

The Influence of Distributive Justice on Agricultural Environmental Sustainability

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Abstract—The implementation and uptake of sustainability initiatives will benefit from any burdens imposed on those expected to participate being perceived as fair. The financial structures that underpin the policies and programs designed to enhance sustainability are tightly bound to a set of ethical and moral issues. The research sought to understand how New Zealand (NZ) horticultural enterprises conceptualize fairness, equity, and distributive justice concerns surrounding environmental mitigation. A vignette survey of horticultural enterprises was used to elicit views on fairness under different distributive justice scenarios. It was found that the majority of NZ horticulturalists preferred to sacrifice some overall industry efficiency in the interest of promoting a more egalitarian distribution of burdens amongst growers. Respondent's also demonstrated a strong tendency to absorb the costs of on-farm environmental mitigation, and supported the 'polluter pays' principle. The research suggests that fairness concerns may have a significant influence over how growers' would like a sustainability assessment initiative to function.

Index Terms—Agricultural sustainability, burden sharing distributive justice, sustainability assessment.

I. INTRODUCTION

Agricultural production faces multiple challenges 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 [1]. 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 [2]. 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 [3]. Agricultural systems will need to improve in all parts of the world if the long term sustainability of agriculture is to be secured [4].

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Agriculture is New Zealand's largest trade sector, accounting for 72 percent of all New Zealand merchandise exports in 2014 [5]. New Zealand also has the lowest level of producer support for agriculture in the developed world [6], resulting in agricultural enterprises with different financial incentives to their equivalents in other regions such as Europe [7]. The New Zealand horticulture industry is worth approximately \$4 billion and produces a wide variety of products from more than 100,000ha of land [8]

Agricultural sustainability is both driven by, and responding to, the values of different stakeholder groups at different scales [9]. It is however, at a farm level where practical steps will likely need to be taken if the challenge of agricultural sustainability is to be addressed [10]. Regulatory instruments to promote sustainability are often unpopular with New Zealand growers, and are seen as unfair or even inappropriate [11]. The horticultural sector therefore relies heavily on voluntary market driven initiatives to meet environmental or sustainability objectives.

The implementation of a successful sustainability initiative relies on the acceptance of those who are required to implement it [12]. If the participants in this process do not consider the environmental mitigation burdens they receive under a voluntary initiative to be fair and equitable, they may be less likely to willingly accept them [13]. The research develops an understanding of how growers believe environmental burdens could be equitably distributed, which can help to inform the creation of environmental policies or initiatives that could garner the support of those expected to implement them. Gaining consensus on the distribution of environmental mitigation burdens in agricultural industries will be essential for ensuring that practical environmental targets are well accepted by growers [14]. Through the use of a fictional environmental burden sharing scenario, the research sought to develop an understanding of NZ horticulturalists preferences on relevant distributive justice challenges, and what influences their responses to those challenges.

II. ENVIRONMENTAL PERFORMANCE AND ASSESSMENT IN HORTICULTURAL ENTERPRISES

Environmental performance indicators are highly relevant if specific parties are to be held accountable for their performance [15]. Voluntary environmental assessment initiatives are becoming an increasingly common way to address sustainability concerns [16]. The choice of approach to target setting has been shown to have an important impact on the absolute performance level of a farm [17]. Figge [18] argues that society defines in political processes the

‘goalposts’ of sustainable development, and suggests that it is these targets that parties need to meet.

Specific, quantitative, time-bound targets can be linked to indicators so that performance can be interpreted clearly on a distance to target basis [15]. Targets play an important role in operationalizing sustainability indicators. There are two important aspects of setting targets for sustainability assessment. The first is to define an absolute value for the target that is to be worked towards, either at a farm level or at a higher level. The second is to assign responsibility amongst individuals for meeting the target. This paper addresses the second of these two aspects.

