The Influence of Perceptions of New Zealand Identity on Attitudes to Biotechnology

Lesley Hunt
John Fairweather

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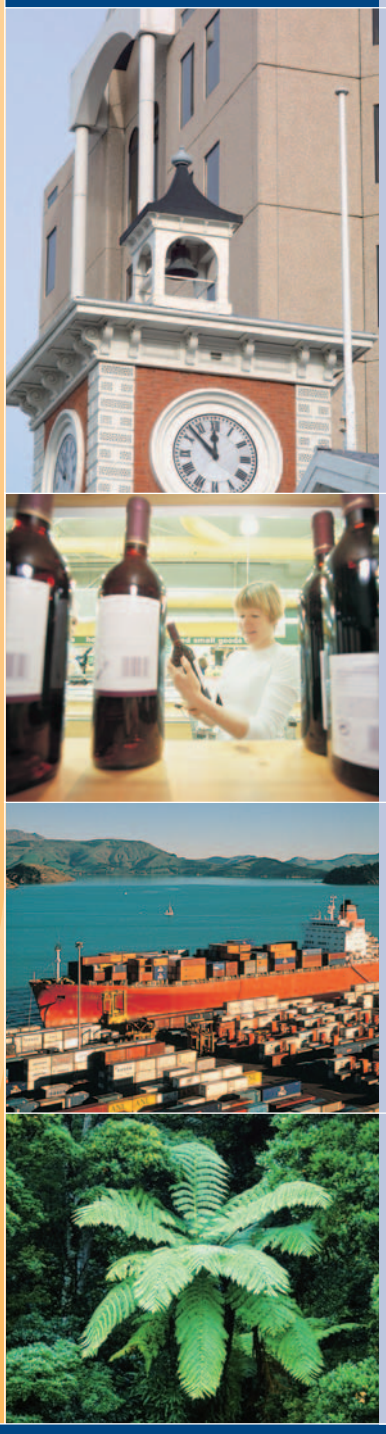

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Preface

Our research programmes typically provided a wealth of data. Sometimes we are able to carry out additional analyses of the data to develop new insights into topics of interest. This report re-examines survey data in our biotechnology research programme in order to explain the role that identity plays in peoples' reactions to biotechnology. Readers interested in how and why the public react to biotechnology will find this report to be of value, as would those interested in New Zealand identity generally.

Professor Caroline Saunders
Director
Agribusiness & Economics Research Unit

Summary

The objective of this research was to examine possible links between national identity and the acceptability of biotechnology. Factor analysis and cluster analysis used on data from the 2004 national survey (N=660) identified five clusters from the national identity variables. The clusters were characterised using other survey data and tests were then conducted to appraise hypothesised links of national identity to biotechnology.

The five clusters, with a general indication of response to biotechnology, were:
Cluster 1: The gentle dreamers (anti biotechnology).
Cluster 2: The classy materialists (pro biotechnology).
Cluster 3: The sceptical environmentalists (anti biotechnology).
Cluster 4: The accepting traditionalists (pro biotechnology).
Cluster 5: The happy as they are sports enthusiasts (pro biotechnology).

The basic hypothesis was that the 'Sceptical Environmentalists' would find the most problems with biotechnology and be the least accepting, with the 'Accepting Traditionalists' having the least problems and being the most accepting. The other clusters were expected to fit somewhere in between these views. These predictions proved well founded. The 'Sceptical Environmentalists' were least accepting of environmental and medical uses of biotechnology, the 'Accepting Traditionalists' the most accepting. Other clusters did fit somewhere in between. The 'Gentle Dreamers' aligned themselves with the 'Sceptical Environmentalists' as the least accepting of agricultural uses of biotechnology, while the 'Classy Materialists' aligned themselves with the 'Accepting Traditionalists' as the most accepting. When it came to 'buying products of biotechnology, the 'Sceptical Environmentalists' were the least likely to buy and the 'Accepting Traditionalists' were the most likely to buy these products.

Survey respondents were presented with five biotechnology scenarios: repairing DDE contamination with GM bacterium, an antibacterial throat lozenge made from bacteria in saliva, bacteria in a sheep's stomach to reduce greenhouse gases, a GM potato, and the use of embryo stem cells for the treatment of Alzheimer's Disease. Responses to these generally fell in line with the summary above except the throat lozenge was least acceptable to the 'Gentle Dreamers' and the 'Accepting Traditionalists' and most acceptable to the 'Happy as they are Sports Enthusiasts'. The 'Sceptical Environmentalists' were the most likely to feel dread about the use of biotechnology, lacked confidence that unexpected outcomes could be controlled, felt that use of the biotechnologies would result in harmful outcomes and that these biotechnologies were unnatural. However, the 'Accepting Traditionalists' were not always more supportive of the biotechnologies depicted in the scenarios for these aspects.

Overall, the 'Gentle Dreamers', 'Sceptical Environmentalists' and 'Happy as they are Sports Enthusiasts' were most sceptical about the different sources of information on biotechnology, and who benefited from it, and were more concerned about biotechnology, than the 'Classy Materialists' and the 'Accepting Traditionalists'.

Other data showed that those who agreed that New Zealand was clean and green were more likely to have a positive attitude towards biotechnology than those who disagreed. On first appearance this seems to be a strange result. However, further exploration revealed that those who did not believe New Zealand was clean and green were the most questioning about biotechnology and its supposed benefits.

Overall, there was no unified view of biotechnology but different groupings in New Zealand society had varying appraisals of biotechnology.

Chapter 1
Introduction, Context and Literature Review

1.1 Introduction

In the report by Hunt, Fairweather and Coyle (2003) on the focus group studies carried out as part of the Foundation for Research Science and Technology (FRST) funded 'Fate of Biotechnology' programme, it was hypothesised that attitudes to specific biotechnologies may be linked to certain beliefs or perceptions individuals have about their identity as New Zealanders. As a result ten statements about New Zealand identity were included in a nationwide survey on public attitudes to biotechnology, carried out in 2003 as part of the same programme. This report considers the links that were found in this survey between New Zealand identity characteristics and biotechnology attitudes. The survey as a whole is reported on by Cook, Fairweather, Satterfield and Hunt (2004) in the 'New Zealand public acceptance of biotechnology' report. A copy of the questionnaire used is contained in Appendix 2.

1.2 Context

Biotechnology, particularly genetic modification, challenges our sense of place, our sense of where we belong in the natural world. Some scientific creations/modifications do not fit in the places and categories we have assigned to living beings. (Nanotechnology will soon challenge the boundaries constructed between living things and technology.) Bauman (2001), in his book, *Community: seeking safety in an insecure world*, postulates that in present society most people no longer belong in face-to-face communities and are searching for identity as a source of belonging, value and security. One of the places where this longing might be satisfied is in an 'imagined' community (Bauman, 2001: 4-5; Anderson, 1983). The myths that contribute to the idea of New Zealand identity could well be described as forming one such imagined community. Bell (1996) implies that this search indicates increasing insecurity, which could certainly be seen as part of the time in which we find ourselves. It then would be logical to suggest at a time when New Zealanders are daily confronted with a barrage of national identity images that attitudes to biotechnology could be filtered through such images.

1.3 Prior research leading to this report

In a series of eleven focus groups conducted throughout New Zealand participants were asked about the acceptability to them of five different biotechnology exemplars. The facilitator then went over each example asking who ranked it 'most acceptable' and why, and then on to those who ranked it 'acceptable' and so on. This produced in-depth discussions from which many factors of acceptability of biotechnology emerged. (These examples were also used in the later nation-wide survey.) One purpose of this programme was to identify relevant factors in determining the public perception of technological risk. (For fuller reports of this programme see Coyle, Maslin, Fairweather & Hunt (2003) and Hunt et al. (2003).)

In the course of analysing the data from these groups the researchers were struck by the frequency with which certain words, images and emotional responses arose in the group interactions. Specific words included 'sheep', 'clean and green', 'clean up', 'waste', and

there was a strong identification with farming, a pride in agricultural achievements and a dissociation from profit making.

In the next sections we detail the five scenarios used in the focus groups and describe some of findings that related to New Zealand identity.

1.3.1 The first example: bioremediation of DDT soil contamination

A genetically modified bacterium has been developed that helps to remediate New Zealand's soil from the effects of DDE contamination. (DDE is a toxin produced when the pesticide, DDT breaks down.)

Nearly everyone seemed to know about DDT and so this exemplar provoked a concern about whether solving this problem would create another problem in twenty years.

> If it works well it's OK, but if it's a mess, then it's a big mess … you could be going down the same track as 20 or 30 years ago they went down with DDT. That's the scary bit (Male, Waimate focus group).

Participants were very aware of other past "mistakes" as illustrated by this male conversation in the Waimate focus group:

> "I think we're really concerned here that we've made messes in the past and they're irreparable. I mean New Zealand must have been a terrific place before gorse and broom and possums and -"
> "Rats."
> "Wallabies."
> "Stoats."
> "Humans."
> "Came in."
> "So nobody should have come in the first place really. Should have just left it here."
> "Well, we could have been a bit more careful about [it]."
> "But it was the knowledge of the day, wasn't it?"

Somehow participants felt responsible for 'making a mess' of the world and thought they should 'clean it up' so that it would become available for agricultural use.

1.3.2 The second example – the bacterial throat lozenge

A beneficial bacterium found naturally in some peoples' saliva has been synthesised and introduced into throat lozenges. A protein produced by this bacteria fights a more harmful form of bacteria that can cause throat infections, rheumatic fever and rheumatic heart disease (BLIS, 2003).

This was the most acceptable of the examples. It was a product over which participants could exercise some consumer choice. There was a 'survival of the fittest' component to some people's attitudes. This biotechnology was using a strength that some people had and sharing it with everyone. However, there was some dislike of the idea ('ugh' factor) that this used someone's 'spit' even though participants understood that the bacteria had been reproduced in a lab and was not directly taken from someone's mouth! They felt that through the use of such an 'easy-fix' lozenge people would forget how to look after their own immune systems. Some people felt that sore throats were rather trivial and favoured examples that would help larger groups of people en masse through some environmental change. There was some

discussion about the role of commercial developers and a suspicion of making money from products.

1.3.3 The third example – reducing methane production in sheep

New Zealand's main source of the greenhouse gases that can harm the environment come from methane in the stomachs of sheep. A plastic device containing bacteria can be inserted into a sheep's stomach to slow down the methane-producing bacteria and reduce the amount of gas produced (MoRST, 2002).

Participants' first reactions to this exemplar were usually very strong and empathetic identifications with a sheep having such a device inserted. One of many examples was the woman who said, "I sure as hell wouldn't like something shoved … down my throat or up the rear end, and have to carry that around for the rest of my life" (Waipukurau focus group). Participants did not want to see sheep harmed in any way. This concern about sheep also had a contradictory side because participants wondered whether such a device could affect meat flavour![1] There was an awareness of the importance of meat exports to the New Zealand economy. Two focus groups from rural communities were very concerned about who should pay for this technology. Their arguments mimicked those seen in the press over the Government's proposed tax on methane producing animals presented by a group called Farmers Against Ridiculous Taxes (FART). Why should farmers pay for something that would benefit the whole country, if not the world, by reducing greenhouse gases? An added dimension to this example was doubt and cynicism about the Kyoto Protocol and its politics.

> Is our contribution through cows and sheep doing their business - is that a serious factor or is that just our little token of what we can put into the world and say, this is what we are doing? (Female, Nelson focus group).

Participants felt it was humans who have added to greenhouse gases and yet sheep were being 'blamed' for it and being 'punished' as it were, for doing something that was a 'natural' part of their digestive process.

> My question is, why do we need to bother suppressing a natural process of an animal to counterbalance a problem we've caused in industry? I ranked it '5' [least acceptable] personally because I can't see why we need to go sticking things down the sheep's throats because we've buggered up industry in the last 100 years (Male, Auckland 1 focus group).

1.3.4 The fourth example – a synthetic toad gene inserted into a potato

A synthetic toad gene has been inserted into a potato. This gene carries an antibiotic toxin from an African toad that may protect potato crops against soft rot.

This example was the least acceptable to participants and the greatest discomfort was expressed about the placement of a synthetic animal gene into a plant. Concerns were expressed about antibiotics in food and soil and the possibility of mutations of the soft rot pathogen. Participants had very negative feelings about toads and this attitude coloured their perceptions about this example. For some reason the word 'toad' became 'frog' in participant's conversations. There were questions such as would this potato be an animal or a vegetable? How would vegetarians decide whether to eat it or not? Such a biotechnology

[1] See MacNaghten (2001) on the tension between the instrumental use of animals and animal welfare.

threatened perceived boundaries between humans, animals and plants. How would we know where something fitted any more? Even the possibility that this biotechnology might enable more land to grow potatoes, posed a challenge for some. Others felt that it would increase the efficiency of potato growing by decreasing the wastage. Land could be freed up for other uses. Participants strongly against such a biotechnology felt it would only help those with commercial interests in potatoes, in spite of support for the reduction in pesticide use that such a technology would bring.

> I would prefer that the potatoes that are produced for my consumption are produced through natural selection, not through economics … I get very cynical when I see these huge companies producing stuff for their own good … it's not for the good of mankind (Male, Nelson focus group).

Potatoes had a cultural element. They are part of the staple diet, have links with the Irish heritage of many New Zealanders, and fish and chips are still the most popular take-aways! The Pacific Island and Asian focus groups on the other hand, could see people had a choice to eat potatoes, taro, kumara or rice! These latter factors indicate how this example challenged participants' sense of place, of where they fit and belong – culturally and biologically.

1.3.5 The fifth example – stem cells helping people with alzheimer's disease

New cells (stem cells) from a 5 day-old human embryo can be inserted into the brain of a person with Alzheimer's disease. This serves to regenerate some of the brain cells that have been destroyed and therefore slow down or even reverse the disease's progression.

This example promoted the greatest dilemma for participants. They all wanted to help Alzheimers suffers and particularly their families, but many baulked at the use of stem cells from embryos. Such a biotechnology raised the fear that in the future embryos could be 'farmed'. Some participants who disliked the idea of using embryos changed their minds when they found that the embryos likely to be used were those 'left over' from in-vitro fertilisation (IVF) and would otherwise be 'wasted'. This justified "using" them, making them "productive" (Female, Nelson focus group). If it helped sufferers' from some illness to become more "useful" (Male, Nelson focus group) members of society then that was also regarded very positively.

> Yeah, initially the idea of using a 5 day old embryo didn't appeal to me too much, but the fact is that these embryos will be destroyed so it would be quite good if they could used for something useful like helping somebody with these serious diseases (Male, Wellington focus group).

1.4 New Zealand identity themes

Through all the responses to these examples there are some emergent themes which can be linked to a sense of New Zealand identity. We have summarised them as issues of responsibility and justice, identification with rurality, and traditional food.

Responsibility includes concern about New Zealand's history in which the environment has been invaded and changed by 'outsiders' – whether DDT, possums, gorse or people, for example. There is a perceived responsibility for and ownership of the 'clean and green' image, and hence the need to keep things 'clean' and to make good the mistakes of the past:

> … we pride ourselves on being a clean green country and over the years we've put a lot of crap on our pasture … so if we can get rid of that and step back to square one … (Male, Waipukurau focus group).

There is also an expressed responsibility for cleanliness which may relate to the wary attitudes to bacteria and its mutational possibilities, and to the risk of antibiotic resistance. There is a responsibility to use things, preferably to benefit others, as illustrated in these quotes: "I think we should help people if we can" (Male, Waimate focus group), and "It could help a lot of poor countries that we need to find a lot of food for" (Female, Christchurch 1 focus group). Also resources should be used efficiently not wastefully.

Justice includes a concern for democracy, that people have choices, that they are able to consent or not consent, and that the right person (or 'thing') gets 'blamed' for a mistake and pays for it, as in 'blaming' sheep for the methane problem when it is really a 'people' problem. Part of a democratic identity could be perceived as a healthy distrust of Government and profit-making, often expressed as cynicism, a suspicion of what gets written on product labels, and of all the activities which separate 'us' from 'them'. This also illustrates a desire for an egalitarian society. 'We' are all in this together. Life should be 'fair' and we should all have equal chances to do well.

It is out of the identification with rurality that the concern for sheep (not toads) arose, and other aspects demonstrating an agricultural consciousness: "I saw on TV how uncomfortable overseas buyers are when we do something to our animals" (Female, Waipukurau focus group). There is a down-to-earth, call-a-spade-a-spade, pragmatic side to the New Zealand character as exemplified in the translation of saliva to 'spit', and potato to 'spud'. This also demonstrates a concern for self-sufficiency (not to be dependent on throat lozenges for bodily immunity to infection, for instance), part of an innovative, resourceful character that does not waste anything, even embryos.

Finally biotechnology is associated with traditional foodstuffs. Potatoes are part of our heritage. So is meat and its association with the Sunday roast of lamb. Food should not contain antibiotics, but should be grown in a 'natural' way just as it would have been in a home garden of old.

1.5 New Zealand identity

What does it mean to be a New Zealander? Certain aspects of New Zealand's identity myths could be very pertinent to factors that play a part in the acceptability of biotechnologies to the public.[2] The first most relevant aspect of the New Zealand identity to biotechnology is the awareness and pride in the portrayal of New Zealand as 'God's own country',[3] a pastoral,

[2] Risk has socio-political and cultural determinants (Slovic, 2000).

[3] New Zealand rates seventh out of 23 countries in 'general national pride' in the International Social Survey Program's (ISSP) 1995 National Identity Study (Smith and Jarkko, 2001: 3). 89% were proud to be a New Zealander in the New Zealand Study of Values of 1998 (Webster, 2001:100).

clean and green paradise (Conrich and Davy, 1997: 3).[4] Secondly, New Zealanders have a dream of an egalitarian society. Thirdly, many New Zealanders identify strongly with agriculture and know the economy of the country depends on it. Fourthly, New Zealanders are very proud of the scientific expertise of New Zealanders, dating back to Ernest Rutherford.[5] They are aware that New Zealand has developed an expertise in agriculture which owes a lot to science, particularly that associated with the past days of the DSIR and the Ministry of Agricultural and Fisheries (MAF).

The world of free competition does not match New Zealand's egalitarian myth. One way of circumventing this has been to present rural New Zealand as the 'real' New Zealand while what goes on in Auckland is considered to be atypical. A second method of circumvention has been to promote Kiwi ingenuity – New Zealanders have always been free marketers. New Zealand is a place where anyone can be successful (Brown, 1997: 8). However, there is a continuing suspicion about business. A recent survey by Industry New Zealand (INZ) (Industry New Zealand, 2003) found that few New Zealanders could see the link between quality of life and the country's economic performance, but most were supportive of new growth industries, one of which was biotechnology. Fifty per cent of those surveyed thought "it was more important for New Zealand to do what was right socially than what was right economically". Nearly one third "preferred people to remain modest about their success in business". The business community wants to change these attitudes. The INZ general manager of marketing said, "A culture that fosters positive attitudes towards business people and business success is vital to improving New Zealand's standard of living and future prosperity" (RSNZ News, 4 June 2003).

This study produced another question which led on to the research being presented in this report. Can the response to particular biotechnologies be predicted in any way by considering certain attributes of myths about the Aotearoa New Zealand/Kiwi, probably Pakeha, identity?[6] (The question of Māori identity and its association with biotechnology is outside the scope of this research.) New Zealanders have a certain view of how New Zealand should be – a sense of place. Would a particular biotechnology threaten this? Would New Zealand still be regarded as 'clean' and 'green'? To many people New Zealand means white sheep on green pasture with a snowy mountain backdrop. This picture has implications for any biotechnology to do with sheep (rather than dairy cows or other farming animals), agriculture in general, the form the landscape takes, and the environment. It is also associated with the maintenance of, or making into reality, the ideals behind New Zealand's 'clean and green' image.

The pragmatic nature of New Zealanders and their feelings that things should be used and useful, links with biotechnology that puts something that would otherwise be wasted to good use, and hopefully makes it 'clean' as well. Attached to this pragmatic image is New Zealand as a nation of 'do-it-yourselfers'. There is also an awareness and ownership of how much New Zealand is dependent on exporting primary products and the expertise developed in this area. Hence, there is an expectation that in spite of New Zealand being a small country we can foot it with others overseas who have far greater resources for research. If a biotechnology promises that this image could be maintained and that New Zealand will therefore 'keep up' with the rest of the world and 'progress' it acts as a counter to those who

[4] It is interesting to note that 'clean and green' was only mentioned once in the focus group of Pacific Islanders, whereas in the group of Asian people it was mentioned seven times and seems to have been an image which encouraged them to come to live in New Zealand.

[5] New Zealand rates third in national pride in science and technology (Smith and Jarkko, 2001: 24).

[6] Webster (2001: 99) talks of the K-factor – "kiwiness". 46 per cent of respondents in the New Zealand Values Study of 1999 identified as New Zealanders, 25 per cent as Pakeha and 18% as European (ibid: 104).

want New Zealand to remain the same. It may be that even the same individual will experience such ambivalence.

It is these thoughts that were further explored in the 2003 survey and the analysis of the data from that survey relating New Zealand national identity to attitudes to biotechnology are recounted in this report. The next chapter describes the methods used to carry out this part of the research.

Chapter 2
Method

2.1 Introduction

In this chapter the methods used to carry out this research are described, particularly the way in which the data was analysed and the reasons behind that. However, first we will provide a brief description of the sample and the response rate. A more detailed description is available in Cook et al. (2004).

Questionnaires were distributed in December, 2003, to 2,000 randomly selected household provided from a national record of listed and unlisted telephone subscribers. A second questionnaire was posted out to those who had not responded in mid-January, 2004. In all, 701 questionnaires with usable responses were returned. When the questionnaires that were returned undelivered or incomplete were taken into account, this gave a response rate of 36.3 per cent. When the representativeness of the sample was considered by comparing the demographic data with the latest census there were differences found between the sample population and the New Zealand population in age, income, number of respondents with a university education and ethnicity (Cook et al., 2004: pp.20-23).

2.2 The national identity statements in the survey

In the survey respondents were asked to score the following statements on a scale from 1 to 5, ranging from 'strongly disagree', 'disagree', 'neither agree nor disagree', 'agree', to 'strongly agree':

- New Zealand is clean and green.
- Agriculture is an important part of New Zealand identity.
- Sheep are an important part of New Zealand identity.
- Winning at international sport is an important part of New Zealand identity.
- The kiwi is an important part of New Zealand identity.
- New Zealanders value something if it is useful.
- New Zealanders are in touch with the land.
- New Zealanders value business success.
- New Zealanders value science and research.
- New Zealanders value arts and craft.
- The world needs a more equal distribution of wealth.

