental concerns and conflicts exist at multiple levels including regional, national, and global. Developing consensus around how environmental issues should be addressed will require understanding justice perceptions at multiple scales. Future research could extend the study's method to participant groups which represent different scales. While the research was aimed at a farm scale respondent, the vignettes can be

answered by a person at any scale as they are based on fundamental justice principles. By undertaking the same research with participants at different scales, it would be possible to consider how policies and sustainability initiatives could be crafted to better meet the needs of multiple parties in a way that would enhance conflict resolution and improve performance outcomes.

Early environmental justice research focused on local and national ecological concerns, while more recent research has tended to focus on behaviours and attitudes towards global issues such as climate change (Klinsky & Golub, 2016). Research on the role of distributive justice in sustainability will benefit from a continuing expansion of scope in intertemporal and intergenerational aspects while strengthening connections between local and global scales. Future research could investigate whether tensions exist between what is considered fair at a local scale versus a global scale. As science continues to reveal ever-greater interdependencies across time, space, and species, distributive justice research will benefit from examining the reaction of individuals to different distributive justice models across a range of environmental challenges and contexts.

The research sought to provide insights into the role of fairness perceptions in mitigating environmental issues. For an agricultural industry, this challenge is typically embedded in a much broader sustainability assessment initiative. The research focused on fairness perceptions as they have been shown to be an important motivating factor in an individual's willingness to participate in an initiative that entails distributive impacts. There are however, multiple other concerns beyond fairness that are relevant to the establishment of a sustainability assessment initiative. For example, the selection of a metric on which an environmental issue is to be measured can have significant implications for growers as well as in determining the sustainability of an agricultural system. Future research could consider whether a tension exists between fairness perceptions and other sustainability assessment considerations such as an ecosystem's physical limitations or the practicality of metric selection. The combination of moral considerations and bio-physical considerations within a sustainability assessment initiative could create a more robust approach to sustainability assessment, capable of achieving practical sustainability outcomes while supporting the participants moral sentiments.

Finally, other methods can be used in studies of fairness perceptions. It would be beneficial to repeat the study using a different methodological approach in order to cross check the results. Additionally the use of a laboratory-based experiment would provide the ability to include a wider array of variables within the research, such as the ability to deliberate over the allocations. Repeating the research using a choice experiment could provide the ability to conduct a deeper

statistical analysis of the results. Finally, conducting the research through interviews could provide the ability to use richer and more detailed vignettes.

7.6 Concluding Remarks

This research focused on farmers' perceptions of fairness in the distribution of environmental improvement targets. Sustainability performance targets and benchmarking systems are becoming an increasingly common feature in agricultural operations. If these systems that strive to improve sustainability are better aligned to the sentiments of their intended participants, they will be better positioned to achieve their intended outcomes. This research provided information on the fairness sentiments of New Zealand farmers towards environmental improvement targets under different contextual circumstances. The research provided valuable information on what farmers consider fair in setting environmental improvement targets. This information has direct applicability to enhancing the development of sustainability initiatives which seek to improve environmental conditions.

The thesis contributes to the fields of sustainability and distributive justice by extending existing research in new directions. The research focused on intra-generational equity which is a topic that has received significantly less attention in sustainability literature than has inter-generational sustainability (Neumayer, 2012). The research also adds to the social choice literature by applying a method commonly used with student samples to a practitioner sample. In doing so, the research highlights both similarities and differences in the two sample groups. The research also contributes to theoretical interpretations of distributive justice by testing the applicability of normative theories in a real word scenario. This real-world application of normative theories demonstrated that while in general the theories predicted the participants' behaviour, there were significant instances where they did not.

The results implied that farmers prioritise fairness concerns over productive efficiency concerns. This is a significant finding as it provides both support for the research's chosen path of enquiry, as well as possible pathway for improving the effectiveness of sustainability initiatives. The majority of respondents traded off some industry level productivity in order to provide what they saw to be a fairer distribution of burdens between growers. The results also demonstrated the significance of different distributive justice principles in their effect on fairness preferences. In doing so, the research confirmed the applicability of some aspects of the wider distributive justice literature to agricultural sustainability assessment. The provision of contextual information on the higher financial needs of one of the growers resulted in a significant number of respondents changing their preferred allocation of preferences in a way that supported the struggling grower. Additionally, the

research demonstrated that respondents reacted strongly to a grower who was described as putting little effort into improving his environmental performance. In this case, the respondents considered it fair to place larger burdens on the struggling grower. In both the need, and effort vignettes, the results aligned with much of the theoretical literature on distributive justice, as well as several experimental studies in social choice. However, the research also produced a result that while aligning with some studies in social choice, went against much of the theoretical literature on distributive justice. That is, the respondents did not give additional support to a struggling grower whose adverse circumstances where caused by events outside of his control. This finding has significance for target setting and benchmarking as these systems often consider it necessary to tailor targets and benchmarks to local environmental conditions. The research however demonstrated that this tailoring might not align closely with farmers perceptions of fairness. In conclusion, the research demonstrated that farmers are sensitive to distributive justice concerns, and that these concerns could have an important role in the development of successful sustainability assessment initiatives.