Sustainability assessment at a farm level is often part of a higher-level sustainability program, such as at a regional, national, or industry wide level [19]. An example of this is the New Zealand Sustainability Dashboard (NZSD) which establishes industry level sustainability assessment frameworks [20]. Targets are set at a high level and responsibility for meeting the targets divided up amongst participants either equally, or through a distribution mechanism that takes other factors into account. The division of responsibilities for meeting performance targets is a matter of distributive justice, a subject based in an extensive theoretical and applied literature.

III. DISTRIBUTIVE JUSTICE

The normative foundations for fairness concerns in sustainability are often based on philosophical and moral theories of distributive justice. [21], [22]. Yaari & Bar-Hillel [23] describe the distributive justice challenge as follows: “*given that a distribution of some entity [e.g. environmental mitigation costs] is going to take place, what are the rules which ought to govern the manner in which this will be done?*” There has been extensive debate about the relative merits of different normative theories of equity [24], [25]. There are numerous theories of distributive justice that vary on multiple dimensions. Three theoretical approaches to distributive justice which have received significant attention in addressing sustainability are egalitarianism, a Rawlsian approach, and utilitarianism.

A. Egalitarianism

Egalitarianism provides one of the simplest distributive justice mechanisms [26]. The principle 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 [27].

John Rawls – maximin equity criterion (the ‘difference principle’)

The ‘difference principle’ regulates inequalities and only permits inequalities that work to the advantage of the worst-off. The difference principle promoted by Rawls has become one of the most widely discussed modern theories of justice, particularly in relation to sustainability [21, 28]. Rawls [29] argued that “[s]ocial and economic inequalities... are to be to the greatest benefit of the least

advantaged members of society”. Rawls’ conception of moral equality and the right to resources lends support to the Brundtland definition of sustainable development, which emphasizes the need to equitably satisfy human needs across generations [30].

B. Utilitarianism

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 popularized by Bentham [31] that can be used to rank social alternatives according to their ‘goodness’. Justice from a utilitarian standpoint is ultimately a matter of maximizing the sum total of human happiness [32]. Utility can be understood as an index of individual lifetime wellbeing, for a fixed population [33]. 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.

Other studies which have considered the distributive justice preferences of individuals have typically conducted the research using students as participants [34-36]. Faravelli [34] finds that the selection of a particular distribution is related to the type of university course the respondent is enrolled in (i.e. economics students or sociology students). However, Konow [35] finds no evidence that personal characteristics can be used as predictors of distributive preferences. Additionally, Aguiar et al. [36] finds that the social preferences of participants do not affect individuals’ decisions under impartiality conditions.

IV. METHOD

The research was conducted through a vignette questionnaire, which is a method used to gather information on moral intuitions and ethical opinions [34], [35]. 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 [35]. Goldstein & Weber [37] 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 the use of vignettes is less common in economic or sustainability research, vignettes have nevertheless featured in several significant studies [e.g. 38, 39]. The research sought to understand horticulturalists’ 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 significantly affect allocations of resources [40]. By removing personal stakes, participants begin to converge on less biased solutions [41].

Participants were identified using a GIS mapping tool¹ to

¹ <https://data.linz.govt.nz/layer/307-nz-orchard-polygons-topo-150k/>

locate horticultural land. A combination of property ownership records², Google Maps³, and postal services⁴ were then used to obtain postal addresses and occupants for the identified sites. A postal survey was sent out which reached 464 participants. 95 responses were obtained from horticultural operations, a response rate of 21 percent. Due to the high level of cognitive challenge presented by the vignette scenario, a response rate above 20 percent response rate was not expected for the research. Although the chosen method is relatively new to the field of agricultural environmental research, a study employing a similar method achieved a response rate of 13.4% [42]. All respondents were presented with the following distribution challenge.

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.

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' <input type="checkbox"/> | 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' <input type="checkbox"/> | 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' <input type="checkbox"/> | Sarah | -0% Water / -12% Energy | 0% |
| | Steve | -12% Water / -0% Energy | -2.4% |
| | | | Industry Total Apple Reduction -2.4% |

The challenge provides no contextual information on the growers' circumstances, instead it only provides information on the effect of environmental mitigation targets on the growers' production levels. For each scenario, participants were given three potential solutions to the challenge to select from. 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 option was a utilitarian solution. The utilitarian solution resulted in the lowest overall loss of production 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 production 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 scenario, however it also resulted in the highest overall loss of production.