The following sections describe the analysis of the data.

2.3 Grouping the national identity data: cluster and factor analysis

The data set was reduced to the 660 respondents who provided a full set of national identity data. For a start we wished to find whether the answers to the 11 national identity questions were grouped in any way. To do this we carried out a 'Quick Cluster' analysis (k-means

cluster in SPSS)[7] on the standardised data (the variables converted to mean zero and standard deviation one) in order to make the variables equivalent. Even though they were all measured on a five point Likert scale this did not mean that there was an even scatter of responses about the mid value of 'neither agree nor disagree' (see Table 24, p.45 in Cook et al, 2004). However, what this analysis did was differentiate between those survey respondents who were more conservative in their scoring (and were more likely to have used the 'agree', 'neither agree or disagree', 'disagree categories') compared with those who used the full palette of responses (including the 'strongly disagree' and 'strongly agree' categories). This is an artefact of the survey method and did not seem a good or useful basis on which to separate respondents into groups.

To get around this we did a factor analysis on the 11 national identity variables using a Varimax rotation, to reduce the 11 variables first before clustering them (Appendix, Table A1). It was not till five factors were considered that we felt there was sufficient meaningful differentiation/discrimination between the factors. These five factors accounted for 67 per cent of the variation in the data (Appendix, Table A2). A k-means cluster analysis was carried out on these five factors and it was decided that five clusters seemed to make the most sense (Appendix, Table A3).

The assignment of the respondents to these five clusters was checked by carrying out a multiple discriminant analysis on the five factors which demonstrated that the predicted cluster membership fitted the assigned cluster membership by 96 per cent (Appendix, Table A4). It was also checked against the original responses to the 11 national identity variables which also verified that the groups discriminated between these variables. The differences between the groups over these 11 variables was tested using one-way ANOVAs (see Appendix, Table A20) to check that the meaning assigned to the way the clusters were differentiated still held. What this revealed was that the clustering had been successful at discriminating between the pattern of low scores (that is the 'neither agree nor disagree', 'disagree', and 'strongly disagree' categories) which made a lot of sense since for all these variables the majority of respondents were in the 'agree and 'strongly agree' categories (see Table 1, which is reproduced from Table 23, Cook et al, 2004: p.44), leaving little to discriminate on. Hence, it was decided that five clusters/groups was a satisfactory way of dividing up the data.

[7] This clustering method is suggested in the SPSS Statistics Help File for variables with more than 200 data points.

Table 1: New Zealand identity (personal view)

	n	Mean	Std. Dev.	Agreement percentage
New Zealand is clean and green	679	3.3	1.0	56
Agriculture is an important part of New Zealand identity	684	4.3	0.6	95
Sheep are an important part of New Zealand identity	684	4.0	0.8	84
Winning at sport is an important part of New Zealand identity	685	3.6	1.0	62
The kiwi is an important part of New Zealand identity	685	4.2	0.8	89
New Zealanders value something if it is useful	685	3.9	0.7	77
New Zealanders are in touch with the land	683	3.3	0.9	77
New Zealanders value business success	682	3.8	0.8	71
New Zealanders value science and research	683	3.6	0.9	64
New Zealanders value arts and crafts	685	3.4	0.9	52
The world needs a more equal distribution of wealth	680	3.7	1.0	67

Note: Range for all items - 1 = Strongly disagree, 5 = Strongly agree.

2.4 Building a fuller description of the clusters

One-way ANOVAs were then carried out across all of the survey responses from Section B and the first part of Section A, using cluster membership as the factor, to try to build up a fuller picture of what the people in these clusters were like. Section B contained grouped statements associated with attitudes toward nature, to technology and resource use, to clean, green New Zealand, to spirituality, and some general questions about attitudes to life in general and personal control over that life. The first part of the first section of the survey was about concern related to issues facing society. In these ANOVAs the clusters were tested for statistically significant differences in their responses using two-tailed tests. (The tables giving the results of these tests are available in the Appendix.)

At this point we need emphasise that we have used what is essentially categorical data (data obtained from responses of the form 'strongly disagree', 'disagree', 'neither agree nor disagree', 'agree', 'strongly agree' – commonly known as Likert Scales) and have analysed it as if it was interval data by assigning these categories the numbers 1 to 5, and using the least significant difference (LSD) to test for differences between the clusters. We are doing this in the hope that the robustness of the normal distribution will hold for this data (Wood and Saville, 2002). In the situations where the variance within clusters was significantly different (i.e., not homogenous) Tamahere's T2 test was used.[8]

[8] This test basically compares the differences between the two clusters rather than using a common variance calculated from the variation within all the clusters – like a paired t-test. Hence, it is very conservative as it has fewer degrees of freedom.

2.5 Hypothesising how the national identity clusters will respond to biotechnology

By using these fuller descriptions of what distinguished the members of these clusters from one another, we were able to hypothesise what their different attitudes might be to the biotechnologies and attitudes to biotechnology that were involved in the rest of Section A in the questionnaire. The areas covered were the acceptability of certain biotechnologies with potential for use in the environment, medicine and agriculture, and then five different biotechnology scenarios with statements exploring different feelings that people might have about them. This was followed by parts on different views about biotechnology, trust in information about biotechnology, who benefits from biotechnology, concerns about biotechnology, overall attitude to biotechnology and finishing with intentions to buy particular biotechnology products. Thus, the members of one cluster that appeared to be very concerned about the protection of the environment could be expected to have certain views as compared with another whose members were very positive about everything contained in our New Zealand identity statements.

2.6 Testing the hypotheses

By presenting these hypotheses we were able to test whether different clusters did agree more or less with certain biotechnologies or had particular attitudes. This involved using one way ANOVAs again but this time the statistical comparisons between the groups could involve one-tailed tests rather than two-tailed tests, because we were hypothesising that a relationship would go in a particular direction where more people in one cluster agreed with a statement than in another cluster, for example. (The tables presenting these results are given in the Appendix. These tables (compared with the ones used to fill out the descriptions of the clusters) contain the p-values of all the comparisons across clusters to be perfectly transparent about the levels of significance of the differences.)

The results from the ANOVAs were supported by crosstabulations of the same data. (The crosstabulations were tested for strength of relationship between the two variables using the Chi-Squared Criterion.) However, because presenting the crosstabulation results took at least three times as much space as presenting the ANOVA results, only the ANOVA results are presented here as tables, most of which appear in the Appendix. One ANOVA result – that for the NZ identity statements is also presented as a crosstabulation as well, just to illustrate this point.

Means across different sets of statements were calculated where appropriate in order to compare some overall variables across the five different clusters. To do this some of the statement scores were inverted for consistency. For example, in a set of responses measuring a positive attitude to biotechnology the negative statements were turned around so that agreement with them no longer was regarded as a high value but a low value. In other words agreement with a negative statement was turned into disagreement with a positive statement. Such an example would be the statement ‘I feel dread at the thought of this use of biotechnology’.

We are also not claiming cause and effect – that an attitude to biotechnology is dependent on a particular identification with certain national identity characteristics though it is obvious the latter comes before the former! However, we obviously cannot conduct a designed experiment to demonstrate this – as is the nature of social research. All we can demonstrate

is that people in the population holding these particular views about New Zealand identity are more likely than people who do not hold these views to have this attitude to biotechnology.

It is important to emphasise that this report expresses the differences between groups of New Zealanders in their attitudes to biotechnology, however, these differences may often be within the context of overall agreement or overall disagreement or neutrality. To view the overall results see Cook et al. (2004).

2.7 Comparing responses to the NZ is clean and green statement

Cross tabulations (and Chi-Squared tests) were also carried out across the responses to all the questions to see if there were any relationships within the responses between those who agree that NZ is clean and green compared with those who disagree.

The next chapter describes the results of this analysis in the order outlined in this methods chapter.

Chapter 3
Results

3.1 Introduction

In this chapter the identification from the national identity data of five clusters reflecting certain attributes of national identity is described. Then further characteristics of these five groupings are explored by using other questions in the survey that are not to do with biotechnology. Using this fuller description it is then predicted how the members of each cluster will respond to the questions to do with attitudes to biotechnology, and these predictions are then tested against the actual responses. Finally the responses to the 'New Zealand is clean and green' statement are correlated with other responses in the survey to explore further this particular aspect of our national identity.

3.2 Factor and cluster analysis: identification of clusters of respondents representing 5 different views on national identity

The clusters which we decided may be five different representations of the views about national identity held by the New Zealand population, are described in the following paragraphs. Four clusters are of similar size and are not significantly different at around an average of 18 per cent of the population but the biggest group, Cluster 4, is significantly different from the others (27.6% ± 3.5%). The justification for this division into five clusters is quite clearly identified in Table 2 which shows the percentages in each cluster who agree or disagree with the national identity statements posed in the questionnaire. Table A20 (in Appendix) presents a different view of this data by using ANOVAs to compare the clusters.

Table 2: Views of the clusters on the New Zealand identity statements

Statement	% in group who:	Cluster				
		1	2	3	4	5
New Zealand is clean and green	% Agree	45	55	8	84	70
	% Neither	19	24	21	15	19
	% Disagree	36	21	71	1	11
Agriculture is an important part of New Zealand identity [a]	%Agree	98	95	86	98	96
	% Neither	2	5	8	2	4
	% Disagree	0	0	6	0	0
Sheep are important an important part of New Zealand identity [a]	%Agree	88	76	73	95	82
	% Neither	11	15	16	3	12
	% Disagree	2	9	12	2	6
Winning at international sport is an important an important part of New Zealand identity	%Agree	20	61	62	76	82
	% Neither	30	21	19	20	15
	% Disagree	50	18	19	4	3
The kiwi is an important an important part of New Zealand identity [a]	%Agree	60	93	92	98	94
	% Neither	28	4	7	2	6
	% Disagree	12	4	1	0	0
New Zealanders value something if it is useful	%Agree	35	78	88	92	79
	% Neither	49	17	12	7	18
	% Disagree	17	5	0	1	4
New Zealanders are in touch with the land	%Agree	27	44	22	85	32
	% Neither	33	36	38	14	40
	% Disagree	41	20	41	1	28
New Zealanders value business success	%Agree	65	80	80	91	21
	% Neither	31	17	17	8	47
	% Disagree	4	4	3	1	32
New Zealanders value science and research	%Agree	58	71	67	93	5
	% Neither	29	24	21	7	44
	% Disagree	13	5	12	0	52
New Zealanders value arts and craft	%Agree	36	43	55	81	25
	% Neither	40	42	28	18	39
	% Disagree	24	15	17	1	36
The world needs a more equal distribution of wealth (egalitarian)	%Agree	84	0	92	89	69
	% Neither	12	52	8	12	24
	% Disagree	4	49	0	0	7
Total in each cluster		**113**	**136**	**121**	**182**	**108**

Note: 1. All these crosstabulations except those marked [a] showed significant relationships (p = 0.000) between the statement and the cluster using Pearson's Chi-square criteria.
2. [a] signifies that there were too many empty cells for the test to be valid. This occurs where the statements are strongly supported by all groups, for example the importance of sheep and the kiwi as symbols of NZ identity.

3.2.1 Views common to all clusters

As demonstrated in Table 1 the levels of agreement on some of the identity statements are very high. Hence, while sometimes most people agree on something, some of the distinctions that follow are on the measure of that agreement – agreeing more or less – which implies that a higher percentage in one group may agree or disagree more strongly than those in another

group giving them a higher or lower average score for this attribute. (As already described, the categories were given values of 1 for the lowest, most negative view – e.g., 'very unacceptable' or 'strongly disagree' – up to a value of 5 for the highest – e.g., 'very acceptable' or 'strongly agree'. Hence a mean of 1.3 say, would imply that most people in a cluster were expressing strong negative views about a statement whereas a value of 3 would indicate that they were neutral on average, and a value of 3.8 or 4.2 would indicate that most were positive about it.) So there are two ways of looking at this data, as stated in the last chapter – comparing the averages in ANOVAs or the percentages in each cluster across each category (e.g., strongly agree, agree, neither, disagree, strongly disagree etc.) for each statement in a crosstabulation (see Table 2, for example). Because it was easier to present the ANOVA results and to make sense of them, the tables for these analyses are presented in the main text or the appendix. Sometimes a crosstabulation of the same data is given as well.

3.2.2 Cluster 1 (113 members, 17 per cent of sample, or 17 ± 3 per cent of population)

Cluster 1 represents those who agreed more with the statement the 'World needs a more equal distribution of wealth' (as well as Clusters 3 and 4) and hence supported an egalitarian point of view. However, the main source of difference is in their negative or arbitrary views on some of the other aspects of the national identity statements. More than any of the other clusters they feel neutral or disagree that 'Winning at international sport is important' (80 per cent) and that they 'value something if it is useful' (67 per cent). They are the group least likely to agree that the kiwi is an important symbol of NZ (60%). Hence this cluster represents those New Zealanders for whom winning and usefulness are not important.

3.2.3 Cluster 2 (136 members, 21 per cent of sample, or 21 ± 3 per cent of population)

Cluster 2 has a positive emphasis on business (like Clusters 3 and 4) but again, the members of this cluster are marked more by their negative or arbitrary views. In particular they *all* are neutral about or disagree that the 'World needs a more equal distribution of wealth'. So this cluster represents those who hold non-egalitarian views.

3.2.4 Cluster 3 (121 members, 18 per cent of sample, or 18 ± 3 per cent of population)

Cluster 3 along with Cluster 4 hold most strongly to the egalitarian view that the 'World needs a more equal distribution of wealth'. However, the most distinguishing feature of this group is that they are the least likely to agree that 'NZ is clean and green' (8%), feeling that this is a myth (see later). Though they still agree with all the other clusters on the importance of agriculture and sheep they are the least likely of all the clusters to agree about these aspects of NZ identity. Hence this cluster represents those for whom NZ is not really clean and green at all.

3.2.5 Cluster 4 (182 members, 28 per cent of sample, or 28 ± 3 per cent of population)

Cluster 4, the biggest group, is that one whose members feel positively about all the statements presented in the questionnaire as aspects of NZ identity. The agree more than any other group that NZ is clean and green (84%); that agriculture (98%), sheep (95%), and the kiwi (98%) are important; and that New Zealanders 'value something if it is useful' (92%), 'value business success' (91%), and 'value science and research' (92%). This is the only group with a majority that agrees that New Zealanders are 'in touch with the land' (85%) and

almost the only one with a majority that agrees that New Zealanders 'value arts and crafts' (81%). This could be called the cluster with traditional NZ values.

3.2.6 Cluster 5 (108 members, 16 per cent of sample, or 16 ± 3 per cent of population)

Cluster 5 places the greatest emphasis on winning at international sport (82%) of all the clusters and alongside Cluster 4 agrees that 'NZ is clean and green' (70%) but the most dominant feature is that this is the only group with a majority who disagree or are neutral about valuing 'business success' (79%) and valuing 'science and research' (95%). Hence, Cluster 5 represents those for whom business and research are not important but sport is.

3.2.7 Comparisons across the clusters

The responses of those in Cluster 1 were less than those in all other clusters for four of the national identity statements: winning at sport, usefulness, the kiwi, and being in touch with the land (see Appendix, Table A20). Compared with Cluster 2, Cluster 1 respondents gave higher levels of agreement to agriculture, sheep and egalitarian values. Compared with Cluster 3, Cluster 1 gave higher value to 'clean and green', agriculture and sheep. Compared with Cluster 5, Cluster 1 gave higher value to business, science and research, and arts and craft.

The responses of those in Cluster 2 had the greatest disagreement with egalitarian values of all clusters. They were in greater agreement than those in Cluster 1 with the exception of agriculture, sheep and egalitarian values, more than or about the same as those in Cluster 3 except for 'clean and green' and 'usefulness' where they were a lot more, or egalitarian, where they were significantly less. Cluster 2 responses were always in less agreement than Clusters 4 and 5, except for Cluster 5 where those in Cluster 2 were significantly in more agreement for business, science and research, and arts and craft.

Members of Cluster 3 were always significantly more in agreement than those in Cluster 1 except for 'clean and green', agriculture and sheep and were similar for in touch with the land and the value of science and research. When compared with Cluster 2 members those in Cluster 3 were always less than or about the same except for 'clean and green' where those in Cluster 3 were a lot less, or egalitarian, where they were a lot more. In fact Clusters 2 and 3 are almost similar except for the extremity of the differences of their views on these two attributes. They were always significantly less in agreement than Clusters 4 and 5 with some exceptions. Cluster 3 members were always less in agreement in their responses than those in Cluster 4 except for the similarity in their egalitarian values. When compared with those in Cluster 5, they were less in agreement except for business, science and research, arts and craft, and egalitarian in which they were significantly more in agreement.

The members of Cluster 4 were more in agreement with all the national identity statements than all other clusters. Members of Cluster 4 are close to those of Cluster 3 in their agreement with egalitarian values and to Cluster 5 in their agreement with the importance of agriculture, winning and the symbolic value of the kiwi.

Cluster 5 expressed more agreement with the identity statements than any of the other groups except for Cluster 4. Business, science and research, and arts and craft were of least importance to those in this cluster and, except for those in Cluster 2, egalitarian values were of lesser importance. Cluster 5 members were always in less agreement than those in Cluster

4 except for two items where they were nearly the same – winning and the symbolic value of the kiwi.

3.3 Expanding on the descriptions of the clusters

Using other sections of the questionnaire from Section B – those on attitudes towards nature (Appendix Table A19), technology (Table A21), clean green New Zealand (Table A22), spirituality (Table A23) and general viewpoints (Table A24) a better picture can be built up of the similarities and differences between the clusters. Using Section C also builds a demographic picture of these different groups (see Tables A25 to 31) and using the first group of questions in Section A on the level of concern respondents had about issues facing society also gives further insights into the nature of these groups (Table A5). This will ultimately help to understand the different views of those in each cluster towards biotechnology.

3.3.1 Expanding on the descriptions of Cluster 1

Demographic description
Cluster one was of average age (52 – significantly younger than Cluster 4) and age distribution with the most women of any cluster (55 per cent). It had more people in the $40-60,000 income bracket but otherwise had an average income distribution. A higher proportion of this cluster identified themselves as 'European' (19 per cent) (as compared with 'NZ European') and a higher percentage had attended only primary or secondary school but left with no qualifications (20%) or had a Diploma or trade certificate (26 per cent). A lower percentage than average identified themselves as 'spiritual but not religious' (19 per cent) and a higher percentage declared themselves to be atheist (16 per cent).

Attitudes to nature
In this section of the questionnaire Cluster 1 only differentiates itself from Cluster 4 by being in less agreement with statements about nature such as 'nature knows best', and that nature is morally good, pure and wild, and exists in ecological harmony. People in this cluster are more likely to disagree than Cluster 4 that 'the environment doesn't need as much protection as we imagine' and they are less likely to agree that 'at least once in my life I have felt a deep connection with nature'. So basically this group is rather more sceptical (or holds less romantic notions) about nature than do those in Cluster 4.

Technology
This section of the questionnaire differentiates Cluster 1 from all the other clusters in their attitude to technology. People in this cluster on average feel neutral about technology's ability to eliminate poverty and realise society's goals. They sit between the extremes of Clusters 2 and 3 in their belief that wealthy nations should consume less and 'groups that oppose the emphasis on materialistic values deserve our support'.

Clean green New Zealand
This section also differentiates Cluster 1 from all others in some way or another but mainly to position it between Clusters 2 and 3, and Clusters 4 and 5. So it is less likely than Clusters 4 and 5 to agree about statements supporting NZ as clean and green, but more likely to agree than Clusters 2 and 3.

Spirituality
Again this section differentiates this cluster from 4, with its members being more neutral about thinking often about the meaning of life and belief in a personal God, while being less agreeable about the existence of sin.

General viewpoints
This section also differentiates this cluster from 4, with its members being less likely to agree that 'people who try harder should be rewarded financially' and more likely to disagree that government should limit risk taking and that they had 'little control over risks to my health'. These views support an agreement with the perspective that 'individuals should be responsible for their own lives'.

Issues facing society
The group of questions serves to discriminate between Cluster 1 and clusters 3 and 4. Cluster 1 members are less concerned about industrial pollution, loss of animal and plant species, decline in water quality and global warming than Cluster 3, and less concerned than Cluster 4 about crime and violence, natural hazards, terrorism, motor vehicle accidents and global warming.

3.3.2 Expanding on the descriptions of Cluster 2

Demographic description
Cluster 2 was of average age 48.5 years (significantly younger than Cluster 4) with 49 per cent of its members between 30 and 49 years old (Table 3). It had a lower proportion of people in the lower income brackets (30 per cent with incomes of less than $20,000, 53 per cent with incomes less than $40,000) and therefore a greater proportion in the higher brackets (29 per cent above $60,000). This cluster has the highest proportion with a Diploma or trade certificate qualification (38 per cent) than any other cluster. Like Cluster 1, a lower percentage than average identified themselves as 'spiritual but not religious' (21 per cent) and a higher percentage declared themselves to be atheist (16 per cent).

Attitudes to nature
In this section of the questionnaire Cluster 2 mainly differentiates itself from Clusters 3 and 4. It differs from Cluster 4 by being in less agreement with statements about nature such as 'nature knows best', and that nature is morally good, pure and wild, and 'I remember when the environment was more natural' and 'at least once in my life I have felt a deep connection with nature'. So basically this group is rather more sceptical (or holds less romantic notions) about nature and is more pragmatic than those in Cluster 4.

Cluster 2 differs from Cluster 3 in a different set of statements. Its members are less likely than Cluster 3 to agree that 'when we interfere with nature the consequences are unpredictable', 'if we interfere with nature our descendants will pay for it', 'nature may be resilient but can only absorb a very limited amount of damage', 'nature is essentially a fragile thing. It cannot withstand what has been done to it thus far' and 'nature is made up of complex interdependencies. Human meddling of the kind introduced by genetic modification will cause a chain reaction with unanticipated effects'. They also agree less with the statements, 'I remember when the environment was more natural', 'the environment probably doesn't need as much protection as we imagine', 'we shouldn't be too worried about environmental damage. Technology is developing so quickly that in the future people will be able to repair most of the environmental damage that has been done' and 'at least once in my life I have felt a deep connection with nature' than those in Cluster 3. Thus those in Cluster 2 see nature as more resilient than those in Cluster 3.