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Appendix A

Example Survey – Vignette 2.1

*Original formatting has been modified to fit this thesis

Environmental Certification in Horticultural Industries

It would really help us out if you could compete this survey.

The purpose of this survey is to understand how environmental certification programmes can better meet the needs of the horticultural sector.

The questions in this survey explore your thoughts on the fairness and operation of environmental certification programmes.

The survey should take about 10 to 15 minutes to complete.

New Zealand Grower and Producer Survey

Participation is voluntary, and you have the right to decline to answer any question or stop the survey at any time. The survey does not collect identifying information, and your responses cannot be linked to you. The results of the research may be published.

The lead researcher is Jay Whitehead (PhD candidate), supervised by Prof. Caroline Saunders and Prof. Paul Dalziel. If you have any questions or concerns about the research, you may contact them at:
[Contact Information]

Lincoln University
Te Whare Wānaka o Aoraki
CHRISTCHURCH•NEW ZEALAND

AERU Agribusiness and Economics Research Unit

1. **Are you directly involved in a horticultural operation (e.g. grower, orchard manager, packhouse worker, viticulturist etc.)?**
   - ☐ Yes
   - ☐ No (If you answered no, please disregard this survey)

2. **What is the size of your farm or orchard you work on?**
   - ☐ N/A (e.g. packhouse or processor)

   ☐ Hectares

3. **Which option best describes the primary industry you belong to?**
   - ☐ Pip fruit
   - ☐ Stone fruit
   - ☐ Kiwifruit
   - ☐ Wine
   - ☐ Vegetable
   - ☐ Other, please state _____

4. **Are you involved with an environmental certification programme (e.g. NZGAP, ZespriGAP, SWNZ)?**
   - ☐ Yes
   - ☐ No

5. **If yes, is it voluntary?**
   - ☐ Yes
   - ☐ No
   - ☐ N/A

6. **If environmental improvements (e.g. increasing bird numbers or riparian planting) were required in the horticultural sector, how would you divide the share of costs between land owners and the general public?**

   Please circle a point on the line below which you think is fair.

Land owners **General public**

|----------|----------|----------|----------|---------- |----------|----------|----------|----------|----------|

100 % of Costs 50/50 Share of Costs 100% of Costs

Fairness Experiment - The following two questions are based on Australian scenarios that help us to design fair certification programmes in NZ.

Imagine that the Australian government has asked the horticultural sector to reduce its water and energy use by 12% each.

Imagine you are a packhouse manager in the Australian apple industry who needs to meet this 12% target.

You only have two growers, Sarah and Steve, and the following information:

Sarah - A cut in water use will have a **large impact** on production, but a cut in energy use **no impact**.

Steve - Cuts in water or energy use will have a **moderate impact** on production.

7. Question: All three options below will meet the 12% target, which option do you think is the **fairest**?

Options (please check only one option)		**Energy and Water Cuts**	**Reduction in apple Production**
Option 1 'All things equal' ☐	Sarah	-6% Water / -6% Energy	-2.4%
	Steve	-6% Water / -6% Energy	-2.4%
			Industry Total Apple Reduction **-4.8%**
Option 2 'Equal Outcome – Unequal Cuts' ☐	Sarah	-4% Water / -12% Energy	-1.6%
	Steve	-8% Water / -0% Energy	-1.6%
			Industry Total Apple Reduction **-3.2%**
Option 3 'Unequal outcomes – Efficient cuts' ☐	Sarah	-0% Water / -12% Energy	0%
	Steve	-12% Water / -0% Energy	-2.4%
			Industry Total Apple Reduction **-2.4%**

You have been provided with a new piece of information about the two growers:

- Steve's orchard is newly established and is struggling to make a profit

8. **Question:** Based on all the information you have, please tick which option you think would be the **fairest now**?

Note that all options and details below are the same as the previous question.

Options (please check only one option)		**Energy and Water Cuts**	**Reduction in apple Production**
Option 1 'All things equal' ☐	Sarah	-6% Water / -6% Energy	-2.4%
	Steve	-6% Water / -6% Energy	-2.4%
			Industry Total Apple Reduction **-4.8%**
Option 2 'Equal Outcome – Unequal Cuts' ☐	Sarah	-4% Water / -12% Energy	-1.6%
	Steve	-8% Water / -0% Energy	-1.6%
			Industry Total Apple Reduction **-3.2%**
Option 3 'Unequal outcomes – Efficient cuts' ☐	Sarah	-0% Water / -12% Energy	0%
	Steve	-12% Water / -0% Energy	-2.4%
			Industry Total Apple Reduction **-2.4%**

9. What do you think is the fairest way to pay for environmental improvements?
(Please rank the options from 1 – 3, with 1 being the most fair and 3 being the least fair)

☐ 'Polluter Pays'
The people who cause environmental damage pay the most

☐ 'Ability to Pay'
The people with the most money pay the most

☐ 'Existing Use Rights'
New growers/producers pay relatively more, while existing growers/producers pay relatively less

The following questions will help us make sure we cover a wide range of opinions. Please remember that this is an anonymous survey, and that you cannot be identified from any information you provide.