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.

V. RESULTS

A. Allocation of Burdens

There were 82 respondents that undertook the distribution challenge. Participants were asked to select the fairest distribution based from three different options. Each option presented the participant with different trade-offs to each grower and the industry as a whole as outlined in Table I.

TABLE I: 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 II). The majority of respondent (40 percent) perceived the Rawlsian allocation to be the fairest, followed by the utilitarian allocation at 33 percent, and the egalitarian allocation at 28 percent.

TABLE II: RESPONDENTS' SELECTION OF ALLOCATION MECHANISMS

| Allocation | n | % |
|--------------|-----------|------------|
| Utilitarian | 27 | 32.5 |
| Rawlsian | 33 | 39.8 |
| Egalitarian | 23 | 27.7 |
| Total | 82 | 100 |

The majority of respondents (72 percent) chose to trade off some overall industry production in order to allocate burdens between the growers in a way that they perceived to be fairer. Chi-square tests undertaken using SPSS were used to investigate the relationship between allocation choice and a range of other variables. No relationship was found between the growers' distributive justice preferences and a range of personal characteristics (e.g. age, education, industry, region, and their views on environmental mitigation mechanisms), however a significant relationship ($\chi^2 = 22.16, p = 0.036$ see Table III.) was found between the respondents' income and their distributive justice preferences.

Rawlsian distributions were the most popular at the lower end (< \$20,000 - \$70,000) and at the high end (\$220,000 - \$270,000). A similar trend was seen in preferences for an

² <https://data.linz.govt.nz/layer/805-nz-property-titles-including-owners/>

³ <https://www.google.co.nz/maps>

⁴ <https://www.nzpost.co.nz/tools/address-postcode-finder>

egalitarian distributions which were popular in the \$70,000 – \$120,000 range and with those earning over \$270,000. The utilitarian distribution was most popular with respondents in the mid to high \$120,000 – \$220,000 range.

TABLE III: CHI-SQUARE TESTS – INCOME AND JUSTICE

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|------------------------------|---------------------|----|-----------------------------------|
| Pearson Chi-Square | 22.161 ^a | 12 | .036 |
| Likelihood Ratio | 21.856 | 12 | .039 |
| Linear-by-Linear Association | .389 | 1 | .533 |
| N of Valid Cases | 78 | | |

a. 15 cells (71.4%) have expected count less than 5. The minimum expected count is .29.

While no significant relationships were found between personal/organizational characteristics and the respondents who selected a Rawlsian or Egalitarian distribution. A significant relationship was found between the respondents' who selected a utilitarian distribution and their views on how the costs of on farm environmental mitigation should be divided up between land owners and the general public.

B. Sharing of Costs

Participants were asked to use a sliding scale to allocate a proportion of costs for on-farm environmental improvements between the land owners (commonly themselves) and wider society. The most common allocation (43.2 percent) was a 50/50 sharing arrangement of costs between the land owner 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 (28.4 percent) and those who indicated that land owners should bear more of the costs for on farm environmental improvements (28.4 percent).

No relationship was found between respondents' who selected an egalitarian or Rawlsian solution and their allocation of costs between land owners and general society. However, a significant relationship ($\chi^2 = 10.76, p = .001$ see Table IV.) was found between respondents who selected a utilitarian selection and respondents who allocated less than 50 percent of the costs for on farm environmental mitigation to the land owners.

TABLE IV: CHI-SQUARE TESTS – UTILITARIANISM AND COST ALLOCATION

| Chi-Square Tests | Value | df | Asymptotic Significance (2-sided) |
|------------------------------|---------------------|----|-----------------------------------|
| Pearson Chi-Square | 10.785 ^a | 1 | .001 |
| Likelihood Ratio | 10.234 | 1 | .001 |
| Linear-by-Linear Association | 10.669 | 1 | .001 |
| N of Valid Cases | 93 | | |

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.55.