Technology
This section of the questionnaire differentiates Cluster 2 from all the other clusters in their attitude to technology. The members of Cluster 2 differ from Clusters 3 and 4 by agreeing less that 'living a simpler lifestyle is the best way to conserve energy and resources', 'wealthy nations should consume less and limit their use of resources' and are neutral about 'groups that oppose the emphasis on materialistic values deserve support'. They also differ from Cluster 3 in that they agree more that 'advances in technology mean that the goals of society can be realised'.

Cluster 2 differs from Cluster 1 in that it members agree more that 'advances in technology mean that the goals of society can be realised' and less that 'wealthy nations should consume less and limit their use of resources'.

The members of Cluster 2 differ from those in Cluster 5 agreeing less that 'wealthy nations should consume less and limit their use of resources' and are neutral about 'groups that oppose the emphasis on materialistic values deserve support'.

Hence people in this cluster on average are more positive about technology being able to deliver in a way that will realise society's goals than most other clusters and they are the least likely to support less materialistic ways of living.

Clean green New Zealand
This section also differentiates Cluster 2 from all others in some way or another but mainly to position it between Clusters 1 and 3, and Clusters 4. So it is less likely than Cluster 4 to agree about statements supporting NZ as clean and green, but more likely to agree than Clusters 1 and 3. So people in this cluster do think that NZ is clean and green but they also think that it could be better.

Spirituality
Again this section differentiates this cluster from 4, with its members expressing less agreement or more disagreement with all the statements than those in Cluster 4. Its members also think less about the meaning of life than those in Cluster 3.

General viewpoints
This section also differentiates this cluster from 4 on two points: its members are more likely to disagree that government should limit risk taking and that 'life's ups and downs are mostly a matter of fate or divine will, not personal control'. Like Cluster 1 it appears that Cluster 2 also supports the perspective that 'individuals should be responsible for their own lives' more than do those in Cluster 4.

Issues facing society
The group of questions serves to discriminate between Cluster 2 and clusters 3 and 4. Cluster 2 members are less concerned about ten of the 16 items in the list in the first part of Section A (apart from six items) than those in Cluster 4. The six items they do not differ on are industrial and air pollution, loss of animal and plant species, crime and violence, biotechnology and use of GMOs in agriculture. They are less concerned than Cluster 3 about seven of the 16 items: industrial and air pollution, climate change, loss of animal and plant species, decline in water quality, pesticide use and global warming.

3.3.3 Expanding on the descriptions of Cluster 3

Demographic description
Cluster 3 was of average age 52 years (significantly younger than Cluster 4) fairly much fitting the age distribution for the sample population. It had a higher proportion of people in the lower income brackets (73 per cent with incomes less than $40,000) and the highest number (35 per cent) in the $20 – 40,000 bracket and therefore one of the two lowest proportions in the $40-60,000 (12 per cent). Twelve per cent of this group were of Maori, or Pacific Island ethnicity – the highest percentage of any cluster. Along with Cluster 5, this cluster had the greatest percentage with a postgraduate qualification (18 per cent). It had the highest percentage who identified themselves as 'spiritual but not religious' (34 per cent) and a lower percentage declared themselves to be Christian (48 per cent).

Attitudes to nature
In this section of the questionnaire Cluster 3 mainly differentiates itself from Clusters 2 and 4. It differs from Cluster 4 by being in less agreement with statements about nature such as 'nature knows best', and that nature is morally good, pure and wild, 'the environment probably doesn't need as much protection as we imagine' and 'we shouldn't be too worried about environmental damage. Technology is developing so quickly that in the future people will be able to repair most of the environmental damage that has been done'. So basically this group is rather more sceptical (or holds less romantic notions) about nature than those in Cluster 4.

Cluster 3 differs from Cluster 2 in a different set of statements. Its members are more likely than Cluster 2 to agree that 'when we interfere with nature the consequences are unpredictable', 'if we interfere with nature our descendants will pay for it', 'nature may be resilient but can only absorb a very limited amount of damage', 'nature is essentially a fragile thing. It cannot withstand what has been done to it thus far' and 'nature is made up of complex interdependencies. Human meddling of the kind introduced by genetic modification will cause a chain reaction with unanticipated effects'. They also agree more with the statements, 'I remember when the environment was more natural', and 'at least once in my life I have felt a deep connection with nature', but disagree more that 'the environment probably doesn't need as much protection as we imagine', and 'we shouldn't be too worried about environmental damage. Technology is developing so quickly that in the future people will be able to repair most of the environmental damage that has been done', than those in Cluster 2. Thus those in Cluster 3 see nature as less resilient and more fragile than those in Cluster 2.

Technology
This section of the questionnaire differentiates Cluster 3 from all the other clusters in their attitude to technology. The members of Cluster 3 differ from Clusters 2 by agreeing more that 'living a simpler lifestyle is the best way to conserve energy and resources', and from Clusters 1, 2, 4 and 5 that 'wealthy nations should consume less and limit their use of resources' and from Clusters 1, 2 and 5 that 'groups that oppose the emphasis on materialistic values deserve support'. They also differ from Clusters 2 and 4 in that they agree less that 'advances in technology mean that the goals of society can be realised'.

Cluster 3 is more neutral than Cluster 4 about 'a technological society has the best chances of eliminating poverty.

The members of Cluster 3 are more neutral than other clusters about technology as a solution to problems and they are more into living more simply through supporting less consumption of goods and lower materialistic values.

Clean green New Zealand
This section also differentiates Cluster 3 from all others. It has the highest or the lowest average score in all but one of the statements in this section. So people in this cluster are less likely than others to agree that NZ is clean and green and see this perception as a myth. Hence they are more likely to think that agriculture adversely affects the environment and that NZ was more clean and green in the past and could become more so in the future.

Spirituality
Cluster 3 does not differentiate itself from others in this section except that along with Cluster 4, its members are more likely to agree that they 'often think about the meaning of life'.

General viewpoints
There are no factors of interest differentiating Cluster 3 in this section.

Issues facing society
This group of questions serves to discriminate between Cluster 3 from all others. For two items - industrial pollution and loss of animal and plant species – the members of Cluster 3 are more concerned than those in all other clusters. For another two items - decline in water quality and global warming – those in Cluster 3 are more concerned than those in Clusters 1, 2 and 5. For three items - air pollution, climate change and pesticide use - those in Cluster 3 were more concerned than those in Clusters 2 and 5. They were less concerned that Cluster 4 about crime and violence, illegal drug use, natural hazards, and motor vehicle accidents.

These differences indicate that Cluster 3 is the most concerned about environmental issues than any of the other clusters, but less concerned than Cluster 4 about social issues.

3.3.4 Expanding on the descriptions of Cluster 4

Demographic description
Cluster 4 had an average age of 58 years (significantly older than all other clusters) having 55 per cent more than 60 years old (Table 3). Perhaps reflecting this older age group there were 48.5 per cent on incomes of less than $20,000. It had the highest proportion of people who attended primary and/or secondary school but left without any other qualifications. It had the highest percentage who identified themselves as Christian (66 per cent) and another 25 per cent who identified as 'spiritual but not religious' and hence had correspondingly lower percentages of atheists or agnostics.

Attitudes to nature
In this section of the questionnaire Cluster 4 differentiates itself from all others. It differs from all clusters being in greater agreement with statements about nature such as 'nature knows best', and that nature is morally good, pure and wild. Members of Cluster 4 are also more likely to disagree than those in Clusters 1 and 3 that 'the environment probably doesn't need as much protection as we imagine' are less likely to disagree than Cluster 3 that 'we shouldn't be too worried about environmental damage. Technology is developing so quickly that in the future people will be able to repair most of the environmental damage that has been done'. The agreement with these statements implies that those in Cluster 4 are more likely that the others to see nature as having the ability to heal itself and that it is inherently 'pure' and 'good'.

Members of Cluster 4 differ from those in Clusters 1 and 2 as they are more likely to agree that 'at least once in my life I have felt a deep connection with nature' and with those in Cluster 2 in that they are more likely to 'remember when the environment was more natural'.

Technology
Those in Cluster 4 are more likely to agree than those in Clusters 1 and 3 that 'a technological society has the best chance of eliminating poverty' and 'advances in technology mean that the goals of society can be realised'. The members of Cluster 4 differ from Clusters 1, 2 and 5 by agreeing more that 'living a simpler lifestyle is the best way to conserve energy and resources', and from Clusters 2, and 3 that 'wealthy nations should consume less and limit their use of resources' and from Clusters 1 and 2 that 'groups that oppose the emphasis on materialistic values deserve support'.

The members of Cluster 4 are more positive than other clusters about technology as a solution to problems but they would also like to see people living more simply through supporting less consumption and less materialism.

Clean green New Zealand
This section differentiates Cluster 4 from all others. Members of this cluster are the biggest supporters of NZ as clean and green giving the greatest support to all four items that support this notion and disagree the most that this is a myth.

Spirituality
Cluster 4 has the highest average scores for all the items to do with spirituality, not that this means that they agree with everything. They disagree that they 'attend religious services on a regular basis' and that they 'often have the feeling that life is meaningless' (as do all clusters). This means that more than those in most clusters they agree that there is a personal God, that people have a soul, that sin exists and that there is life after death – traditional, conservative theological doctrines.

General viewpoints
Members of this cluster are more likely to think people who work harder should be better rewarded compares with those in Cluster 1. They disagree, but less than others, about the government limiting risk (compared with Clusters 2 and 5), that 'it is OK for society to impose a small amount of risk on individuals without their consent' (compared with Cluster 1), that 'life's ups and downs are mostly a matter of fate or divine will, not personal control' (compared with Cluster 2), and 'that they have very little control over risks to their health' (compared with Cluster 1). As can be seen, these comparisons served to differentiate Cluster 4 from Clusters 1 and 2 and backed up the perception that those in this cluster felt that they had less control over their lives than those in other clusters appeared to believe.

Issues facing society
The group of questions serves to discriminate between Cluster 4 from all others, but most of all from Cluster 5. For seven items they had the greatest levels of concern – unemployment, crime and violence, illegal drug use, natural hazards, the availability and quality of public health care, terrorism, and motor vehicle accidents. For five more they were a close second or equal to Cluster 3 (and not significantly different from) – air pollution, climate change, decline in water quality, pesticide use and global warming.

These differences indicate that those in Cluster 4 are a very worried lot! They are most concerned about social issues.

3.3.5 Expanding on the descriptions of Cluster 5

Demographic description
Cluster 5 was of average age 49 years (significantly younger than Cluster 4) with 48 per cent of its members between 40 and 59 years old, the 24 per cent between 50 and 59 being the highest percentage in this age group in any of the clusters (Table 3). It had the lowest proportion of people in the lower income brackets (26 per cent with incomes of less than $20,000) and the highest and same proportion (26 per cent) in the $40-60,000 bracket (as Cluster 1), making this cluster similar to Cluster 2 but made up of more middle income rather than high income earners. This cluster has the lowest proportion who attended primary and/or secondary school and left with no qualifications (18 per cent) but the highest proportion with a Bachelor's degree (24 per cent) than any other cluster and correspondingly the highest with university qualifications (39 per cent). It is the most highly educated cluster. Cluster 5 has highest percentage of declared atheists and agnostics (28 per cent) and the lowest percentage of Christians (44 per cent).

Attitudes to nature
In this section of the questionnaire Cluster 5 mainly differentiates itself from Cluster 4 which it differs from by being in less agreement with statements about nature such as 'nature knows best', and that nature is morally good, pure and wild, and 'I remember when the environment was more natural'. So basically this group is rather more sceptical (or holds less romantic notions) about nature and is more pragmatic than those in Cluster 4.

Cluster 5 differs from Clusters 1 and 3 in one statement. Its members are less likely to disagree that 'the environment probably doesn't need as much protection as we imagine'.

Technology
This section of the questionnaire differentiates Cluster 5 from Clusters 2 and 3 by members of Cluster 5 being more likely than Cluster 2 to agree to the following statements and less likely than Cluster 3: 'wealthy nations should consume less and limit their use of resources' and 'groups that oppose the emphasis on materialistic values deserve support'. They also differ from Cluster 4 in that they are less likely to agree that 'living a simpler lifestyle is the best way to conserve energy and resources', and they are more likely than Cluster 1 to agree that 'advances in technology mean that the goals of society can be realised'. Hence they position themselves into a more middle of the road position on materialism and the ability of technology to solve problems than those in Clusters 2 or 3.

Clean green New Zealand
This section differentiates Cluster 5 from all others except Cluster 2 in some way or another but mainly, like Cluster 2, to position it between the cynicism of those in Clusters 1 and 3, and perhaps the more naïve views of those in Cluster 4. So it is less likely than Cluster 4 to agree about statements supporting NZ as clean and green, but more likely to agree than Clusters 1 and 3. However, it does align itself with Cluster 4 more often than Cluster 2 did – in agreeing with Cluster 4 that NZ's environment is more clean and green than other countries, and in their pride in NZ's status as clean and green. So people in this cluster do think that NZ is clean and green but they also think that it could be better.

Spirituality
This section differentiates this cluster from 4, with its members expressing less agreement or more disagreement with all the statements than those in Cluster 4. Its members also express more disagreement about there being a 'personal God' than those in Cluster 3.

General viewpoints
This section also differentiates this cluster from 4 on two points: its members are more likely to disagree that government should limit risk taking and that 'my whole life feels like it's falling apart'. Cluster 5 also differs from Cluster 3 in this way on the latter statement.

Issues facing society
The group of questions serves to discriminate between Cluster 5 and clusters 3 and 4. Cluster 5 members are less concerned about 12 of the 16 items in the list in the first part of Section A (apart from four items) than those in Cluster 4. The four items they do not differ on are industrial pollution, loss of animal and plant species, biotechnology and use of GMOs in agriculture. They are less concerned than Cluster 3 about eight of the 16 items: industrial and air pollution, climate change, loss of animal and plant species, biotechnology, decline in water quality, pesticide use and global warming. Hence they are more concerned than Cluster 2 in terms of the number of things they differ about with Clusters 3 and 4.

Table 3: Age distribution across the clusters

	Age							
Cluster	**< 30**	**30 - 39**	**40 - 49**	**50 - 59**	**60 - 69**	**70 - 79**	**>80**	**Total**
1	13%	19%	22%	11%	14%	16%	5%	100%
2	12%	22%	27%	14%	11%	11%	2%	99%
3	10%	20%	19%	16%	17%	16%	3%	101%
4	11%	12%	10%	12%	19%	25%	11%	100%
5	12%	19%	24%	24%	8%	9%	4%	100%
Total	74	115	127	97	94	105	35	647
%	11.4%	17.8%	19.6%	15.0%	14.5%	16.2%	5.4%	100.0%

Notes: 1. Pearson Chi-Square = 61.0, d.f. = 24, p = 0.000
2. Percentages may not add to 100% due to rounding.

3.3.6 Summarising the distinctive features of the clusters

An immediate point of interest was that those Clusters (4 and 5) with the most agreement about NZ being clean and green, seemed to have views and concerns that did not make sense on first consideration (see Table 4). They saw New Zealand's clean and green image as a reality, not a myth, compared with Cluster 3 members, 50 per cent of whom agreed it was a myth. We could expect that respondents for whom New Zealand being clean and green is an important part of New Zealand identity would be concerned to maintain that clean and green image but Cluster 4 tended to view nature as resilient and that any damage that could occur would be able to be repaired by technology and that technology could achieve societal goals. When this is compared with the views of those in Cluster 3, whose members saw nature as fragile and not so resilient and were more neutral about technology being able to fix things (Appendix: Tables A19 and A21). This led us to believe that those who personally did not agree that New Zealand is clean and green were more likely to be concerned about the impact of biotechnology than those who did agree with this statement.

Table 4: Views of the clusters on 'clean, green New Zealand'

Statement	% in group who:	Cluster				
		1	**2**	**3**	**4**	**5**
New Zealand's natural environment is more clean and green than other countries	% Agree	65	66	52	78	87
	% Neither	17	23	26	8	8
	% Disagree	19	11	22	2	5
Agricultural production in New Zealand has few adverse effects on the environment	%Agree	28	42	18	51	33
	% Neither	27	25	19	27	32
	% Disagree	46	33	63	23	34
I think that New Zealand could one day become clean and green	%Agree	54	53	71	72	51
	% Neither	30	35	18	25	44
	% Disagree	16	13	11	3	5
I am proud of our current international status as a clean and green country	%Agree	59	73	47	92	83
	% Neither	30	25	36	8	16
	% Disagree	11	2	17	0	1
New Zealand used to be more clean and green than it is now	%Agree	78	74	91	80	79
	% Neither	21	20	5	11	9
	% Disagree	1	7	4	10	11
Clean green New Zealand is a myth	%Agree	37	22	50	13	13
	% Neither	34	41	30	19	40
	% Disagree	30	37	21	67	47
Total in each cluster		**112**	**136**	**121**	**180**	**108**

Note: All these crosstabulations showed significant relationships ($p = 0.000$) between the statement and the cluster using Pearson's Chi-square criteria.

Cluster 1

Cluster 1 consists of those who are not into sporting competitiveness and are less likely than others to value things for their usefulness. There are more women in this cluster than other clusters and those in the cluster have lower qualifications but higher incomes. They have neutral feelings about technology being able to solve society's problems, are middle of the road about New Zealand being clean and green, materialism, and are less concerned about environmental and social issues.

Cluster 2

Cluster 2 members are the most materialistic and pro-technology cluster, seeing technology as providing a solution to society's problems. They are younger than most of the other clusters with half in the 30-50 age group, have a higher income and a greater percentage of them have a trade qualification or diploma. They do not hold romantic notions about nature and see nature as reasonably resilient. They are also less concerned about the environment and social issues.

Cluster 3

Cluster 3 consists of the environmentalists. They are sceptical and questioning both about New Zealand's clean and green status and the likelihood that technology will be able to fix everything. They are most concerned about things that impact on the environment. They tend to have a lower income (less than $40,000) but are well educated, having the greatest proportion with postgraduate qualifications. There are more Maoris and Pacific Islanders in this cluster than any other. There are more of them who see themselves as spiritual but not religious than in any other group and a lower proportion of those who think of themselves as Christian. They see nature as fragile and easily damaged and humans as interfering and

meddling in nature. Technology is seen as being unlikely to be able to fix the resultant problems. They have a greater belief in living a non-materialistic, more simple lifestyle than the other clusters and have put this into practice (as indicated by their lower incomes but higher levels of education). As far as they are concerned it is a myth that NZ is clean and green.

Cluster 4
Cluster 4 contains a greater number of older members than any other cluster. These members are more accepting and less discriminating than any other cluster. They are more supportive of government intervention, believing that it is acceptable for government to limit risk, or impose something on society for the benefit of all that might increase the risk a little, hence they are prepared to go further towards individuals having less responsibility for themselves and less autonomy for the greater good. In this way they see themselves as having less control over their lives and so are those most concerned about societal issues such as unemployment, availability and quality of public health care, crime and so on. As such they are more fearful than those in the other clusters but this fearfulness does not extend to technology which is seen positively. They hold romantic notions about nature apart from human involvement in nature, but think technology can be developed to fix any problems. They are less materialistic than clusters 1 and 2 and hold traditional, conservative beliefs, containing the greatest proportion of those who identify as Christian. They are the biggest supporters of NZ being clean and green.

Cluster 5
The members of Cluster 5 focus on and are passionate about sport but do not value business success or scientific research. They are more likely to be middle aged, middle income New Zealanders, well educated and atheists or agnostics than those in other clusters. They hold middle of the road views about most things - whether NZ is clean and green, and about materialism, they are not concerned about social or environmental issues, and hold the least romantic ideas about nature, but see nature as resilient.

3.4 Predicting attitudes to biotechnology and NZ identity

Using what we have discovered so far we now attempt to predict what attitudes to biotechnology each of these cluster will have. From now on we will talk of the clusters as if they are groups of individuals holding a singular viewpoint, rather than speaking of cluster members which was becoming cumbersome. As before, it is probably useful to refer to the questionnaire in Appendix 2, as we work our way through the predicted responses of the clusters to the sections to do with biotechnology.

3.4.1 'Acceptability of biotechnology items' (Section A2 in questionnaire)

Cluster 3 appears to represent those who are sceptical and thoughtful so it is unlikely that they will support any GM biotechnologies as they see them as interfering with nature. Cluster 2 on the other hand are more pragmatic and see nature as being able to look after itself. Cluster 4 consists of those people who are agreeable about most things and see people and technology more positively. They are more romantic about nature and divorce it from 'reality, hence we would see Clusters 2 and 4 as finding most examples of biotechnology more acceptable than the other clusters. Cluster 1 does not take a competitive perspective and is neutral about NZ being clean and green. Cluster 5 is a bit like Cluster 2 but more in the 'don't care' bracket. Hence, we would expect Clusters 1 and 5 to be between the

extremes of Cluster 3 and Clusters 2 and 4 in their support for the many examples of biotechnology in the questionnaire.

3.4.2 'Specific examples of biotechnology' (A3) and 'overall attitude to biotechnology' (A8)

We would expect that what we stated above will apply to the acceptability of the five examples of biotechnology investigated in more depth in this part of the survey. In terms of familiarity, Cluster 3 is better educated and more interested so we would expect them to know more about these biotechnologies than any other cluster. When considering feeling dread 'at the thought of the use of this biotechnology' and feeling that 'use of this biotechnology would be unnatural' we would expect that Cluster 3 may be more likely than the others to agree with these statements. Cluster 4 may be expected to also agree with these because of their romantic notions about nature but these could be balanced by their tendency to see the positive in most things. Cluster 3's feelings of dread may be because they might disagree that 'any unexpected outcomes … can be controlled' and they agree that they 'fear that use of this biotechnology will result in irreversible harmful outcomes', whereas those in Cluster 4 would be the opposite way around. Cluster 2 feel neutral about technology as the answer to society's problems and so could be expected to be alongside Cluster 3 in their feelings about irreversibility and lack of control. Cluster 5 can be expected to be between the others.

It could be expected that these results may show more strongly for the biotechnology examples that are more extreme such as the GM potato. For the medical examples it could be expected that people would be more supportive, and for the environmental examples those who accept that it is alright for government to impose small risks on people for the greater good, could be expected to be more supportive. Cluster 4 is the most like this.