10. What is your Age?
- ☐ 18 - 24 years
- ☐ 25 - 34 years
- ☐ 35 - 44 years
- ☐ 45 - 54 years
- ☐ 55 - 64 years
- ☐ 65 years or older

11. Please select the highest level of formal education you have completed (or the equivalent outside of New Zealand).
- ☐ None
- ☐ High school
- ☐ Trade/technical qualification or similar
- ☐ Undergraduate diploma/certificate/degree
- ☐ Postgraduate diploma/certificate/degree

12. Please indicate gross household income before taxes for a typical 12 month period:
- ☐ Less than $20,000
- ☐ $20,001 - $70,000
- ☐ $70,001 - $120,000
- ☐ $120,001 - $170,000
- ☐ $170,001 - $220,000
- ☐ $220,001 or $270,000
- ☐ More than $270,000

That was the last question of the survey!

Thank you very much for your participation.

Comments

If you have any comments about the survey or any additional thoughts about matters raised in the survey, please write them here:

Appendix B

Three survey treatments

Need Treatment:

You have been provided with a new piece of information about the two growers:

- Steve's orchard is newly established and is struggling to make a profit

8. **Question:** Based on all the information you have, please tick which option you think would be the **fairest now**?

Note that all options and details below are the same as the previous question.

Options (please check only one option)		**Energy and Water Cuts**	**Reduction in apple Production**
Option 1 'All things equal' ☐	**Sarah**	**-6% Water / -6% Energy**	**-2.4%**
	Steve	**-6% Water / -6% Energy**	**-2.4%**
			Industry Total Apple Reduction -4.8%
Option 2 'Equal Outcome – Unequal Cuts' ☐	**Sarah**	**-4% Water / -12% Energy**	**-1.6%**
	Steve	**-8% Water / -0% Energy**	**-1.6%**
			Industry Total Apple Reduction -3.2%
Option 3 'Unequal outcomes – Efficient cuts' ☐	**Sarah**	**-0% Water / -12% Energy**	**0%**
	Steve	**-12% Water / -0% Energy**	**-2.4%**
			Industry Total Apple Reduction -2.4%

Exogenous Responsibility Treatment:

You have been provided with a new piece of information about the two growers:

- Steve's local environment makes it difficult for him to reduce his water use

9. Question: Based on all the information you have, please tick which option you think would be the **fairest now**?

Note that all options and details below are the same as the previous question.

Options (please check only one option)		**Energy and Water Cuts**	**Reduction in apple Production**
Option 1 'All things equal' ☐	Sarah	-6% Water / -6% Energy	-2.4%
	Steve	-6% Water / -6% Energy	-2.4%
			Industry Total Apple Reduction **-4.8%**
Option 2 'Equal Outcome – Unequal Cuts' ☐	Sarah	-4% Water / -12% Energy	-1.6%
	Steve	-8% Water / -0% Energy	-1.6%
			Industry Total Apple Reduction **-3.2%**
Option 3. 'Unequal outcomes – Efficient cuts' ☐	Sarah	-0% Water / -12% Energy	0%
	Steve	-12% Water / -0% Energy	-2.4%
			Industry Total Apple Reduction **-2.4%**

Endogenous Responsibility Treatment:

You have been provided with a new piece of information about the two growers:

- Steve has put no effort into improving his water use

13. **Question:** Based on all the information you have, please tick which option you think would be the **fairest now**?

Note that all options and details below are the same as the previous question.

Options (please check only one option)		**Energy and Water Cuts**	**Reduction in apple Production**
Option 1 ‘All things equal’ ☐	Sarah	-6% Water / -6% Energy	-2.4%
	Steve	-6% Water / -6% Energy	-2.4%
			Industry Total Apple Reduction **-4.8%**
Option 2 ‘Equal Outcome – Unequal Cuts’ ☐	Sarah	-4% Water / -12% Energy	-1.6%
	Steve	-8% Water / -0% Energy	-1.6%
			Industry Total Apple Reduction **-3.2%**
Option 3 ‘Unequal outcomes – Efficient cuts’ ☐	Sarah	-0% Water / -12% Energy	0%
	Steve	-12% Water / -0% Energy	-2.4%
			Industry Total Apple Reduction **-2.4%**