Of the respondents that selected a utilitarian distribution, 52 percent thought that land owners 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 choose to distribute the costs of on-farm

environmental mitigation with the general public, there was a large degree of consensus around the most fair distributive justice mechanism for allocating burdens amongst growers.

C. 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

The polluter pays mechanism was selected as the fairest by the vast majority (86 percent) of respondents, with 14 percent of respondents selecting existing use rights, and no respondent selecting ability to pay. Many of the respondents selected only the fairest mechanism, rather than providing a ranking for all three, but 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. No relationship was found between the burden sharing mechanism preferences and any personal characteristics.

VI. DISCUSSION

Studies on distributive justice are often conducted with students and therefore are not easily generalizable to other population groups [43]. Rather than considering types of students, the research considered types of growers (e.g. wine grapes, kiwifruit, and stone fruit). The disciplinary influence on distributive justice preferences in students found by Faravelli [34] was not reflected in any significant effect of horticultural industry type on grower preferences. An extension to the research could however consider whether there are any differences between other major farming types e.g. horticulture, dairy, sheep and beef etc.

Finding no relationship between industry type and distribution preference suggests that fairness ideals cut across different interest groups. This finding is reflected by Konow [35] who finds no evidence that personal characteristics can be used as predictors of distributive preferences. However, in contrast to Konow [35], while no relationship was found between the growers and a range of personal characteristics (e.g. age, education, industry, region, and their views on environmental mitigation mechanisms), a significant relationship was found between the respondents' income and their distributive justice preferences. At both the low and high ends of the income spectrum, respondents preferred more egalitarian distributions, while respondents in the middle income range preferred a utilitarian distribution. The distributive justice preferences in turn had further significant consequences for how some of the respondents preferred to divide up the burdens of environmental improvements. In

particular, respondents that selected a utilitarian solution were more likely to allocate a smaller share of mitigation costs to the land owner.

The results demonstrate a large degree of willingness on the part of the growers to mitigate adverse environmental effects on their land. This willingness to improve performance is in accordance with the findings of research on non-agricultural entities such as large corporations [44]. Additionally, individual fairness concerns were seen by the majority of respondents as more important than maximizing aggregate industry production levels. This finding has significant implications for the development of environmental targets as part of industry level sustainability assessment initiatives, and contributes to an increasing focus on ethical issues in sustainability assessment [45]. 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 polluter pays mechanism than allocated 50 percent or more of the costs of environmental mitigation to the land owners. This could be explained by an identified tendency for individuals to take personal responsibility for desirable outcomes, and externalize responsibility for undesirable ones [46, 47]. Some respondents may not view themselves as having personal responsibility and therefore not be effected by a polluter pays mechanism. This position could rationalize support for both a polluter pays system, and a low allocation of mitigation costs to the land owners.

The findings suggest that setting targets which are designed to minimize impacts on industry production levels may not be perceived by growers to be the fairest method of distributing burdens.

VII. CONCLUSION

While this study represents only a first attempt at exploring the distributive justice preferences of horticultural operations, it nevertheless raises a warning that impacts on production levels, which can be raised as a challenge to environmental mitigation [48], may not be the most important consideration for growers' taking part in a sustainability initiative. Instead, growers may prioritize a fair distribution of environmental mitigation burdens amongst themselves over maintaining production levels in some circumstances.

Additional research is being undertaken to further explore the relationships between fairness preferences and contextual factors. While the research presented here examined base fairness preferences in the absence of contextual information through a vignette survey, it is also important to explore the effect that contextual factors such as responsibility and need have on the perceived fair allocation of burdens amongst

growers. This continued research will provide for a more nuanced understanding of fairness which could be used to enhance the efficiency and effectiveness of environmental mitigation initiatives in a strategic policy process before they are implemented at the industry level.

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