3.4.3 'Views on biotechnology' (A4)

We expect that those in Cluster 4 will express more agreement with positive statements about biotechnology than the other clusters, and will agree more to statements that include God in the scheme of things because they are the largest group with an adherence to Christianity. Those in Cluster 3, on the other hand, are expected to be more sceptical about any claims made of biotechnology. Those in Cluster 2 being against any implications of egalitarianism, are unlikely to accept responsibility for others and less likely to worry or to feel that something is wrong, and to feel that the use of biotechnology needs to be 'transparent', than the other groups. Clusters 1 and 5 could be expected to be in the middle because they do not really care, whereas Cluster 1 is more moderate than Clusters 3 and 4.

3.4.4 Information about biotechnology (A5)

Again Cluster 4 is expected to be most trusting of information sources about biotechnology and Cluster 3 the least trusting, with the others more in between.

3.4.5 Who benefits from biotechnology?(A6)

This section could be expected to discriminate between all the clusters more than other sections because it will separate out the pro-biotechnology people and the ones against it. However, there may be strong agreement with biotechnology benefiting private corporations or companies, and for this statement the cluster order may be reversed with the highest agreement from Cluster 3. So again, Cluster 3 can be expected to be the most sceptical to all claims about who will benefit and Cluster 4 probably in the most agreement. Cluster 1 may join Cluster 3 on the sceptical side, and Cluster 2 may be in more agreement than even Cluster 4 with statements that support biotechnology as having economic benefits, but less about its benefit to wider society. On the other hand Cluster 5 may be more like Cluster 4 in seeing the public good side of biotechnology.

3.4.6 Concerns about biotechnology (A7)

We expect that the results to this section will be the opposite to those in Section A4, 'Views about biotechnology'. Those in Cluster 4 will have fewer concerns about biotechnology, and so will agree less with these statements than those in Cluster 3. There may be other differences between the clusters owing to the differing views their members hold about people. For example, those in Cluster 2 may not be concerned about the commercialisation of biotechnology being a risk to the public or the environment and other related questions.

3.4.7 Buying the products of biotechnology (A9)

As is probably clear by now, we would expect that those in Cluster 4 would be more likely to buy the GM or GM related products listed in this section than those in other clusters and those in Cluster 3 would be the least likely to purchase these products.

3.5 Attitudes of the clusters to biotechnology

In this section we consider what the actual survey results tell us about the differing attitudes to biotechnology of the clusters. Tables A6 to A18 in Appendix 1 apply to this section.

3.5.1 Some overall comments

Information
Politicians were the least believed of all groups (followed by biotech companies) and this was consistent over all clusters. Similarly universities and CRIs were the most believed and this was also consistent over all clusters. Cluster 1 was the most distrustful overall, followed by Clusters 3 and 5, followed by Cluster 2 and Cluster 4 was the most trusting. However, it needs to be pointed out that the overall averages were all less than three (neutral) indicating that a majority in each cluster did not believe information from these sources. Table A14 summarises these results.

3.5.2 Attitudes of Cluster 1 to biotechnology

Cluster 1: Biotechnology items
Cluster 1 differentiates mainly from Cluster 4. Those in Cluster 1 were likely to find the GM possum virus, the nanotech sunscreen and the genetic modification of pine trees less acceptable, while having neutral views about Bt spray and finding genetic modification of

kumara and apples more unacceptable than those in Cluster 4. They also found GM of kumara less acceptable than those in Cluster 2.

Cluster 1: DDE example
Cluster 1 members were less familiar with this biotechnology than those in Cluster 4, and more likely to disagree about being 'confident that any unexpected outcomes from this biotechnology can be controlled' than those in Clusters 2 and 4.

Cluster 1: Lozenge example
Cluster 1 members were less likely to find this biotechnology acceptable, more likely to 'feel dread at the thought of this use of biotechnology' and feel that it was unethical than those in Cluster 5, and more likely to disagree about being 'confident that any unexpected outcomes from this biotechnology can be controlled' than those in Clusters 4 and 5.

Cluster 1: Sheep example
Cluster 1 members were less familiar with this biotechnology issue than those in Cluster 4.

Cluster 1: Potato example
Cluster 1 members found this biotechnology more unacceptable than those in Clusters 2 and 4. They were less familiar with this biotechnology than those in Cluster 4. They were more likely to disagree about being 'confident that any unexpected outcomes from this biotechnology can be controlled' than those in Clusters 2 and they felt less fearful that the use of this biotechnology will result in irreversible harmful outcomes than Cluster 3.

Cluster 1: Stem cells example
Cluster 1 members felt neutral about whether this biotechnology is unnatural compared with Cluster 3 which had more who agree that it is unnatural.

Hence, Cluster 1 is different from all the other clusters in some way or other but there is little consistency except that they seem to be less familiar with most of the biotechnology examples than those in Group 4.

Cluster 1: Views on biotechnology
More in Cluster 1 disagreed that GM animals and plants have a right to live and reproduce, and that 'we are made in the image of God and shouldn't destroy this' than those in Cluster 4 and they were neutral on average about 'God made people responsible for the welfare of other living things' compared with Cluster 4. They were neutral on average about 'the genetic makeup of humans and other animals is very similar' compared with the slight agreement of those in Cluster 3 on this statement. They joined the members of Clusters 3, 4 and 5 in agreeing more strongly that 'the use of biotechnology needs to be transparent so that we all know about what is being developed' when compared with Cluster 2.

Cluster 1: Information
Those in Cluster 1 were less likely than those in Cluster 4 to believe statements made by any group except for regulatory agencies, indicating that on this count Cluster 1 was the most sceptical of what they hear and read about biotechnology and Cluster 4 was the least sceptical.

Cluster 1: Who benefits from biotechnology?
Cluster 1 agreed that corporations would benefit from biotechnology but were neutral or disagreed that anyone else would, differing significantly from Cluster 4. Cluster 1 along with

Cluster 3 appears to be the most sceptical group about who to believe about biotechnology and who will benefit from it.

Cluster 1: Concerns about biotechnology
Cluster 1 shared its major concerns with Clusters 3 and 5 and it differs from Clusters 2 and 4 on two aspects. It differed from Clusters 2 and 4 being more likely to agree that 'people will not always comply with rules or regulations governing the development and release of genetically modified organisms (GMOs)'. It was more likely than Cluster 4 to agree that 'the use of genetically modified plants will result in cross contamination of non-GM seeds', and more likely than Cluster 2 to agree that 'biotechnology may solve a problem but it can also create many problems.

Cluster 1: Overall attitude to biotechnology
Cluster 1 was not significantly different from any other cluster on the items in this section, indicating that individual biotechnologies need to be presented before differences can be found with other clusters.

Cluster 1: Buying the products of biotechnology
Those in Cluster 1 would be less likely than those in Cluster 4 to purchase 'meat from sheep genetically modified for 'double-muscling', producing more meat and less fat per animal' and 'bread made from genetically modified wheat that is 25% cheaper to grow'.

Cluster 1: Overall comments
Members of Cluster 1 were the most distrustful of all sources of information.

Members of Cluster 1 appear to be most like those in Clusters 3 and 5 in their attitudes to biotechnology. They were slightly less worried than Cluster 3 in terms of their feelings about irreversibility (GM potato scenario) and unnaturalness (stem cells) and more likely to feel dread about the throat lozenge (this was the same for all other clusters so this is more about 5 being different from the rest) and less confident (with Cluster 3) that any unexpected outcomes can be controlled than those in Cluster 5.

This cluster differs most from Cluster 4 and less from Cluster 2. It differs from Cluster 4 most in that its members were less likely to feel 'confident that any unexpected outcomes can be controlled' (and Cluster 2) and were concerned about cross contamination and that biotechnology will not be able to solve the problems it may create, and that people in general may not follow rules and regulations. Overall members of Cluster 1 were less informed about some of the biotechnologies than those in Cluster 4. Hence, those in Cluster 1 were far less trusting than Cluster 4 on the whole, and less trusting than Cluster 2, about biotechnology and its impacts.

3.5.3 Attitudes of Cluster 2 to biotechnology

Cluster 2: Biotechnology items
Cluster 2 differentiates mainly from Cluster 3. Those in Cluster 2 were more likely to find the genetic modification of cows, and pine trees, and the use of copies of pancreatic cells from pigs for diabetics acceptable than those in Cluster 3, while having neutral views about genetic modification of potatoes and kumara, when those in Cluster 3 were more likely to find them less acceptable. They also found GM kumara less acceptable than those in Cluster 2. Those in Cluster 2 found the GM possum virus less acceptable than do those in Cluster 4 and the GM kumara more acceptable than those in Cluster 1.

Cluster 2: DDE example
Cluster 2 members were less likely to disagree about being 'confident that any unexpected outcomes from this biotechnology can be controlled' than those in Clusters 1 and less likely to feel dread than those in Cluster 3 about this biotechnology.

Cluster 2: Lozenge example
Cluster 2 did not differ significantly from any other on this biotechnology except that its members were more likely than those in Cluster 5 to feel that use of it would be unnatural.

Cluster 2: Sheep example
Cluster 2 did not differ significantly from any other on this biotechnology.

Cluster 2: Potato example
Cluster 2 members were less against this biotechnology than those in Cluster 3. They were less likely than those in Cluster 3 to find it unacceptable, to feel dread, to disagree about controlling any unexpected outcomes, to agree about it being irreversible, and to think it is unethical. They were also less likely than those in Cluster 1 to find it unacceptable, and less likely than those in Clusters 1 and 5 to disagree about controlling any unexpected outcomes.

Cluster 2: Stem cells example
Cluster 2 members found this biotechnology more acceptable, and were more confident about its control than do those in Cluster 3. They were less familiar with it than those in Clusters 4 and 5.

Hence, two of these scenarios – the GM potato and the stem cells - serve to distinguish the more pro-biotechnology views of those in Cluster 2 from those in Cluster 3.

Cluster 2: Views on biotechnology
Their views on biotech served to discriminate between those in Cluster 2 from Clusters 3 and 4. Cluster 2 agreed less than all other clusters that 'the use of biotechnology needs to be transparent so that we all know about what is being developed'. They agreed less than Cluster 3 that 'when we try to play God we make mistakes', 'it feels wrong to mix genetic material from plants and animals', 'it is worrying that the food we eat might have been produced using genetic modification', and felt more neutral about 'it was wrong to lift the moratorium on field trails of genetically modified plants'. Compared with Cluster 4 those in Cluster 2 disagreed more that 'we are made in the image of God and shouldn't destroy this' and they were neutral on average about 'God made people responsible for the welfare of other living things' compared with those in Cluster 4 who found it more acceptable.

So those in Cluster 2 were less inclined to agree with some of the conservative theological implications of the Christian beliefs of those in Cluster 4, and agreed less with those in Cluster 3 about worrying about genetic modification.

Cluster 2: Information
Those in Cluster 2 were more likely than those in Cluster 1 to believe statements made by university scientists and less likely than Cluster 4 to believe statements by CRIs, and less likely to disagree than Clusters 1 and 5 that they believe statements by politicians, and were less likely along with Cluster 4 to disagree that they believe statements by biotech companies. In other words they were less trusting of sources of information about biotech than Cluster 4 but more trusting than Cluster 1.

Cluster 2: Who benefits from biotechnology?
Cluster 2 was less likely than Clusters 3 and 5 to agree that corporations would benefit from biotechnology and agreed more than Cluster 3 that it would benefit the NZ economy. This positions this cluster as slightly less cynical than Cluster 3 about who would benefit from biotechnology.

Cluster 2: Concerns about biotechnology
This section mainly differentiated Cluster 2 as being less concerned about biotechnology than Clusters 1, 3 and 5. Those in Cluster 2 were less likely to agree than Clusters 1, 3 and 5 that 'people will not always comply with rules or regulations governing the development and release of genetically modified organisms (GMOs)', and that 'biotechnology may solve a problem but it can also create more problems'. They were less likely to agree than Clusters 3 and 5 that ''the commercialisation of biotechnology will result in more risk to the public or the environment', and with Cluster 3 that 'GMOs will spread into places we do not want them'.

Cluster 2: Overall attitude to biotechnology
Cluster 2 is significantly different to Cluster 3. Its members were more likely to find biotechnology acceptable, and to agree that unexpected outcomes can be controlled, but they were less likely to agree irreversible harmful outcomes could result from the use of biotechnology. Hence they were more supportive of biotechnology overall than those in Cluster 3.

Cluster 2: Buying the products of biotechnology
Those in Cluster 2 would be more likely than those in Cluster 3 to purchase 'meat from sheep genetically modified for 'double-muscling', producing more meat and less fat per animal'.

Cluster 2: Overall comments
Cluster 2 contrasts most strongly with Cluster 3 and aligns most with Cluster 4. Its members were very pro-biotechnology, perhaps from the pro-business emphasis. They did not see it as producing the same problems or feel that it has the risks that other groups perceive.

3.5.4 Attitudes of Cluster 3 to biotechnology

Cluster 3: Biotechnology items
Cluster 3 differentiates from Clusters 2 (as mentioned above), 4 and 5 in the acceptability of many biotechnology items listed in the survey. Some of what follows will have already been described in the comparisons above. Those in Cluster 3 were more likely than those in Clusters 2 and 4 to find the genetic modification of cows, and the use of copies of pancreatic cells from pigs for diabetics unacceptable (along with those in Cluster 5 as well). They were most likely to find the genetic modification of potatoes, pine trees and kumara unacceptable, and these results are significantly different from those of Clusters 2 and 4. They were most likely to find GM apples unacceptable (significantly different from those in Cluster 4). They were neutral about the GM possum virus and more likely to find the use of Bt spray unacceptable than those in Clusters 4 and 5 and were less likely to find the nanotech sunscreen acceptable than those in Cluster 4. The members of Cluster 3 were those most likely to find these examples unacceptable. When the environmental examples are averaged Cluster 3 is significantly different from Clusters 4 and 5 and when this is done for the agricultural examples Cluster 3 is significantly different from Cluster 4. (The clusters do not differ significantly for the medical examples.)

Cluster 3: DDE example
Cluster 3 members were less familiar with this biotechnology scenario and more likely to disagree about being 'confident that any unexpected outcomes from this biotechnology can be controlled' than those in Cluster 4. They were less likely to disagree about feeling dread and most likely to agree that this biotechnology is unnatural than those in Cluster 5. They were also less likely to disagree about feeling dread than those in Cluster 2.

Cluster 3: Lozenge example
Cluster 3 members were more likely to disagree about being 'confident that any unexpected outcomes from this biotechnology can be controlled' than those in Clusters 4 and 5.

Cluster 3: Sheep example
Those in Cluster 3 were most likely to agree that they fear that this biotechnology could result in irreversible, harmful outcomes, and that it is unnatural. These differences are significant when compared with Cluster 5. When considered overall by contrasting the mean responses of all the statements about this biotechnology, Cluster 3 differs very significantly from Clusters 2 and 4. It is interesting in terms of their environmental concern that this group still did not feel that the use of this particular biotechnology is acceptable.

Cluster 3: Potato example
Cluster 3 members were significantly different in their responses to Cluster 2 and/or Cluster 4 on six out of the seven statements on this biotechnology. They were more likely than Clusters 2 and 4 to disagree about its acceptability and the likelihood of controlling any unexpected outcomes, to agree to feeling dread, and to fear that is irreversible (along with Cluster 1). They were most likely to agree that it is unethical (significant when compared with Cluster 2) and that it is unnatural (significant when compared with Cluster 4). When considered overall using the means from the responses to the items in this section, Cluster 3 is significantly different from Clusters 4 and 5.

Cluster 3: Stem cells example
Those in Cluster 3 had significantly more extreme feelings about this biotechnology than those in Cluster 4 for four of the statements – acceptability, the likelihood of controlling any unexpected outcomes, fear that is irreversible and feelings that it is unnatural. They were least likely to agree to its acceptability (compared with Clusters 2, 4 and 5), most likely to disagree about the likelihood of controlling any unexpected outcomes (compared to Clusters 2 and 4), most likely to agree that they fear irreversible harmful outcomes (compared to Cluster 4) and that it is unnatural (compared to Clusters 1 and 4).

When the overall average of the responses to these statements is considered Cluster 3 is significantly lower than Clusters 2, 4 and 5 for this scenario.

Hence, all of these scenarios distinguish the more anti-biotechnology views of those in Cluster 3 from all the other clusters. In particular more members of Cluster 3 disagreed with the statement 'I am confident that any unexpected outcomes from this biotechnology can be controlled', and agreed that 'the use of this biotechnology would be unnatural' for four of the five scenarios and that 'fear that the use of this biotechnology will result in irreversible, harmful outcomes' for three of the scenarios (more than any other clusters).

Cluster 3: Views on biotechnology
Again, their views on biotechnology served to discriminate between those in Cluster 3 and those in Clusters 2, 4 and 5. They were most likely to disagree that 'biotechnology simply harnesses and uses natural processes' (statistically significant when compared with Cluster 4)

and most likely to agree that 'the genetic makeup of humans and other animals is very similar (Cluster 1), 'when we try to play God we make mistakes' (Cluster 2), 'it feels wrong to mix genetic material from plants and animals' (Clusters 2 and 4), 'it was wrong to lift the moratorium on field trials of genetically modified plants' (Clusters 2 and 4), 'it is worrying that the food we eat might have been produced using genetic modification', (Clusters 2, 4 and 5), and they were less likely to agree that 'God made people responsible for the welfare of other living things'(Cluster 4).

Hence those in Cluster 3 expressed their views against biotechnology without making reference to religious beliefs such as 'God made people responsible for the welfare of other living things'. They appear to take a more moral and emotional stand, feeling that certain things are 'wrong'.

Cluster 3: Information
Those in Cluster 3 were less likely than those in Cluster 4 to believe statements made by university scientists, less likely to disagree than Cluster 1 that they believe statements by politicians, and were more likely to disagree that they believe statements by biotech companies. In other words they were less trusting of sources of information about biotech than Cluster 4.

Cluster 3: Who benefits from biotechnology?
Cluster 3 was more likely than Clusters 2 and 4 to agree that corporations would benefit from biotechnology and less likely than Cluster 4 to agree that the NZ public would benefit. Cluster 3 members were neutral about biotechnology benefiting the NZ economy (less than Cluster 2), and disagree most that 'biotechnology will improve the quality of life for all New Zealanders' (compared with Cluster 4). This positions this cluster as the most cynical about who would benefit from biotechnology (significantly different from Cluster 4).

Cluster 3: Concerns about biotechnology
This section served to further explain how Cluster 3 is distinct from Clusters 2 and 4. Members of Cluster 3 were more likely to agree than Cluster 4 that 'the use of GM plants will result in the cross-contamination of non-GM seeds', Clusters 2 and 4 that 'people will not always comply with rules or regulations governing the development and release of genetically modified organisms (GMOs)', and Cluster 2 that 'the commercialisation of biotechnology will result in more risk to the public or the environment', and that 'biotechnology may solve a problem but it can also create more problems'. They were most likely to agree that 'GMOs will spread into places we do not want them' and this view is significantly different from that of those in Clusters 2 and 4.

Comparing the average across all concerns showed that those in Cluster 3 were significantly different from those in Cluster 2.

Cluster 3: Overall attitude to biotechnology
Overall Cluster 3 is significantly different to Cluster 4, but it is also often different on individual items from Cluster 2. Its members were least likely to find biotechnology acceptable (statistically significant when compared with Cluster 2), most likely to disagree that any unexpected outcomes can be controlled (statistically different when compared with Clusters 2 and 4), and most likely to agree that irreversible harmful outcomes could result from the use of biotechnology (statistically different when compared with Clusters 2 and 4). Hence they were less supportive of biotechnology overall than those in Cluster 4.

Cluster 3: Buying the products of biotechnology
Those in Cluster 3 would be less likely than those in Cluster 4 to purchase 'butter from cows genetically modified to produce 50% less cholesterol in their milk', 'meat from sheep genetically modified for 'double-muscling' producing more meat and less fat per animal'(and also Cluster 2), 'bread made from GM wheat that is 25% cheaper to grow', GM apples that produce twice as much antioxidants which may help prevent cancer, and milk from cows that are grown on pastures containing genetically modified clover.

Cluster 3: Overall comments
Cluster 3 contrasts most strongly with Cluster 4. Its members were very negative about biotechnology. They did see it as producing environmental problems and felt that it was very high risk. They were altogether sceptical about the benefits biotechnology could bring and what people and organisations say to support it.

3.5.5 Attitudes of Cluster 4 to biotechnology

Cluster 4: Biotechnology items
Cluster 4 was more likely than all the other groups to support the use of a GM virus to reduce the fertility in possums, and was also more likely than Clusters 1 and 3 to support the aerial use of Bt spray. Those in Cluster 4 were more likely than those in Cluster 3 to find the genetic modification of cows, and the use of copies of pancreatic cells from pigs for diabetics acceptable. They were most likely to find the nanotech sunscreen more acceptable than Clusters 1 and 3. They found the genetic modification of pine trees, kumara and apples more acceptable than those in Clusters 1 and 3, and the GM potatoes more acceptable than those in Cluster 3. When the environmental and agricultural examples are averaged Cluster 4 was significantly different from Clusters 1 and 3. (The clusters do not differ significantly for the medical examples.)

Cluster 4: DDE example
Cluster 4 members were more familiar with this biotechnology than the other clusters and less likely to disagree about being 'confident that any unexpected outcomes from this biotechnology can be controlled' than those in Clusters 1 and 3. They were more likely to disagree about feeling dread than those in Cluster 3. On average they had a less negative attitude to this biotechnology than did those in Cluster 3.

Cluster 4: Lozenge example
This example mainly differentiates the views of those in Cluster 4 from those in Cluster 5. It was more acceptable to those in Cluster 5 and they were less likely to feel dread at its use, or to feel that its use is unethical. Cluster 4 members were less likely to disagree about being 'confident that any unexpected outcomes from this biotechnology can be controlled' than those in Clusters 1 and 3.

Cluster 4: Sheep example
Those in Cluster 4 were more likely to be familiar with this biotechnology than any other cluster. When considered overall by contrasting the mean responses of all the statements about this biotechnology, Cluster 4 differs very significantly from Clusters 1, 3 and 5 being more positive than the others. However, all clusters were not positive about this biotechnology overall.

Cluster 4: Potato example
Cluster 4 members were significantly more positive in their responses than Cluster 3 on five out of the seven statements on this biotechnology, and for four out of the seven compared to

Cluster 1. They were also more positive than Cluster 5 on two of the statements. They were less likely than Clusters 1 and 3 to disagree about its acceptability and the likelihood of controlling any unexpected outcomes (along with Cluster 5), and less likely to agree to feeling dread. They were less likely than those in Clusters 3 and 5 to fear that it is irreversible. They were the least likely to agree that it is unnatural (significant when compared with Cluster 3) and more likely than those in Cluster 1 to be familiar with this use of biotechnology. When considered overall using the means from the responses to the items in this section, Cluster 4 is significantly less negative than Clusters 1 and 3.

Cluster 4: Stem cells example
Those in Cluster 4 had significantly less extreme feelings about this biotechnology than those in Cluster 3 for four of the statements – acceptability, the likelihood of controlling any unexpected outcomes, fear that is irreversible and feelings that it is unnatural. They were less likely to disagree about the likelihood of controlling any unexpected outcomes (compared to Clusters 1 and 3), less likely than those in Cluster 3 to agree that they fear irreversible harmful outcomes and that it is unnatural.

When the overall average of the responses to these statements is considered Cluster 4 is significantly more agreeable than Cluster 3 for this scenario.

Cluster 4: Views on biotechnology
The views of Cluster 4 on biotechnology served to discriminate its members from all other clusters. They agreed more strongly than those in Cluster 1 that GM animals and plants have a right to live and reproduce, that 'biotechnology simply harnesses and uses natural processes', that 'the genetic makeup of humans and other animals is very similar, that 'we are made in the image of God and shouldn't destroy this', and that 'God made people responsible for the welfare of other living things'. They felt more strongly than those in Cluster 2 that 'the genetic makeup of humans and other animals is very similar, and that 'God made people responsible for the welfare of other living things'. They felt more strongly than those in Cluster 3 that 'biotechnology simply harnesses and uses natural processes', that 'we are made in the image of God and shouldn't destroy this', and that 'God made people responsible for the welfare of other living things'. On the other hand, those in Cluster 4 felt less strongly than those in Cluster 3 that 'it feels wrong to mix genetic material from plants and animals', 'it was wrong to lift the moratorium on field trials of genetically modified plants', and 'it is worrying that the food we eat might have been produced using genetic modification'. They felt more strongly than those in Cluster 5 that 'biotechnology simply harnesses and uses natural processes', 'we are made in the image of God and shouldn't destroy this', and 'God made people responsible for the welfare of other living things'.

Hence those in Cluster 4 expressed their views about biotechnology differently from all the other clusters by making reference to religious beliefs such as 'God made people responsible for the welfare of other living things' and 'we are made in the image of God and shouldn't destroy this'.

Cluster 4: Information
Those in Cluster 4 were more likely than those in all other clusters to believe statements about biotechnology whoever is making them. They were significantly more likely than those in Cluster 5 to believe statements made by regulatory agencies, than those in Clusters 1, 2 and 3 to believe university scientists, than those in Clusters 1, 3 and 5 to believe media reports, than Clusters 1, 2 and 3 to believe CRIs, than Clusters 1 and 5 to believe statements by politicians, and than Clusters 1, 3 and 5 to believe statements by biotech companies.

Cluster 4: Who benefits from biotechnology?
Cluster 4 was significantly more likely than Cluster 3 to agree on all the statements about who would benefit from biotechnology. Similarly, they were more likely to agree on all statements compared with Cluster 1 and 5 except for biotechnology benefiting the New Zealand economy, and for Cluster 5 on improving the quality of life. This positions this cluster as the most positive about who would benefit from biotechnology (significantly different from all other clusters).

Cluster 4: Concerns about biotechnology
This section further explained how Cluster 4 is distinct from Clusters 1, 3 and 5. Members of Cluster 4 were less likely to agree than Clusters 1, 3 and 4 that 'the use of GM plants will result in the cross-contamination of non-GM seeds', and that 'people will not always comply with rules or regulations governing the development and release of genetically modified organisms, (GMOs), than Clusters 3 and 5 that 'GMOs will spread into places we do not want them', and than Clusters 1 and 3 that 'biotechnology may solve a problem but it can also create more problems'.

Comparing the average across all concerns showed that those in Cluster 4 saw significantly less risks in the use of biotechnology compared with Clusters 3 and 5.

Cluster 4: Overall attitude to biotechnology
Overall Cluster 4 is significantly different to Cluster 3. Its members were less likely to disagree that unexpected outcomes can be controlled (statistically different when compared with Clusters 3 and 5) and less likely to agree that irreversible harmful outcomes could result from the use of biotechnology (statistically different when compared with Cluster 3). Hence they were more supportive of biotechnology overall than those in Cluster 3.

Cluster 4: Buying the products of biotechnology
Those in Cluster 4 would be more likely than those in Cluster 3 to purchase 'butter from cows genetically modified to produce 50% less cholesterol in their milk', and milk from cows that are grown on pastures containing genetically modified clover, and more likely than those in Clusters 1, 3 and 5 to purchase 'meat from sheep genetically modified for 'double-muscling' producing more meat and less fat per animal', and 'bread made from GM wheat that is 25% cheaper to grow'. Overall, they are more likely than those in Cluster 3 to purchase these products.

Cluster 4: Overall comments
Cluster 4 contrasts most strongly with Cluster 3. Its members were positive about biotechnology. They saw biotechnology as being able to fix any environmental problems it may produce and do not see it as such a high risk. They were more positive about the benefits biotechnology could bring and what people and organisations say to support it.

3.5.6 Attitudes of Cluster 5 to biotechnology

Cluster 5: Biotechnology items
Cluster 5 differentiates from Cluster 3 in the acceptability of many biotechnology items listed in the survey. To repeat what has already been said about these differences, but centring it on Cluster 5, those in Cluster 5 were more likely than those in Cluster 3 to find acceptable: 'producing a low pollution grain-based fuel for cars by genetically modifying a crop', 'developing a GM virus that reduces fertility in possums', the use of Bt spray, the use of copies of pancreatic cells from pigs for diabetics, and the nanotech sunscreen (and those in Cluster 1). They found the cloning of a kakapo to ensure survival of the species more

acceptable than those in Cluster 1 and 'developing a GM virus that reduces fertility in possums' much less acceptable than those in Cluster 4. They found the genetic modification of potatoes and pine trees less acceptable than those in Cluster 4.

When the environmental examples are averaged Cluster 5 is significantly more accepting than Cluster 3.

Cluster 5: DDE example
Cluster 5 were more likely to find this biotechnology acceptable than those in Clusters 1 and 3. They were less familiar with this biotechnology than those in Cluster 4 and agree to feeling less dread and less unnaturalness about the use of this biotechnology than those in Cluster 3.

Cluster 5: Lozenge
This example mainly differentiates the views of those in Cluster 5 from those in Clusters 1 and 3. This biotechnology was more acceptable to those in Cluster 5 than those in Clusters 1 and 4. Those in Cluster 5 were less likely to feel dread at its use than those in Clusters 1, 3 and 5, to feel that its use is unethical than those in Clusters 1 and 4, and that is use is unnatural than those in Clusters 2 and 3. They were more confident than those in Clusters 1 and 3 that 'any unexpected outcomes from this biotechnology can be controlled'.

Overall those in Cluster 5 were more positive about this biotechnology than those in Clusters 1, 2 and 3.

Cluster 5: Sheep example
Those in Cluster 5 were less likely than those in Clusters 2 and 3 to feel dread at the thought of the use of this biotechnology. When considered overall by contrasting the mean responses of all the statements about this biotechnology, Cluster 5 differs significantly from Clusters 4 being less positive.

Cluster 5: Potato example
Cluster 5 members were more likely to find this biotechnology acceptable than those in Cluster 1. They were less confident than those in Clusters 2 and 4 that any unexpected outcomes can be controlled and less fearful that Cluster 3 but more fearful than Cluster 4 that it will result in irreversible outcomes.

When considered overall using the means from the responses to the items in this section, Cluster 5 is significantly less negative than Clusters 1 and 3.

Cluster 5: Stem cells example
Those in Cluster 5 found this biotechnology more acceptable than those in Cluster 3. They were more familiar with it than those in Clusters 1, 2 and 3, and were more confident about the likelihood of controlling any unexpected outcomes than those in Cluster 3.

When the overall average of the responses to these statements is considered Cluster 5 is significantly more favourable to this biotechnology than Cluster 3.

Cluster 5: Views on biotechnology
The views of Cluster 5 on biotechnology mainly served to discriminate its members from Cluster 4. When compared with those in Cluster 4 they disagreed more that
'biotechnology simply harnesses and uses natural processes', and they agreed less that 'we are made in the image of God and shouldn't destroy this', and that 'God made people

responsible for the welfare of other living things'. They agreed more than those in Clusters 1 and 3 that 'biotechnology can improve on the imperfections of nature', and less than Cluster 3 that 'it is worrying that the food we eat might have been produced using genetic modification'.

Hence those in Cluster 5 are more pro-biotechnology than Clusters 1 and 3 but do not wish to make reference to God in the way that those in Cluster 4 do.

Cluster 5: Information
Those in Cluster 5 are different in different ways from those in Clusters 1 and 4, and share some differences with both Clusters 2 and 4. They were less likely than those in Cluster 4 to believe regulatory agencies, and media reports but more likely than Cluster 1 to believe university scientists, and crown research institutes. They were less likely than Clusters 2 and 4 to believe politicians and biotech companies. They were less likely than those in Cluster 3 to believe politicians. Overall they were significantly less trusting than Cluster 4.

Cluster 5: Who benefits from biotechnology?
Cluster 5 was more likely than Clusters 2 and 4 to think that biotechnology will benefit private corporations. They were less likely than Cluster 4 to think that biotechnology will benefit the NZ public or 'myself or my immediate family'. This difference with Cluster 4 was significant overall.

Cluster 5: Concerns about biotechnology
This section explained further how Cluster 5 is distinct from Clusters 2 and 4. Members of Cluster 5 were more likely to agree than Clusters 2 and 4 that 'GMOs will spread into places we do not want them', and that 'people will not always comply with rules or regulations governing the development and release of genetically modified organisms (GMOs)'. They also agreed more than Cluster 4 that 'the use of GM plants will result in the cross-contamination of non-GM seeds', and more than Cluster 2 that 'biotechnology may solve a problem but it can also create more problems'.

Comparing the average across all concerns showed that those in Cluster 5 saw significantly more risks in the use of biotechnology compared with Clusters 2 and 4.

Cluster 5: Overall attitude to biotechnology
Those in Cluster 5 were more likely to find biotechnology acceptable than those in Cluster 3, and less likely to be fearful about irreversible harmful outcomes, and that the use of biotechnology is unnatural. However, they were less confident than those in Cluster 4 that unexpected outcomes can be controlled. Hence they were more supportive of biotechnology overall than those in Cluster 3 but exercising some scepticism compared with Cluster 4.

Cluster 5: Buying the products of biotechnology
Cluster 5 had no significant differences with Clusters 1, 2 and 3 and only two with Cluster 4 on whether they would purchase these GM products. Those in Cluster 5 would be less likely than those in Cluster 4 to purchase 'meat from sheep genetically modified for 'double-muscling' producing more meat and less fat per animal', and 'bread made from GM wheat that is 25% cheaper to grow'.

Cluster 5: Overall comments
Cluster 5 contrasts most strongly with Cluster 4 in terms of being less supportive of biotechnology but its members are more likely than those in Cluster 3 to be accepting of biotechnology products and they are less fearful.

3.6 Comparing these results with our predictions

In this section we see how well our earlier predictions of the different attitudes to biotechnology of the clusters stand up against the actual data.

In the tables that follow a notation was developed in order to present a simple picture of the order of the clusters in relation to their scores on the statements in the questionnaire, and to give a sense of which differences were statistically significant at the 5 per cent level or more. (The full results may be referred to in the tables in Appendix 1.) The notation starts with the cluster with the lowest score and ends with the highest. The dash signifies a significant difference between the clusters – the clusters on the right hand being significantly higher (5 per cent level) in their rating than those on the left. For example, '3 – 2,5' indicates that Clusters 2 and 5 found this example significantly more acceptable than did Cluster 3 (but that Clusters 2 and 5 are not significantly different). The brackets enclosing a cluster number imply that this cluster is not significantly more or less than the one next to it across the dash. For example, '3 (1) – 2,5 – 4' signifies that Cluster 1 is not significantly less than Cluster 2, but is significantly less than Cluster 4, and that Cluster 3 is significantly less than Clusters 2 and 5. Clusters 1, 2, 3 and 5 are significantly less than Cluster 4.

3.6.1 Comparing these results with our predictions: acceptability of biotech items

In the comparison between the clusters of the acceptability of different examples of environmental uses of biotechnology Cluster 4 was generally the most accepting of the named biotechnologies and Cluster 3 was the least accepting with Clusters 1, 2 and 5 spread between these two extremes (see Table 5). This does not mean that they found any of these biotechnologies very acceptable, mostly hovering about the neutral value of 3 (see Table A6 in Appendix 1). However, for the example of using a GM grain for fuel for cars, Cluster 4 did not feature, suggesting that for this cluster there were mixed feelings about the use of GM compared with those in Cluster 3 for whom it is a problem and those in Clusters 2 and 5 for whom it is not such a problem. Cloning a kakapo was found more acceptable to those in Cluster 5 than those in Cluster 1. There were no differences between the clusters about the use of a GM bacteria to clean up toxins in soil but later when this example was explored in more detail and DDE contamination was named as the toxin, there were significant differences between Clusters 1 and 3 and Cluster 5, the latter finding it more acceptable. (An explanation for this is given with the discussion that follows of that example.)

Hence the divergence between Clusters 3 and 5 is as predicted. Clusters 2 and 5 were often different from Cluster 3 but it was not expected that Cluster 2 would align itself with Cluster 5 rather than Cluster 4. This could be because their attitudes to nature do not different significantly (see Table A19 in Appendix 1).

Table 5: Acceptability of biotechnology items

Statement	Comparisons between clusters
Environmental uses	
Use of genetically modified bacteria to help clean unwanted toxins in soil	
Producing a low pollution grain-based fuel for cars by genetically modifying a crop	3 – 2,5
Developing a virus (genetically modified) that reduces fertility in possums	3 (1) – 2,5 – 4
Use of aerial prays made from soil bacterium (Bt) to control unwanted insect pests in urban areas	3 (1) – (2) – (5) 4
Cloning a kakapo to ensure the survival of the species	1 – 5
Average	3 (1) – 2,5 – 4
Medical uses	
Using bacteria in throat lozenges to prevent serious infections	
Inserting human genes into a cow to produce milk for the treatment of multiple sclerosis	3 – 2,4
Preventing stomach cancer by modifying a person's genetic code	3 – 4
Removing, repairing and then reinserting brain stem cells to help a sufferer of Huntingdon's disease	
Using new cells (stem cells) from a 5 day old human embryo to treat an Alzheimer sufferer	3 – 4
Transplanting copies of pancreatic cells from pigs into a person to help treat diabetes	3 – 2,4,5
Using DNA (gene) testing to help convict criminals	
Using a microscopic device to carry chemotherapy drugs through the blood-brain barrier to treat a brain tumour	
Using a miniature biosensor implanted into a human body to monitor blood sugar levels in diabetics	
Manipulating the molecular structure of sunscreen so that it penetrates the skin to provide greater protection against UV radiation	1 (3) – (2) 4,5
Average	3 - 4
Agricultural uses	
Using genetic screening to breed sheep that produce twins or triplets	1 - 2
Raising hormone levels in farm animals to increase fertility	
Genetically modifying potatoes to resist common pests or diseases	1,3,5 – 2,4
Genetically modifying pine trees to produce stronger timber	1,3,5 – 2,4
Genetically modifying kumara to resist common pests or diseases	3 – 2
Inserting a plastic device containing bacteria into a sheep's stomach to reduce the production of harmful greenhouse gases	1,3 – 4
Genetically modifying an apple to make it more nutritious	1,3 – 4
Average	1,3 – 2,4

For the medical uses of biotechnology Cluster 3 found some of these biotechnologies less acceptable than Cluster 4, and sometimes Clusters 2 and 5 as well, reflecting Cluster 3's concern about biotech in general compares with the more positive approach of those in the other clusters. Cluster 1 remains in the middle except for the example discussed below. For most of the biotechnologies there was no significant differences between the clusters and for some the actual scores again hovered around neutral (GM cow producing milk for MS treatment, stem cells to treat Alzheimer's disease). Some were more generally acceptable (DNA tests to catch criminals, nanotech to treat brain tumours and nanotech to monitor blood

sugar levels in diabetics), while the rest were in between. These latter ones showed no differences between the clusters, perhaps reflecting the lack of controversy around them, with their being seen as good uses of biotechnology to help people with no added implications.

The differences in the responses appear to come with the biotechnologies that are seen as more invasive – involving the introduction into humans of cells from other sources – the GM cows to treat MS, the stem cells from embryos and the copies of pancreatic cells from pigs. Cluster 4 find the use of stem cells more acceptable than those in Cluster 3, perhaps reflecting the older age group of Cluster 4 and therefore their greater interest in a degenerative ailment such as Alzheimer's Disease (and Cluster 3's dislike of a lot of biotechnology). When this example is used later with a fuller description, Clusters 2 and 5 joined with Cluster 4 in finding this biotechnology more acceptable than Cluster 3, perhaps because it gives a fuller description of the benefit to the Alzheimer's sufferer than was evident in this section.

It is interesting that the responses to the two nanotech examples above contrast with the response to the nanotech sunscreen where Clusters 1 and 3 found this less acceptable than Clusters 4 and 5 with Cluster 2 in the middle. Perhaps Clusters 1 and 3 were more aware of the possible invasive nature of such nanotech technology and this result is a reflection of their differences from Clusters 4 and 5 rather than their alignment with each other.

The throat lozenge containing bacteria example showed no significant differences between clusters but when the description of these lozenges was fuller when it is used as an example later in the questionnaire (when the bacteria used in the lozenge is described as derived from saliva), there were differences between Clusters 1 and 4 and Cluster 5, with the latter finding it more acceptable. The explanation for this is given when this biotechnology example is described later.

For the agricultural uses of biotechnology Cluster 3 was most often aligned with Cluster 1 (sheep and apples) and sometimes as well with Cluster 5 (GM potatoes, GM pine trees) as finding certain biotechnologies least acceptable. They were aligned against Cluster 2 and/or Cluster 4. Clusters 2 and 4 might see these biotechnologies as useful and practical (increasing the fertility of sheep, GM pine trees and apples) compared with other concerns that those in Clusters 1 and 3 might have about other issues that override their pragmatism. For example, they may see environmental issues as closely associated with agriculture. They both hold less romantic notions about nature and see the environment as needing more protection than those in Clusters 2 and 4.

3.6.2 Comparing these results with our predictions: buying the products of biotechnology

Though this section was the last in Section A of the questionnaire we have placed these results here because the 'intention to purchase a biotechnology product' relates closely to the examples of biotechnology just discussed. Again the contrast of Clusters 3 and 4 is the most dominant as predicted and this is across all products except the corn (see Table 6). Cluster 2 joins Cluster 4 for three of the products and Cluster 5 joins Cluster 3 for two. Cluster 2 does not align so strongly with Cluster 4 when there are dairy products involved. Cluster 5's alignment with Cluster 3 is harder to interpret but it is interesting to note that it does not align with Cluster 3 where a medical reason is given for the use of biotechnology in this food source. This may indicate that Cluster 3 is more against all GM biotechnology whereas those in Cluster 5 discriminate, depending on its purpose.

Table 6: Buying the products of biotechnology

Statement	Comparisons between clusters
Butter from cows genetically modified to produce 50% less cholesterol in their milk	3 – 4
Meat from sheep genetically modified for 'double-muscling', producing more meat and less fat per animal	3,5 – (2) 4
Bread made from genetically modified wheat that is 25% cheaper to grow	3,5 – (2) 4
Apples genetically modified to produce twice as much antioxidants, which may help to prevent cancer [a]	3 – 2,4
Milk from cows that are grown on pastures containing genetically modified clover	3 – 4
Sweetcorn that has been genetically modified to resist insects so that it requires 50% less than the usual application of pesticides [a]	
Average	3 – 4

3.6.3 Comparing these results with our predictions: specific examples of biotechnology

The throat lozenge example seems to produce different results from the other examples as it is only for this example that Cluster 5 differentiates itself most frequently from all the other clusters (see Table 7). In particular those in Cluster 5 disagree more with the statements associated with negative feelings or emotions than those in the other clusters. For instance, they feel less dread, they think that the example is less unnatural and less unethical. Is it that they are less affected than those in other groups about the association of this lozenge with bacteria taken from saliva? Thus those in Cluster 5 may be reflecting their higher level of university education than any other group, their less romantic notions about nature, and that fewer of them subscribe to any religious beliefs. When placed alongside the results so far it appears that Cluster 5 is the most pragmatic of the groups even though they were not the highest of the clusters as far as the 'valuing something if it is useful' attribute of national identity.

This throat lozenge example is mainly omitted from further discussion in this section because of the distinctive features discussed above.

Table 7: Comparison across clusters for five biotechnology examples

Statement	Example					
	Repairing DDE contamination with GM bacterium	Throat lozenge made from bacteria in saliva	Bacteria in sheep's stomach to reduce of greenhouse gases	GM of potato by synthetic toad gene to increase resistance to disease	Embryo stem cells inserted into brain to treat Alzheimer's disease	Overall
The use of this biotechnology is acceptable to me	1,3 - 5	1,4 - 5		1,3 – (5) 2,4	3 – 2,4,5	1,3 – 2,4,5
I am familiar with this use of biotechnology	1,2,3,5 - 4		1,2,3 - 4	1 - 4	2 (1,3) – 4,5	1,3 – 4
I feel dread at the thought of this use of biotechnology	2 (4,5) – 1,3	5 – 1,3,4	5 – 2,3	4 (2) – 1,3	1 – 3	4,5 – 3
I am confident that any unexpected outcomes from this biotechnology can be controlled	1,3 – 4,2	1,3 – 4,5		1,3,5 – 2,4	3 (1) – 2,4,5	1,3 - 2,4,5
I fear that use of this biotechnology will result in irreversible harmful outcomes [a]				4 – (1,2) 5 - 3	1,2,4 – 3	2,4 – 3
I feel that the use of this biotechnology would be unethical		5 – 1,4		2 – 3		
I feel that the use of this biotechnology would be unnatural	5 – 3	5 – 2,3		4 – 3	1,4 – 3	4,5 - 3
Overall (reversing order for 'negative' statements)	3 – 2,4	1,2,3 –5	3, 1 (5) – 2,4	1,3 – (2) 4,5	3 – 1,2,4,5	

Cluster 3 finds three of the five examples less acceptable than Cluster 5 (the sheep example is not acceptable to anyone), and Cluster 1 also finds three of the five examples less acceptable than Cluster 5. Clusters 2, 4 and 5 are aligned against Clusters 3 and/or 1 for two examples. Thus as expected there is the contrast between Cluster 3 and Clusters 2 and 4 but this only happens for two of the examples, and the alignment of Cluster 1 with 3 as has happened earlier also occurred for two examples. Cluster 5's membership of the group of clusters that found four out of five of the biotechnologies more acceptable resembles what has already been described in some of the environmental and medical biotechnologies used as examples earlier in the questionnaire.

Cluster 4 is most often significantly more familiar with these examples of biotechnology than others. This may have some simple explanation such as these people having more time to read about these things because they are older.

The issue of feeling dread about these biotechnology examples is an interesting one. Cluster 3 was always associated with those who feel more dread but the clusters aligned with it differed across the examples. It was aligned with Cluster 1 for the DDE and potato examples but differs from Cluster 1 in the stem cells example, illustrating that those in Cluster 3 are more likely to feel dread whatever the biotechnology involved – environmental, medical or agricultural – and Cluster 1 feels more dread about GM than some of the other biotechnologies. Cluster 2 aligns with Cluster 3 for the sheep example, which is interesting because along with Cluster 3 they place the least value on sheep and agriculture as part of NZ identity, so perhaps this is the factor operating here. This may seem contradictory but perhaps it means that they place sheep alongside other non-farming animals rather than as part of agricultural production and would not like to see them treated like this whereas other clusters just see this treatment as part and parcel of what happens on a farm. (Maybe, like some in the focus groups, they do not think that sheep should be 'blamed' and become the victims of global warming) But Cluster 2 then aligns itself with those feeling least dread in the DDE and GM potato examples, perhaps indicating its general support for technological solutions to problems (along with Clusters 4 and 5). Also, the clusters that feel the least dread change across the examples – perhaps the pragmatism of Cluster 5 showing up in the DDE and sheep examples, and Clusters 4's lack of concern about GM showing in the DDE and GM potato examples.

In terms of confidence about controlling any unexpected outcomes of the biotechnology example, Clusters 1 and 3 are most often less confident than Clusters 2 and 4 – Cluster 4 perhaps demonstrating its overall more positive attitude to most things whatever they are (New Zealand identity, technology or biotechnology as examples) while Cluster 2 members have a more resilient view of nature (see Table A19 in Appendix 1) and agree with those in Clusters 4 and 5 in seeing technological solutions as helping solve problems (Tables A19 and A21 in Appendix). Cluster 5 swaps sides dependent on the example – aligning itself with Clusters 1 and 3 in its greater concern about controlling the GM potato and with Clusters 2 and 4 in the stem cell example and 4 in the lozenge example with less concern. This may indicate some concern about unexpected consequences of GM in food by those in Cluster 5 that surfaced in some of both the agricultural examples and in buying the products of biotechnology sections.

Concerns about irreversible harmful outcomes of the biotechnology example only resulted in differences between the clusters for the GM potato and stem cells examples in which Cluster 3 was significantly more concerned than those in all other clusters for the GM potato example and than all other clusters except 5 in the stem cell example. This was as expected and predicted.

Those in Cluster 3 find the GM potato example more unethical than those in Cluster 2 reflecting their concern about the negative impacts of human interference in nature (Table A19 in Appendix 1).

Similarly Cluster 3 was more likely to agree that the use of the biotechnology example was unnatural but which cluster it was different from differed over the examples – Cluster 5 finding the DDE example less unnatural, Cluster 4 finding the GM potato less unnatural and Clusters 1 and 4 finding the stem cell example less unnatural. It is interesting that these results differ from those about feeling dread except of course for Cluster 3. This indicates that feeling dread was probably an emotional response whereas this result about what is thought of as unnatural reflects opinions about nature (Table A19 in Appendix 1).

Overall the alignment of Clusters 2 and 4 against Cluster 3 is apparent. Cluster 1 joined Cluster 3 in the sheep and GM potato examples and was against Cluster 3 in the stem cell example. Cluster 5 varies also, being aligned with Cluster 3 in the sheep example, or joining Clusters 2 and 4 in the GM potato and stem cells examples. The possible reasons for these results have been outlined throughout this section.

3.6.4 Comparing these results with our predictions: overall attitude to biotechnology

When these results are compared with those for the questions to do with an overall attitude to biotechnology the same patterns are apparent (see Table 8). It is worth noting that there were no differences between the clusters in their overall assessment of biotechnology as far as familiarity, dread and its ethical nature.

Table 8: Overall attitude to biotechnology

Statement	Comparisons between clusters
Biotechnology is acceptable to me	3 – 2,5
I am familiar with biotechnology	
I feel dread at the thought of Biotechnology	
I am confident that any unexpected outcomes from biotechnology can be controlled	3 (1,5) – 2,4
I fear that use of biotechnology will result in irreversible harmful outcomes	1,2,4,5 – 3
I feel that the use of biotechnology would be unethical	
I feel that the use of biotechnology would be unnatural	5 – 3
Average (after inverting the negative statements)	3 – 2,4

Cluster 3 fears the irreversible outcomes of biotechnology more than any other cluster. Cluster 4 does not feature as different from any other cluster in terms of finding biotechnology acceptable overall perhaps indicating the mix of opinions found within this group and that their attitudes only become distinctive when specific examples are used. Clusters 2, 3 and 5 were more prepared to make a general statement. The confidence of Clusters 2 and 4 that technology can solve problems is reflected in the response here. The pragmatism of Cluster 5 is also compared with Cluster 3 in feeling that biotechnology use would be unnatural.

Further reasons for some of these answers may become more apparent in the next section which looks at the differing views of the clusters on biotechnology.

3.6.5 Comparing these results with our predictions: views on biotechnology

This interesting mix of statements shown in Table 9 develops the explanations for the differences between the clusters further. Cluster 5's higher agreement than Clusters 1 and 3 with the statement 'biotechnology can improve on the imperfections of nature' demonstrates the more positive attitudes of Cluster 5 towards biotechnology. Cluster 4 demonstrates neutral feelings about 'animals and plants that have been genetically modified have a right to live and reproduce' compared with Cluster 1's disagreement, perhaps demonstrating as part of a Christian belief that once living, things have a right to life. Cluster 4 demonstrates greater support for the argument that 'biotechnology simply harnesses and uses natural processes' as a justification for biotechnology compared with Clusters 1, 3 and 5, though all are still mainly in disagreement with it. Clusters 3 and 4 are more likely to agree that 'the genetic makeup of humans and other animals is very similar' compared with the neutrality of Clusters 1 and 2, perhaps illustrating the greater familiarity with and knowledge about biotechnology demonstrated by these two clusters. Cluster 4 shows greater agreement with statements about God relating to their religious beliefs than all other clusters. Cluster 3 is more likely than Cluster 2 to agree that 'when we try to play God we make mistakes' (which is not a statement associated with a belief in Christianity), and Cluster 3 is more likely than Clusters 2 and 4 to agree that 'it feels wrong to mix genetic material' which helps to explain why Cluster 3 is averse to GM technologies. Hence, Cluster 3 was also more likely than Clusters 2 and 4 to think that 'it was wrong to lift the moratorium on field trials of genetically modified plants' and than Clusters 2, 4 and 5 that 'it is worrying that the food we eat might have been produced using genetic modification'. These responses demonstrate that not only is Cluster 3 more negative about biotechnology than other clusters, its members feel particularly strongly about genetic modification. A seemingly surprising result is how Cluster 2 agrees less strongly than all the other clusters that 'the use of biotechnology needs to be transparent, so that we all know about what is being developed', perhaps reflecting the disagreement of its members with the view that the 'world needs a more equal distribution of wealth' and the their higher level of agreement of whom biotechnology would benefit (see later – Table A15 in Appendix 1). Perhaps Cluster 2 sees less need for justification of the use of biotechnology and feels less responsibility for others (see Table A21 in Appendix).

As predicted, Cluster 4 did present more positive attitudes about biotechnology and was more accepting of the two 'God'/theological statements than the other clusters. Cluster 3 was more distrusting of biotechnology and more likely to worry about anything to do with GM. As surmised, Cluster 2 was different from all the rest in seeing the need for transparency in the use of biotechnology, and was less likely to worry or see anything wrong in the use of GM.

Table 9: Views on biotechnology

Statement	Comparisons between clusters
Biotechnology can improve on the imperfections of nature	1,3 – 5
Biotechnology can fix environmental problems that have been caused by humans	
Animals and plants that have been genetically modified have a right to live and reproduce [a]	1 – 4
Genetic modification is a major step because nature hasn't done anything like this before [a]	
Biotechnology simply harnesses and uses natural processes	1,3,5 – 4
Part of natural evolution is that people will start to play with genes [a]	
The genetic makeup of humans and other animals is very similar	1 (2) – 4, 3
We are made in the image of God and shouldn't destroy this	1,2,3,5 – 4
When we try to play God we make mistakes [a]	2 – 3
God made people responsible for the welfare of other living things	1,2,3,5 – 4
It feels wrong to mix genetic material from plants and animals	2,4 – 3
It was wrong to lift the moratorium on field trials of genetically modified plants	2,4 – 3
It is worrying that the food we eat might have been produced using genetic modification	2,4,5 – 3
The use of biotechnology needs to be transparent, so that we all know about what is being developed	2 – 1,3,4,5

Clusters 1 and 5 were expected to be more in the middle as far as their attitudes to biotechnology went. In a way this prediction was partly true. Clusters 1 and 5 do not feature as different from other clusters in three of the statements (see Table 9) but as for most of the results in this section the clusters divide into two groups, Clusters 1 and 5 almost always align with the largest grouping and hence are in the majority. However, Cluster 1 joins with Cluster 3 against Cluster 5 in being less accepting that 'biotechnology can improve on the imperfections of nature'. The only statement that can explain this is the difference in response of these two clusters to the statement 'the environment probably doesn't need as much protection as we imagine', which Cluster 5 found less disagreeable than Cluster 1. Cluster 1 also differs from Cluster 4 in being less agreeable that GM plants and animals have a right to live and reproduce, perhaps, as stated above, indicating a difference in religious beliefs.

3.6.6 Comparing these results with our predictions: Information about biotechnology

Cluster 5 was the least trusting of regulatory agencies while Cluster 4 was the most trusting (see Table 10). University scientists were the most trusted by everyone but Clusters 4 and 5 were the most trusting while Clusters 1 and 3 were the least. While the trustworthiness of politicians about biotech was less than that of biotech companies, Clusters 2 and 4 were more trusting of these sources than Clusters 1 and 5, while Cluster 3 surprisingly changes sides. It was expected that Cluster 4 would be the most trusting of these sources of information about biotechnology and this is born out by the results. However, Cluster 3 had others even less trusting of politicians, though otherwise it is always on the least trusting side as expected. It is interesting that Cluster 5 joins Cluster 4 in its greater trust of university scientists and CRIs, probably reflecting Cluster 5's high level of education (see Table A31 in Appendix 1) but apart from this it is in the least trusting group. Cluster 1 is the least trusting overall and this is also unexpected. Those in Cluster 1 place the least value on winning and usefulness and perhaps this leads them to treat claims made by others about their products and research

as being the best and the most useful etc. with the greatest scepticism. Cluster 2 usually is grouped with the most trusting except for university scientists and CRIs perhaps reflecting that they have the largest number of people with trade certificates or diplomas and correspondingly less with a university education.

Table 10: Information about biotechnology

Statement	Comparisons between clusters	Mean score
I usually believe statements by regulatory agencies [a]	5 – 4	2.9
I usually believe statements by university scientists	1,3 – (2) – 5,4	3.3
I usually believe reports in the newspapers and on the radio or TV	1 (3,5) – 2,4	2.5
I usually believe statements made by crown research institutes	1 (2,3) – 5,4	3.2
I usually believe statements by politicians	1,5 – 2,3,4	1.9
I usually believe statements by biotech companies	1,3,5 – 2,4	2.3
Average	1 (3,5) – 2 – 4	2.7

When comparing these results with our predictions it is seen that Cluster 4 is the most trusting, but we did not predict that Cluster 1 would be the least trusting. Cluster 1 is the least agreeable overall with the statements about NZ identity and in particular about the attributes listed above which may explain this result.

3.6.7 Comparing these results with our predictions: Who benefits from biotechnology?

The pattern is becoming well established and is reinforced by the results comparing the different clusters against their perceptions of who will benefit from biotechnology (Table 11). Clusters 1 and 3, sometimes joined by Cluster 5 appear as the most cynical – being more inclined to support the perception that biotechnology is more likely to benefit private corporations and companies, and least prepared to agree that anyone else will benefit. Clusters 2 and 4 are more willing to see that they, the public and New Zealand in general, will benefit.

Table 11: Who benefits from biotechnology

Statement	Comparisons between clusters
Biotechnology will benefit private corporations or companies	2,4 – 1,3,5
Biotechnology will benefit the New Zealand public	1,3 – 4
Biotechnology will benefit the New Zealand economy	3 – 2,4
Biotechnology will improve the quality of life for all New Zealanders	3,1 – (2) 4
Myself or a member of my immediate family would benefit from a medical treatment developed using biotechnology	1,3,5 – 4
Average of all but first statement	1,3 (5) – 2,4

As predicted Clusters 2 and 4 group against Clusters 1 and 3. However, it was thought that Cluster 5 might be more aligned to Cluster 4 but in fact it aligns with Clusters 1 and 3 or does not appear as significantly different. Hence Cluster 5 appears to be more doubtful about who in the public realm will benefit from biotechnology than we surmised.

3.6.8 Comparing these results with our predictions: Concerns about biotechnology

Again the concerns about biotechnology follow the patterns established earlier but provide some interesting insights into the difference between Clusters 2 and 4 (Table 12). Cluster 2 differentiates itself more from the others than does Cluster 4, caring less about our exports, tarnishing New Zealand's clean and green image, and the commercialisation of biotechnology. Cluster 1 on the other hand, is more concerned about tarnishing the clean and green image than clusters 3 and 5, yet not so aligned with them when it comes to commercialisation.

Table 12: Concerns about biotechnology

Statement	Comparisons between clusters
The use of genetically modified plants will result in the cross contamination of non-GM seeds	4,2 – (1,5) 3
Genetically modified organisms will spread into places we do not want them	2,4 – 3,5
People will not always comply with rules or regulations governing the development and release of genetically modified organisms	2,4 – 1,3,5
Genetically modified organisms will mutate into something Dangerous	
The commercialisation of biotechnology will result in more risk to the public or the environment	2 – 3,5
The release of genetically modified organisms will damage exports by tarnishing New Zealand's image of being clean and green	2 - 1
Biotechnology may solve a problem but it can also create more problems	2,4 – (5) 1,3
Average	2 (4) – 1,3,5

We predicted that again Clusters 2 and 4 would differentiate themselves from Cluster 3 and this has happened for three of the statements – Clusters 2 and 4 having more trust in people and less concern about biotechnology creating further problems, in particular, the risk of GM organisms spreading. Cluster 2 does shows out strongly as positive about biotechnology as we expected, being more positive than Clusters 3 and 5 about the risks of commercialisation and not so worried as Cluster 1 about GM's affect on NZ's clean and green image. However, we did expect this to appear alongside Cluster 4, as it does. When Cluster 5 appears as different from other clusters it is aligned with Clusters 1 and/or 3, demonstrating as suggested above, that those in this cluster are more sensitive to the potential for negative impacts of biotechnology than we first suspected.

The discussion and overall conclusion about these results appears in the next chapter. We go on now to focus on the differences between those who personally agree that NZ is clean and green and those who disagree.

3.7 Focusing on the influence of perceptions of New Zealand as clean and green on attitudes to biotechnology

The 56 per cent of the 662 survey participants who agreed with the statement that 'NZ is clean and green' show up as having some different characteristics and different degrees of acceptance of certain biotechnologies when compared with the 26 per cent of participants who disagreed with this statement.

These differences were explored using crosstabulations of the responses to the 'NZ is clean and green' statement with all other questions in the survey. Chi-squared tests were used to test for associations between the 'NZ is clean and green' variable and the other variables and only those significant at the five per cent level (*) or one per cent level (**) are reported.

The response categories used in the survey have been collapsed so that those who 'strongly agree' and 'agree', for example, have become 'agree'. This was necessary because sometimes the extreme categories such as 'strongly agree', 'strongly disagree', 'very acceptable' and 'very unacceptable' were too small to produce statistically valid results.

The tables below summarise the crosstabulation results into a comparison between those who agree with the statement that 'NZ is clean and green' and those who disagree, for the variables of significance. An example of the type of crosstabulation table thus summarised is given in Table 13. This table could be used to show that 47 per cent of those who agree that 'NZ is clean and green' are concerned about biotechnology compared with 60 per cent of those who disagree that 'NZ is clean and green', i.e., those who agree that NZ is clean and green are less concerned about biotechnology than those who disagree.

Table 13: Crosstabulation – Agreement with 'NZ is clean and green' versus concern about biotechnology

NZ is clean and green		Biotechnology			Total
		Unconcerned	Neither	Concerned	
Disagree	Count	14	54	103	171
	% within NZ is clean and green	8.2%	31.6%	60.2%	100.0%
Neither	Count	15	42	68	125
	% within NZ is clean and green	12.0%	33.6%	54.4%	100.0%
Agree	Count	52	145	171	368
	% within NZ is clean and green	14.1%	39.4%	46.5%	100.0%
Total	Count	81	241	342	664
	% within NZ is clean and green	12.2%	36.3%	51.5%	100.0%

First of all we will cover what participants felt about different aspects of biotechnology according to their agreement or disagreement with the 'NZ is clean and green' statement. Then we will draw up a profile of the differences between these groups according to other characteristics measured in the survey. (Mainly, only statistically significant results are reported on.)

The first section in the survey asked for participants concerns about certain issues facing society today.

3.7.1 Acceptability of biotechnology items

Those who agree that 'NZ is clean and green' are more likely to find different environmental uses of GM biotechnology acceptable than those who disagree, with four out of the five survey items showing a higher percentage of agreement (see Table 2).

Table 14: Comparisons between the two groups on the acceptability of environmental uses of biotechnology

Statement	NZ is clean and green		Statistical Significance
	Agree	Disagree	
Use of genetically modified bacteria to help clean toxins in soil is acceptable	53%	43%	*
Producing low pollution grain-based fuel for cars by genetically modifying a crop is acceptable	57%	47%	*
Developing a virus (GM) that reduces fertility in possums is acceptable	58%	41%	**
Use of aerial sprays containing Bt to control unwanted insect pests in urban areas is acceptable	46%	32%	**

This contrasted with the acceptability of certain medical uses of biotechnology in which differences were only demonstrated in four out of the ten items in the questionnaire (see Table 15).

Table 15: Comparisons between the two groups on the acceptability of medical uses of biotechnology

Statement	NZ is clean and green		Statistical Significance
	Agree	Disagree	
Using new cells (stem cells) from a 5 day old human embryo to teat and Alzheimer sufferer is acceptable	52%	45%	**
Transplanting copies of pancreatic cells from pigs into a person to help treat diabetes is acceptable	49%	45%	**
Using a microscopic device to carry chemotherapy drugs through the blood-brain barrier to treat a brain tumour is acceptable	87%	85%	*
Manipulating the molecular structure of sunscreen so that it penetrates the skin to provide greater protection against UV radiation is acceptable	58%	49%	*

In comparison five out of the seven agricultural uses of biotechnology were also found to be more acceptable by those in agreement with 'NZ is clean and green', but in these cases there was not usually greater than 50 per cent acceptability – except for the GM of pine trees (see Table 16.) The odd one out was the use of genetic screening to breed sheep that produce twins or triplets which was more acceptable to those who disagree with 'NZ is clean and green'.

Table 16: Comparisons between the two groups on the acceptability of agricultural uses of biotechnology

Statement	NZ is clean and green		Statistical Significance
	Agree	Disagree	
Using genetic screening to breed sheep that produce twins or triplets is acceptable	38%	44%	**
Raising hormone levels in farm animals to increase fertility is acceptable	29%	22%	**
Genetically modifying potatoes to resist common pests and diseases is acceptable	49%	45%	**
Genetically modifying pine trees to produce stronger timber is acceptable	58%	42%	**
Genetically modifying kumara to resist common pests and diseases is acceptable	35%	28%	*
Genetically modifying an apple to make it more nutritious is acceptable	25%	19%	*

3.7.2 Differences in attitudes in five specific examples of biotechnology

The first example used is that of a GM bacterium that could be developed to help repair soil damaged by DDE contamination. This was found to be more acceptable to those who agree that "NZ is clean and green', and they were more likely to be 'confident that any unexpected outcomes from this biotechnology can be controlled'. They were less likely to 'feel dread at the thought of use of this biotechnology', less likely to 'fear that use of this biotechnology will result in irreversible harmful outcomes' and that 'use of this biotechnology would be unnatural'. (See Table 17 for the detailed results.)

The second example is that of the throat lozenges. There were only two statements which produced significant differences between those who agreed that 'NZ is clean and green' and those who disagreed. The former were more likely to be 'confident that any unexpected outcomes from this biotechnology can be controlled' while they were less likely to agree that the 'use of this biotechnology would be unnatural'. (See Table 17 for the detailed results.)

The third example is the device inserted into a sheep's stomach to reduce the production of methane gas. This was found to be more acceptable to those who agree that "NZ is clean and green', and they were more likely to be 'confident that any unexpected outcomes from this biotechnology can be controlled'. They were less likely to 'feel that use of this biotechnology would be unnatural'. (See Table 17 for the detailed results.)

The fourth example is the GM potato. This was found to be more acceptable to those who agree that "NZ is clean and green', and they were more likely to be 'confident that any unexpected outcomes from this biotechnology can be controlled'. They were less likely to 'feel dread at the thought of use of this biotechnology', less likely to 'fear that use of this biotechnology will result in irreversible harmful outcomes', less likely to 'feel that use of this biotechnology would be unethical' and that 'use of this biotechnology would be unnatural'. (See Table 17 for the detailed results.)

Table 17: Contrasting attitudes to different specific biotechnology examples

Specific example of biotechnology	DDE remediation	Throat lozenge	Methane and sheep	GM potatoes	Stem cells and Alzheimer's	Overall attitude to biotechnology
Statement	**Agree, Disagree (NZ is clean and green)**	**Agree, Disagree (NZ is clean and green)**	**Agree, Disagree (NZ is clean and green)**	**Agree, Disagree (NZ is clean and green)**	**Agree, Disagree (NZ is clean and green)**	**Agree, Disagree (NZ is clean and green)**
The use of this biotechnology is acceptable to me	55%, 46% *	ns	36%, 32% *	31%, 24% **	58%, 47% **	48%, 41% ns
I am familiar with this use of biotechnology	ns	ns	ns	ns	ns	ns
I feel dread at the thought of this use of this biotechnology	14%, 30% **	ns	ns	33%, 50% **	26%, 39% *	24%, 15% **
I am confident that any outcomes from this biotechnology can be controlled	23%, 19% **	32%, 23% **	34%, 22% **	22%, 14% **	36%, 25% **	ns
I fear that use of this biotechnology will result in irreversible harmful outcomes	30%, 45% *	ns	ns	35%, 55%	24%, 32% **	38%, 51% *
I feel that use of this biotechnology would be unethical	ns	ns	ns	35%, 46% *	30%, 36% *	27%, 29% *
I feel that use of this biotechnology would be unnatural	33%, 46% **	26%, 40% *	45%, 60% **	47%, 63% **	35%, 46% **	40%, 49% ns

Note: * indicates statistically significant at the 5% level, ** indicates statistically significant at the 1% level, ns indicates not significant.

The fifth and final example is the use of stem cells in the treatment of Alzheimer's disease. This was found to be more acceptable to those who agree that "NZ is clean and green', and they were more likely to be 'confident that any unexpected outcomes from this biotechnology can be controlled'. They were less likely to 'feel dread at the thought of use of this biotechnology', less likely to 'fear that use of this biotechnology will result in irreversible harmful outcomes', and less likely to 'feel that use of this biotechnology would be unethical' and 'unnatural'. (See Table 17 for the detailed results.)

3.7.3 Differences in views on biotechnology

Those who agree that 'NZ is clean and green' are likely to have more positive attitudes to biotechnology than those who disagree. They are also less likely agree that the genetic makeup of humans and other animals is similar, that the mixing of genetic material between plants and animals feels wrong, that it was wrong to lift the moratorium, and that it is worrying we might be eating GM food. (See Table 6 for the details.) It needs to be noted that for some of these statements the degree of disagreement is higher that the degree of agreement. For example, 51 per cent of those who disagree with 'NZ is clean and green' disagree with the statement that 'biotechnology simply harnesses and uses natural processes' compared with 36 per cent of those who agree that 'NZ is clean and green'. This just indicates that the degree of disagreement was higher that the degree of agreement for some statements (See Cook et al. (2004) for the single variable percentage frequency results.)

Table 18: Comparisons between the two groups on their views about biotechnology:

Statement	NZ is clean and green		Statistical Significance
	Agree	Disagree	
Biotechnology can improve on the imperfections of nature	51%	43%	**
Biotechnology can fix environmental problems that have been caused by humans	54%	49%	**
Biotechnology simply harnesses and uses natural processes	24%	19%	*
The genetic make up of humans and other animals is very similar	29%	36%	*
It feels wrong to mix genetic material from plants and animals	48%	64%	**
It was wrong to lift the moratorium on field trials of genetically modified plants	34%	52%	**
It is worrying that the food we eat might have been produced using genetic modification	46%	57%	*

3.7.4 Differences in levels of belief about biotechnology information sources

Overall there was a general level of disbelief about those who make statements about biotechnology. When considered in this light those who agree that 'NZ is clean and green' were more likely that those who disagree to believe information sources. In particular information from regulatory agencies (36 per cent compared with 23 per cent *), scientists (51 per cent compared with 37 per cent **), CRIs (38 per cent, 48 per cent **), politicians (5 per cent, 3 per cent *) and biotech companies (10 per cent, 6 per cent **) was more credible to the former group.

3.7.5 Differences in levels of belief about the benefits of biotechnology

Again there were differences between the proportions of the two groups about who would benefit from biotechnology. Of those who agreed that 'NZ is clean and green' 77 per cent

agreed that private corporations or companies would benefit compared with 85 per cent of those who disagreed that 'NZ is clean and green' (**), demonstrating that the latter group are rather more cynical than the former about who would mainly benefit from biotechnology. However, more of the former group felt that the benefit would also go to the New Zealand public (41 per cent, 31 per cent *) and the New Zealand economy (45 per cent, 36 per cent **), and would 'improve the quality of life for all New Zealanders' (32 per cent, 20 per cent **).

3.7.6 Differences in levels of concern about biotechnology

Those who agree that 'NZ is clean and green' are not so concerned that 'the use of genetically modified plants will result in the cross contamination of non-GM seeds' (61 per cent, 72 per cent *), that 'genetically modified organisms will spread into places we do not want them' (61 per cent, 75 per cent **), or that 'the release of genetically modified organisms will damage exports by tarnishing New Zealand's image of being clean and green' (55 per cent, 66 per cent *).

3.7.7 What other things can be said about the differences between those who agree and disagree that NZ is clean and green?

Of the nineteen statements in the section on attitudes to nature, nine were sources of difference between the two groups focused on here (Table 19). Those who agreed that 'NZ is clean and green' were more likely to see nature as more resilient and less in need of our care than those who disagreed with this statement. However, still more who agreed that 'NZ is clean and green' disagreed that 'the environment probably doesn't need as much protection as we imagine' – 47 per cent, compared with 66 per cent of those who disagreed that 'NZ is clean and green'.

Table 19: Comparisons between the two groups on their view about nature

Statement	NZ is clean and green		Statistical Significance
	Agree	Disagree	
The environment may have been abused but it has tremendous ability to recover	52%	48%	**
We have a special position in nature	77%	66%	**
If we didn't have a natural desire to improve the world, we'd still be back in the caves	65%	44%	**
Nature is morally good	47%	41%	*
Nature is pure and wild	56%	48%	**
Nature exists in a state of ecological harmony	57%	46%	*
The environment probably doesn't need as much protection as we imagine	31%	20%	**
Nature may be resilient but can only absorb a very limited amount of damage	67%	82%	*
We shouldn't be too worried about environmental damage. Technology is developing so quickly that in the future people will be able to repair most of the environmental damage that has been done	15%	8%	**

When those who disagree with the statement, 'We shouldn't be too worried about environmental damage. Technology is developing so quickly that in the future people will be able to repair most of the environmental damage that has been done,' are considered, 56 per cent of those who agree that ''NZ is clean and green' disagree with this statement, while 77 per cent of those who disagree that ''NZ is clean and green' also disagree with this.

3.8 Summary

This chapter has set up the five national identity clusters and described them as fully as possible from the survey data to do with everything apart from biotechnology. Then, using this information it was predicted what the attitudes of the different groups would be to biotechnology and this was then checked against the data, finding that mostly the clusters fitted the predictions except in a few notable ways. Most of the results fitted across a continuum with its poles positioned at the environmentalist views of those in Cluster 3, who did not see biotechnology in a positive light, and the positive views about most things held by those in Cluster 4.

Then the attitudes of those who considered NZ was clean and green were compared with those who disagreed with this statement. Surprisingly perhaps at first glance, it was found that those who consider NZ to be clean and green were more supportive of most biotechnologies than those who disagreed and had more positive attitudes towards biotechnology. This was explained as the analysis continued as it was found that those who disagreed that NZ was clean and green were more sceptical about biotechnology and its benefits, and more concerned about the environmental impacts of biotechnology, indicating that this group was more thoughtful and questioning and less accepting of the positive rhetoric that surrounds some developments in biotechnology.

Chapter 4
Discussion and Conclusion

4.1 Discussion

The Royal Commission on Genetic Modification (RCGM) stated that it would like to see some shared framework of New Zealand values on which regulatory decisions about genetic modification could be based. It listed seven values that it viewed as important from the submissions it had received: the uniqueness of Aotearoa/New Zealand, the uniqueness of our cultural heritage, sustainability, being part of a global family, the well-being of all, freedom of choice and participation (RCGM, 2001: 11-13). Simon Upton (former Minister of Research, Science and Technology) acknowledged that the restructuring of the New Zealand economy led to uncertainty but he hoped the New Zealand culture would be a stabilising factor (Upton, 1994: 14-15). However, some would say that the instability created by enterprise capitalism can never be balanced by culture. For example, according to George Soros, one of the world's richest capitalists, a capitalist society is inherently unstable and insecure (Soros, 1997: 4-5; Soros, 2000). Schiller, as far back as 1792, argued that we need a "constructed reality, strong enough to furnish sanction for action, but not so strong as to harden into dogma" (cited in Brown, 1997: 3). For contemporary New Zealand, Brown (1996: 16) asserts that though different sectors use the myths of identity for their own purposes, this is no reason for discouraging such myths as they play a significant part in social cohesion, providing a source of shared values. Such myths would enable "New Zealanders who are not members of established or prestigious groups" to "…feel a sense of belonging" (ibid.: 11).

This report has shown how a national survey on public attitudes to biotechnology which contains statements on national identity can be used to form groups of New Zealanders holding particular views about identity. These, in turn, were able to be used to demonstrate that these views affect the acceptability of different biotechnologies and also provide some reasons for this acceptability. It was perhaps too optimistic to hope that all New Zealanders would similarly agree about the importance of certain elements of New Zealand identity. Certainly, over 90 per cent of the sample agreed that agriculture and the kiwi have meaning as symbols of New Zealand, and over 80 per cent agreed that sheep are also an important part of this identity. Further, all statements received over 50 per cent agreement, indicating that their selection as symbols of New Zealand identity was reasonable. However, beneath this broad agreement there were different senses of identity which allowed for differentiation into five clusters.

Another optimistic hope was that if there were particular groups of New Zealanders holding to certain views of New Zealand identity, these groups would be reasonably distinct. However, as could be reasonably expected, they tended more to fit on a continuum with regard to most of the identity statements. Certainly there were distinct features of some of the groups (called clusters) with some of the statements, but for many statements there were reasonable proportions in each group who agreed with them. Cluster 3 consisted of very few people who agreed that New Zealand is clean and green. Cluster 1 consisted of a large majority for whom winning at sport was not important, and these people also placed a lower value on usefulness. Cluster 4 was the only one in which a majority of members agreed that New Zealanders were in touch with the land, a belief that appears to be losing favour with our increasing urbanisation. Those in Cluster 4 were also greater supporters of arts and crafts. Cluster 5 consisted of a group of people without a majority valuing business success and even

fewer of these people valued science and research. Cluster 2 had no one who agreed that the world needs a more equal distribution of wealth. These things do give each cluster a distinctive character but each cluster also shares many of the other identity symbols to a greater or lesser extent.

Using the responses to other questions in the survey not related specifically to biotechnology, a fuller picture of certain qualities of the people in these groups could be built up. A summary is provided next, and for the first time a name has been assigned to each group which summarises their distinctive viewpoint.

Cluster 1: The non-competitive, non-pragmatists (anti biotechnology)
Cluster 1 consists of those who are not into sporting competitiveness and are less likely than others to value things for their usefulness. There are more women in this cluster than other clusters and those in the cluster have lower qualifications. They have neutral feelings about technology being able to solve society's problems, are middle of the road about New Zealand being clean and green and are less concerned about environmental and social issues.

Cluster 2: The materialists (pro biotechnology)
Cluster 2 members are the most materialistic and pro-technology cluster, seeing technology as providing a solution to society's problems. They are younger than most of the other clusters with half in the 30-50 age group, have a higher income and a greater percentage of them have a trade qualification or diploma. They do not hold romantic notions about nature and see nature as reasonably resilient.

Cluster 3: The sceptical environmentalist (anti biotechnology)
Cluster 3 consists of the environmentalists. They are sceptical and questioning both about New Zealand's clean and green status and the likelihood that technology will be able to fix everything. They are most concerned about things that impact on the environment. They tend to have a lower income (less than $40,000) but are well educated. There are more Maoris and Pacific Islanders in this cluster than any other. There are more of them who see themselves as spiritual but not religious than in any other group and hence have a lower proportion of those who think of themselves as Christian. They see nature as fragile and easily damaged and humans as interfering and meddling in nature. Technology is seen as being unlikely to be able to fix the resultant problems. They have a greater belief in living a non-materialistic, more simple lifestyle than the other clusters. As far as they are concerned it is a myth that NZ is clean and green.

Cluster 4: The traditionalists (pro biotechnology)
The members of Cluster 4 have a strong sense of national identity. They see the good in most things but have a concern about the social aspects of the way they see society deteriorating. They probably represent what has become known as 'middle New Zealand'. This cluster contains more older members than any other cluster. These members are more accepting and less discriminating than any other cluster. They are more supportive of government intervention, believing that it is acceptable for government to limit risk, or impose something on society for the benefit of all that might increase the risk a little. In this way they see themselves as having less control over their lives and so are those most concerned about societal issues such as unemployment, availability and quality of public health care, crime and so on. As such they are more fearful than those in the other clusters but this fearfulness does not extend to technology, which is seen positively. They hold romantic notions about nature apart from human involvement in nature, but think technology can be developed to fix any problems. They are less materialistic than clusters 1 and 2 and hold traditional,

conservative beliefs, containing the greatest proportion of those who identify as Christian. They are the biggest supporters of NZ being clean and green.

Cluster 5: The sports enthusiasts (pro biotechnology)
The members of Cluster 5 focus on and are passionate about sport but this is the only area in which they demonstrate any ambition as they do not value business success or scientific research. They are more likely to be middle aged, middle income New Zealanders, well educated and atheists or agnostics than those in other clusters. They hold middle of the road views about most things - whether NZ is clean and green, about materialism and appear to be happy as they are – and were generally positive about biotechnology.

From the above information we were able to predict that basically Cluster 3 would on average find most biotechnologies more unacceptable than any of the other clusters, especially if there was any chance they would impact negatively on the environment. At the other end of the continuum would be Cluster 4, whose members would be find most biotechnologies acceptable, particularly so if the biotechnologies made claims to enhancing health to do with aging. It was then assumed that all other clusters would fall somewhere between these two in most of their views. More detailed results are provided earlier in the report but the key findings are as follows:

Acceptability of biotechnology items:	**Least Most**
Environmental uses	3 (1) -----2, 5----4
Medical uses	3---4
Agricultural uses	1, 3----2, 4

Buying products of biotechnology - average Strong	**Not intend Intend**
	3----4

Specific biotechnologies – overall assessment	**Disagree Agree**
Repairing DDE contamination	3----2, 4
Throat lozenge	1, 2, 3----5
Bacteria in sheep's stomach	3, 1 (5)----2, 4
GM potato	1, 3----(2) 4, 5
Embryo stem cells	3----1, 2, 4, 5

Overall attitude to biotechnology – average	3----2, 4
Information about biotechnology – average	1 (3, 5)----2----4
Who benefits from biotechnology? – average	1, 3(5)-----2, 4
Concerns about biotechnology – average	2 (4)----1, 3, 5

Were we successfully able to predict the different ways in which the clusters would find biotechnology acceptable or unacceptable? The simple answer is yes. Clusters 3 and 4 usually were placed at the extreme opposing ends of the spectrum of responses as predicted. However, many of the clusters converged for certain aspects of biotechnology. Clusters 1 and/or 3 and/or 5 were frequently aligned against 4 and/or 2, for example, in the agricultural uses of biotechnology and concerns about biotechnology.

Other data showed that those who agreed that New Zealand was clean and green were more likely to have a more positive attitude towards biotechnology than those who disagreed. Those who do not consider NZ to be clean and green and see it as a myth, were the most critical and thoughtful group and so, even though wishing to support this vision of NZ, could see how things could be better, and had a desire for this to be so. Basically this analysis probably accentuates the differences found between Cluster 3 and the other clusters in the earlier analysis presented in this chapter.

4.2 Are there particular biotechnologies acceptable to all?

One of the big questions that emerges from this research asks if there is any way in which particular biotechnologies can be identified that would be acceptable to all New Zealanders? There were actually very few biotechnologies or aspects of biotechnology that had similar responses across the clusters. When these views were similar they were often neutral rather than being a demonstration of agreement or disagreement such as in the use of a GM bacteria to remediate DDE contamination in soil, the neutral feeling that this bioremediation and the treatment of sheep to reduce the emission of greenhouse gases were unethical, and the neutrality expressed about GM being a major step and that playing with genes is a natural part in our evolution. Some medical uses of biotechnology were agreeable across all clusters. These were repairing a person's own stem cells (rather than using stem cells from an embryo), in this instance to help sufferers of Huntingdon's disease, the use of nanotechnology devices for the monitoring of blood or the delivery of drugs, and there was strong agreement with the use of DNA in criminology. Overall, there was a slight disagreement about the manipulation of fertility in farm animals and about the reduction of green house gases by using a device in sheep. The lack of support for the latter two technologies may indicate the ignorance of many people about what actually goes on everyday on a farm and may be part of a growing dissonance between urban and rural values. There was slight agreement on biotechnology being able to fix problems caused by humans and a fear that GM organisms will mutate into something dangerous. Most importantly there was agreement that releasing GM organisms in New Zealand will damage exports and New Zealand's clean and green image. (This is supported by several surveys carried out by Bruce Small (RSNZ Alert 422, 2006). This fear is obviously related to the link between our primary industry export base and the use of GM technologies within primary industries. There was also support for medical technologies using supposedly inanimate devices and perhaps not involving GM or the use of stem cells from others particularly embryos.

Overall, then, there appear to be few biotechnologies that would be acceptable to all New Zealanders. What is apparent is that there are several groups in New Zealand society with differing views about the acceptable use if different biotechnologies, not one unified view – just as there is not one single view about what it means to be a New Zealander. This not unexpected lack of uniformity in New Zealand society, is also supported by Jasanoff (2005) in her comparisons of European countries and America. It raises the question of how much diversity can a society stand? How much diversity can be encouraged by legislative processes and legislation itself without the risk of societal disintegration and conflict?

4.3 How does New Zealand compare with other countries?

This moves the discussion on to the identification of the varied ways in which different countries are approaching and dealing with biotechnological change. This has been attempted by Sheila Jasanoff in her book *Designs on nature* (2005), in which she compares the U.K, U.S.A., Germany and the rest of the E.U. She was interested in the lack of controversy over

GM in the U.S.A., but the issues about the use of stem cells that have erupted there. In the U.K. there has been concern about GM but approval of the use of stem cells (2002) and cloning (2001), but this is different from the rest of Europe. Concerns about GM resulted in the banning of some American products. (By the way, she does not see this as simply an expression of anti-Americanism.) Jasanoff thinks that the way countries are relating to the transition from old industrial societies of the nineteenth and twentieth centuries to a new form of global organization called "knowledge societies" (Jasanoff, 2005: 4) is closely connected to their practises of citizenship, deliberation and accountability, and hence to national identity. "What is the relationship between humans and the products of human invention?" (Jasanoff, 2005: 2) What will the consequences be:

> "… for organized power, social stratification, and individual human liberty? What will happen to core democratic values such as citizen participation and governmental accountability … and who will be winners and losers? … Science and technology have been regarded for centuries as instruments of social progress and personal liberation. Yet, as scientific knowledge becomes more closely aligned with economic and political power, producing new expert elites, the distance between the governors and the governed can be expected to grow … Science, moreover, has historically maintained its legitimacy by cultivating a careful distance from politics. As state-science relations become more openly instrumental we can reasonably wonder whether science will lose its ability to serve either state or society as a source of impartial critical authority. New questions about access and equality can be expected to arise as biotechnology becomes more global, as they already have in connection with existing techniques such as in vitro fertilization and promised ones such as "genetic enhancement". Will continued advances in science produce a new genetic underclass, and will they simultaneously increase the state's already immense power to define, classify and regulate life itself?" (ibid.: pp.4-5).

Another issue which arises from this consideration of national identity and biotechnology is how food-related biotechnologies will be used to push an individual's personal responsibility for their own health as part of public health policy. In this area the link needs to be made that people can only buy what is provided to them by companies – that is, personal responsibility has to be seen beyond a market context, because food also has to be safe and nutritious, qualities the market may not be really interested in. As a report from the Food Ethics Council (U.K.) (2005: 2) states: " … it is especially important in a market context for the government to match its policy focus on personal responsibilities with a renewed commitment to human rights".

4.3 Conclusion

The analysis of survey data presented in this report has demonstrated that New Zealand can be seen as containing groups of citizens who differ in their support of various attributes of New Zealand identity. It then achieved the goal of demonstrating that these different groups of citizens also hold varying attitudes to biotechnology that are related to their perceptions of their New Zealand identity.

Since people's predispositions influence acceptability of biotechnology rather than the other way around, it is likely that these predispositions will come to play for other innovations such as nanotechnology.

Biotechnologies that take account of, incorporate or enhance some of the New Zealand identity myths and meanings may find greater acceptance in New Zealand and contribute something unique to the world. In addition, the way in which biotechnologies are developed and utilised in New Zealand will tell a narrative about our country – of what and who is

important to us, and of how we go about the governance of New Zealand and what it means to be a citizen of New Zealand.

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Appendix 1
Tables

Table A1: Factor analysis to develop national identity types: Rotated component matrix

	Component				
	1	2	3	4	5
NZ is clean and green (Personal)	-0.071	0.221	0.081	0.813	-0.072
Agriculture is important (Personal)	0.050	0.855	0.168	0.137	-0.087
Sheep are important (Personal)	0.100	0.856	0.155	0.098	0.083
Winning at sport is important (Personal)	-0.055	0.096	0.700	0.213	-0.041
The Kiwi is important (Personal)	-0.008	0.206	0.713	0.085	-0.047
Value something if useful (Personal)	0.199	0.046	0.640	-0.003	0.091
In touch with the land (Personal)	0.363	0.057	0.250	0.671	0.076
Value business success (Personal)	0.770	0.202	0.163	-0.142	-0.086
Value science and research (Personal)	0.831	0.018	-0.070	0.180	0.040
Value arts and crafts (Personal)	0.530	-0.078	0.095	0.398	0.267
Need a more equal distribution of wealth	0.032	0.006	-0.002	-0.003	0.967

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 7 iterations.

Table A2: Total variance explained by the factors

	Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %
1	1.756	15.960	15.960
2	1.617	14.697	30.657
3	1.569	14.266	44.923
4	1.402	12.749	57.672
5	1.052	9.567	67.239

Extraction Method: Principal Component Analysis.

Table A3: Cluster analysis on the five factors determined by the factor analysis: Final cluster centers

	Cluster				
	1	2	3	4	5
REGR factor score 1	-0.12165	0.22863	0.29196	0.61385	-1.52218
REGR factor score 2	.50361	-0.32944	-0.55379	0.21797	0.14105
REGR factor score 3	-1.37764	-0.09102	0.36270	0.40985	0.45898
REGR factor score 4	-0.29286	0.04695	-1.06196	0.69521	0.26552
REGR factor score 5	0.27565	-1.37702	0.58813	0.40829	0.09865

Table A4: Discriminant analysis to check allocation to clusters accords with original national identity responses

			Predicted Group Membership					
		Cluster Number of Case	1	2	3	4	5	Total
Original	Count	1	104	1	1	6	1	113
		2	2	131	1	1	1	136
		3	1	0	113	6	1	121
		4	2	1	1	178	0	182
		5	0	0	1	7	100	108
	%	1	92.0	0.9	0.9	5.3	0.9	100.0
		2	1.5	96.3	0.7	0.7	0.7	100.0
		3	0.8	0.0	93.4	5.0	0.8	100.0
		4	1.1	0.5	0.5	97.8	0.0	100.0
		5	0.0	0.0	0.9	6.5	92.6	100.0

94.8% of original grouped cases correctly classified.

Table A5: Results from the 'Issues facing society' statements

Issues facing society	Cluster means					Significance of differences between clusters									
Statement	**1**	**2**	**3**	**4**	**5**	**1-2**	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
Industrial pollution	4.1	4.1	4.4	4.1	4.1		**			**			**	**	
Unemployment [a]	3.8	3.7	3.8	4.0	3.5			(*)	(*)		** (**)		(*)	(*)	*** (***)
Air pollution	4.2	4.1	4.3	4.2	4.0					**				**	*
Climate change [a]	3.5	3.5	3.8	3.8	3.3		(**)	(*)		** (**)	* (**)			*** (***)	** (***)
Loss of animal and plant species [a]	4.0	3.8	4.4	4.1	3.9		** (***)			*** (***)	(*)		** (**)	*** (***)	(*)
Crime and violence [a]	4.5	4.6	4.4	4.7	4.4			* (**)			(*)		** (***)		** (***)
Biotechnology	3.5	3.4	3.6	3.6	3.4									*	
Illegal drug use	4.3	4.2	4.2	4.5	4.2						**		**		**
Decline in water quality	4.1	4.1	4.4	4.3	4.1		**			**	*			**	**
Natural hazards	2.9	3.0	3.1	3.4	2.8			***			***		**		***
Use of genetically modified organisms in agriculture [a]	3.7	3.5	3.9	3.7	3.5					(*)				(**)	
Pesticide use [a]	3.8	3.7	4.0	3.9	3.6		(**)			* (**)	(*)			** (***)	* (**)
The availability and quality of public health care	4.4	4.3	4.3	4.5	4.2						*				**
Terrorism	3.5	3.7	3.6	4.0	3.4			***			**		**		***
Motor vehicle accidents [a]	3.7	3.6	3.6	4.1	3.4			** (***)	(*)		** (***)	(*)	*** (***)		*** (***)
Global warming [a]	3.4	3.4	3.9	3.7	3.4		*** (***)	* (**)		*** (***)	* (**)			*** (***)	** (**)

1 = Very unconcerned, 2 = unconcerned, 3 = neither concerned nor unconcerned, 4 = concerned, 5 = very concerned.
Have unequal variances within clusters. The result given here is that found using Tamahane's T2 for paired comparisons for means with unequal variances. The comparison using an LSD (which assumes equality of variances) from a combined estimate of the variance is given in brackets.

Table A6: Results from the 'Acceptability of biotechnology items' statements

Acceptability of biotechnology items	Cluster means					Differences between clusters – p-values									
Statement	**1**	**2**	**3**	**4**	**5**	**1-2**	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
Environmental uses															
Use of genetically modified bacteria to help clean unwanted toxins in soil	3.1	3.2	3.1	3.2	3.3										
Producing a low pollution grain-based fuel for cars by genetically modifying a crop	3.4	3.4	3.2	3.4	3.4					0.071 *				0.085 *	
Developing a virus (genetically modified) that reduces fertility in possums	3.1	3.3	3.0	3.7	3.3			0.000 ***		0.056 *	0.006 **		0.000 ***	0.049 *	0.015 *
Use of aerial prays made from soil bacterium (Bt) to control unwanted insect pests in urban areas	2.9	3.0	2.8	3.3	3.1			0.004 **		0.094 *	0.079 *		0.001 ***	0.042 *	
Cloning a kakapo to ensure the survival of the species	2.7	2.9	2.8	2.8	3.0				0.058 *						
Average	3.04	3.15	2.95	3.27	3.23			0.042 *		0.087 *			0.004 **	0.026 *	
Medical uses															
Using bacteria in throat lozenges to prevent serious infections	3.3	3.4	3.4	3.5	3.5										
Inserting human genes into a cow to produce milk for the treatment of multiple sclerosis	3.0	3.2	2.8	3.2	3.1					0.019 *			0.018 *		
Preventing stomach cancer by modifying a person's genetic code	3.0	3.2	3.0	3.2	3.1								0.063 *		
Removing, repairing and then reinserting brain stem cells to help a sufferer of Huntingdon's disease	3.6	3.7	3.7	3.7	3.7										
Using new cells (stem cells) from a 5 day old human embryo to treat an Alzheimer sufferer	3.2	3.3	3.1	3.3	3.3								0.057 *		
Transplanting copies of pancreatic cells from pigs into a person to help treat diabetes	3.1	3.3	2.9	3.2	3.3					0.017 *			0.016 *	0.010 **	
Using DNA (gene) testing to help convict criminals	4.5	4.6	4.5	4.5	4.5										
Using a microscopic device to carry chemotherapy	4.1	4.1	4.2	4.2	4.2										

Acceptability of biotechnology items	Cluster means					Differences between clusters – p-values									
Statement	**1**	**2**	**3**	**4**	**5**	**1-2**	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
drugs through the blood-brain barrier to treat a brain tumour															
Using a miniature biosensor implanted into a human body to monitor blood sugar levels in diabetics	4.0	3.9	3.9	4.0	4.1										
Manipulating the molecular structure of sunscreen so that it penetrates the skin to provide greater protection against UV radiation	3.3	3.5	3.3	3.7	3.6	0.084 *		0.004 **	0.029 *				0.019 *	0.092 *	
Average	3.51	3.60	3.48	3.64	3.62								0.066 *		
Agricultural uses															
Using genetic screening to breed sheep that produce twins or triplets	3.0	3.2	3.1	3.0	3.1	0.095 *									
Raising hormone levels in farm animals to increase fertility	2.7	2.9	2.7	2.9	2.8										
Genetically modifying potatoes to resist common pests or diseases	2.8	3.0	2.7	3.1	2.8			0.066 *		0.009 **			0.003 **		0.083 *
Genetically modifying pine trees to produce stronger timber	3.1	3.4	3.0	3.5	3.2	0.081 *		0.011 *		0.009 **			0.000 ***		0.068 *
Genetically modifying kumara to resist common pests or diseases	2.7	3.0	2.7	3.0	2.8	0.032 *		0.035 *		0.019 *			0.020 *		
Inserting a plastic device containing bacteria into a sheep's stomach to reduce the production of harmful greenhouse gases	2.5	2.6	2.7	2.7	2.8					0.063 *					
Genetically modifying an apple to make it more nutritious	2.4	2.6	2.4	2.7	2.5	0.083 *		0.023 *					0.038 *		
Average	2.75	2.96	2.74	3.00	2.87	0.070 *		0.033 *		0.062 *			0.028 *		

* represents $0.05 \geq p > 0.01$, ** represents $0.01 \geq p > 0.001$, *** represents $p \leq 0.001$
1 = very unacceptable, 2 = unacceptable, 3 = neither acceptable nor unacceptable, 4 = acceptable, 5 = very acceptable

Table A7: Results from the example of a bacterium to repair DDE contamination in soil

Specific examples of biotechnology 1: Repairing DDE contamination with GM bacterium	Cluster means					Differences between clusters - p-values									
Statement	**1**	**2**	**3**	**4**	**5**	**1-2**	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
The use of this biotechnology is acceptable to me	3.2	3.4	3.2	3.3	3.5				0.074 *					0.074 *	
I am familiar with this use of biotechnology	2.4	2.5	2.5	2.7	2.4			0.011 *			0.074 *		0.043 *		0.002 **
I feel dread at the thought of this use of biotechnology	2.8	2.5	2.8	2.6	2.5	0.066 *				0.025 *			0.071 *	0.044 *	
I am confident that any unexpected outcomes from this biotechnology can be controlled	2.4	2.7	2.5	2.7	2.6	0.039 *		0.017 *		0.052 *			0.024 *		
I fear that use of this biotechnology will result in irreversible harmful outcomes [a]	3.2	3.1	3.2	3.0	3.2										
I feel that the use of this biotechnology would be unethical	2.7	2.6	2.8	2.8	2.6										
I feel that the use of this biotechnology would be unnatural	3.1	3.1	3.3	3.1	3.0									0.037 *	
Average (after inverting the negative statements)	2.90	3.05	2.87	3.04	3.01					0.059 *			0.062 *		

[a] Have unequal variances within clusters. The result given here is that found using Tamahane's T2 for paired comparisons for means with unequal variances. The comparison using an LSD (which assumes equality of variances) from a combined estimate of the variance is given in brackets.
1= strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree.

Table A8: Results from the example of a throat lozenge sourced from saliva bacteria

Specific examples of biotechnology 2: Throat lozenge made from bacteria in saliva	Cluster means					Differences between clusters – p-values									
Statement	**1**	**2**	**3**	**4**	**5**	**1-2**	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
The use of this biotechnology is acceptable to me	3.3	3.4	3.3	3.3	3.5				0.081 *						0.097 *
I am familiar with this use of biotechnology	2.5	2.6	2.6	2.7	2.6										
I feel dread at the thought of this use of biotechnology	2.7	2.7	2.7	2.7	2.5				0.045 *					0.090 *	0.036 *
I am confident that any unexpected outcomes from this biotechnology can be controlled	2.7	2.9	2.7	3.0	3.0			0.036 *	0.011 *				0.030 *	0.009 **	
I fear that use of this biotechnology will result in irreversible harmful outcomes	3.0	2.9	2.9	2.9	2.8										
I feel that the use of this biotechnology would be unethical	2.7	2.6	2.6	2.7	2.5				0.094 *						0.064 *
I feel that the use of this biotechnology would be unnatural	2.9	3.0	3.0	2.9	2.7							0.052 *		0.071 *	
Average (after inverting the negative statements)	3.05	3.10	3.07	3.14	3.27				0.033 *			0.092 *		0.051 *	

1= strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree.

Table A9: Results from example of a device containing bacteria inserted into sheep's stomach to reduce the production of greenhouse gases

Specific examples of biotechnology 3: Bacteria in sheep's stomach to reduce of greenhouse gases	Cluster means					Differences between clusters – p-values									
Statement	**1**	**2**	**3**	**4**	**5**	**1-2**	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
The use of this biotechnology is acceptable to me [a]	2.7	2.9	2.7	2.9	3.0			n.s. (*)	n.s. (*)					n.s. (*)	
I am familiar with this use of biotechnology	2.2	2.4	2.4	2.6	2.4			0.003 *			0.083 *		0.093 *		
I feel dread at the thought of this use of biotechnology	2.9	2.9	2.9	2.8	2.7							0.089 *		0.097 *	
I am confident that any unexpected outcomes from this biotechnology can be controlled [a]	2.6	2.9	2.7	2.9	3.0	n.s. (*)		n.s. (**)	n.s. (**)					n.s. (*)	
I fear that use of this biotechnology will result in irreversible harmful outcomes	2.9	2.8	3.1	2.9	2.7					n.s. (*)				n.s. (**)	
I feel that the use of this biotechnology would be unethical [a]	3.2	2.8	3.0	2.9	2.8	n.s. (**)		n.s. (*)	n.s. (*)	n.s. *)					
I feel that the use of this biotechnology would be unnatural	3.3	3.3	3.4	3.2	3.1								n.s. (*)	n.s. (*)	
Average (after inverting the negative statements)	2.61	2.80	2.50	2.85	2.66	0.079 *		0.018 *		0.006 **			0.001 ***		0.078 *

[a] Have unequal variances within clusters. The result given here is that found using Tamahane's T2 for paired comparisons for means with unequal variances. The comparison using an LSD (which assumes equality of variances) from a combined estimate of the variance is given in brackets.
1= strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree.

Table A10: Results from the example of GM potatoes

Specific examples of biotechnology 4: GM of potato by synthetic toad gene to increase resistance to disease	Cluster means					Differences between clusters – p-values									
Statement	**1**	**2**	**3**	**4**	**5**	**1-2**	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
The use of this biotechnology is acceptable to me	2.3	2.8	2.4	2.7	2.6	0.002 **		0.008 **	0.093 *	0.003 **			0.012 *		
I am familiar with this use of biotechnology	2.5	2.6	2.6	2.7	2.6			0.035 *							
I feel dread at the thought of this use of biotechnology	3.1	3.0	3.3	2.8	3.1			0.073 *		0.043 *			0.000 ***		
I am confident that any unexpected outcomes from this biotechnology can be controlled	2.4	2.7	2.3	2.6	2.3	0.050 *		0.088 *		0.008 **		0.028 *	0.014 *		0.051 *
I fear that use of this biotechnology will result in irreversible harmful outcomes	3.2	3.2	3.5	3.0	3.3		0.040 *			0.025 *			0.000 ***	0.065 *	0.092 *
I feel that the use of this biotechnology would be unethical	3.2	3.0	3.3	3.1	3.0					0.049 *					
I feel that the use of this biotechnology would be unnatural	3.4	3.4	3.6	3.2	3.4								0.022 *		
Average (inverting values for negative statements)	2.74	2.92	2.76	2.96	3.01	0.082 *		0.024 *	0.013 **				0.035 *	0.019 **	

1= strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree.

Table A11: Results from the example of embryo stem cells inserted into brain to treat alzheimer's disease

Specific examples of biotechnology 5: Embryo stem cells inserted into brain to treat Alzheimer's disease	Cluster means					Differences between clusters – p-values									
Statement	**1**	**2**	**3**	**4**	**5**	**1-2**	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
The use of this biotechnology is acceptable to me	3.2	3.4	3.0	3.4	3.3					0.022 *			0.010 **	0.044 *	
I am familiar with this use of biotechnology	2.8	2.7	2.8	3.0	3.0				0.068 *		0.041 *	0.016 **		0.060 *	
I feel dread at the thought of this use of biotechnology	2.7	2.8	3.0	2.8	2.8		0.052 *								
I am confident that any unexpected outcomes from this biotechnology can be controlled	2.7	3.0	2.6	2.9	2.8	0.053 *		0.070 *		0.005 **			0.006 **	0.077 *	
I fear that use of this biotechnology will result in irreversible harmful outcomes	2.9	2.9	3.1	2.9	2.9		0.052 *			0.092 *			0.019 **		
I feel that the use of this biotechnology would be unethical	2.9	2.9	3.1	2.9	3.0										
I feel that the use of this biotechnology would be unnatural	3.0	3.1	3.3	3.0	3.1		0.029 *						0.013 *		
Average (after inverting the negative statements)	3.02	3.05	2.82	3.09	3.04		0.075 *			0.035 *			0.007 **	0.050 *	

1= strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree.

Table A12: Results from taking averages over all five examples of biotechnology

	Cluster means					Differences between clusters – p-values									
Statement	**1**	**2**	**3**	**4**	**5**	**1-2**	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
The use of this biotechnology is acceptable to me	2.95	3.16	2.90	3.15	3.02	0.062 *		0.059 *	0.036 *	0.023 *			0.020 **	0.013 **	
I am familiar with this use of biotechnology	2.49	2.55	2.56	2.75	2.60			0.008 **			0.034 *		0.047 *		
I feel dread at the thought of this use of biotechnology	2.83	2.78	2.92	2.74	2.71								0.077 *	0.071 *	
I am confident that any unexpected outcomes from this biotechnology can be controlled	2.59	2.80	2.55	2.84	2.79	0.049 *		0.016 **	0.079 *	0.018 **			0.004 **	0.033 *	
I fear that use of this biotechnology will result in irreversible harmful outcomes	3.01	2.98	3.15	2.94	3.00					0.094 *			0.028 *		
I feel that the use of this biotechnology would be unethical	2.92	2.78	2.94	2.87	2.79										
I feel that the use of this biotechnology would be unnatural	3.13	3.18	3.33	3.08	3.09								0.032 *	0.066 *	

1= strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree.

Table A13: Results from the 'Views on biotechnology' section

Views on biotechnology	Cluster means					Differences between cluster									
Statement	**1**	**2**	**3**	**4**	**5**	**1-2**	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
Biotechnology can improve on the imperfections of nature	3.1	3.3	3.1	3.3	3.4				0.073 *					0.047 *	
Biotechnology can fix environmental problems that have been caused by humans	3.5	3.4	3.3	3.4	3.4										
Animals and plants that have been genetically modified have a right to live and reproduce [a]	2.7	2.9	2.9	3.1	2.8			0.026 * (***)					(*)	(*)	
Genetic modification is a major step because nature hasn't done anything like this before [a]	3.0	3.1	3.1	3.1	3.0										
Biotechnology simply harnesses and uses natural processes	2.7	2.7	2.6	2.9	2.7			0.095 *					0.022 *		0.057 *
Part of natural evolution is that people will start to play with genes [a]	3.0	3.1	2.9	3.2	3.0								(*)		
The genetic makeup of humans and other animals is very similar	3.0	3.0	3.2	3.2	3.1		0.019 **	0.076 *		0.052 *					
We are made in the image of God and shouldn't destroy this	2.8	2.8	2.9	3.2	2.8			0.017 **			0.005 **		0.076 *		0.010 **
When we try to play God we make mistakes [a]	3.6	3.5	3.9	3.7	3.7		(*)			0.046 * (**)	(*)				
God made people responsible for the welfare of other living things	3.0	3.0	3.1	3.5	3.0			0.001 ***			0.000 ***		0.004 **		0.001 ***
It feels wrong to mix genetic material from plants and animals	3.5	3.3	3.7	3.4	3.5					0.005 **			0.011 **		
It was wrong to lift the moratorium on field trials of genetically modified plants	3.3	3.0	3.5	3.2	3.3					0.003 **			0.024 *		
It is worrying that the food we eat might have been produced using genetic modification	3.4	3.3	3.6	3.3	3.3					0.026 *			0.036 *	0.049 *	
The use of biotechnology needs to be transparent, so that we all know about what is being developed	4.5	4.2	4.5	4.4	4.5	0.024 *				0.005 **	0.024 *	0.031 *			

[a] Have unequal variances within clusters. The result given here is that found using Tamahane's T2 for paired comparisons for means with unequal variances. The comparison using an LSD (which assumes equality of variances) from a combined estimate of the variance is given in brackets.
1= strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree.
There are no averages given here across items because each statement was disparate from the rest.

Table A14: Results from 'Information about biotechnology' items

Information about biotechnology	Cluster means					Differences between cluster									
Statement	**1**	**2**	**3**	**4**	**5**	**1-2**	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
I usually believe statements by regulatory agencies [a]	2.9	3.0	2.9	3.1	2.8			(*)					(*)		0.100 * (**)
I usually believe statements by university scientists	3.1	3.3	3.2	3.4	3.3	0.048 *		0.000 ***	0.055 *		0.077 *		0.015 **		
I usually believe reports in the newspapers and on the radio or TV	2.4	2.6	2.5	2.7	2.5	0.089 *		0.004 **					0.071 *		0.013 *
I usually believe statements made by crown research institutes	3.1	3.2	3.2	3.4	3.3			0.002 **	0.090 *		0.017 **		0.057 *		
I usually believe statements by politicians	1.7	2.0	1.9	2.1	1.8	0.003 **	0.025 *	0.000 ***				0.014 *		0.082 *	0.001 ***
I usually believe statements by biotech companies	2.2	2.5	2.2	2.6	2.2	0.020 *		0.001 ***		0.006 **		0.013 **	0.000 ***		0.000 ***
Average	2.55	2.75	2.66	2.89	2.63	0.012 **		0.000 ***			0.058 *		0.002 ***		0.001 ***

[a] Have unequal variances within clusters. The result given here is that found using Tamahane's T2 for paired comparisons for means with unequal variances. The comparison using an LSD (which assumes equality of variances) from a combined estimate of the variance is given in brackets.
1= strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree.

Table A15: Results from section on 'Who benefits from biotechnology?'

Who benefits from biotechnology?	Cluster means					Differences between clusters – p-values									
Statement	**1**	**2**	**3**	**4**	**5**	**1-2**	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
Biotechnology will benefit private corporations or companies	4.1	3.9	4.1	3.9	4.1	0.080 *		0.068 *		0.047 *		0.048 *	0.038 *		0.040 *
Biotechnology will benefit the New Zealand public	3.0	3.2	3.0	3.3	3.0			0.015 *					0.017 *		0.036 *
Biotechnology will benefit the New Zealand economy	3.1	3.3	3.0	3.3	3.1					0.044 *			0.065 *		
Biotechnology will improve the quality of life for all New Zealanders	2.8	2.9	2.7	3.1	2.9			0.004 **		0.093 *			0.002 ***		
Myself or a member of my immediate family would benefit from a medical treatment developed using biotechnology	2.9	3.1	3.0	3.2	2.9			0.018 *					0.095 *		0.045 *
Average of all but first statement	2.94	3.11	2.9	3.18	2.98	0.093 *		0.012 **		0.069 *			0.007 **		0.035 *

1= strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree.

Table A16: Results from 'Concerns about biotechnology' items

Concerns about biotechnology	Cluster means					Differences between cluster									
Statement	**1**	**2**	**3**	**4**	**5**	**1-2**	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
The use of genetically modified plants will result in the cross contamination of non-GM seeds	3.9	3.7	3.9	3.6	3.9			0.042 *		0.074 *			0.020 **		0.043 *
Genetically modified organisms will spread into places we do not want them	3.9	3.7	4.0	3.7	3.9					0.014 *		0.093 *	0.004 **		0.043 *
People will not always comply with rules or regulations governing the development and release of genetically modified organisms	4.2	3.9	4.2	4.0	4.2	0.014 *		0.016 *		0.026 *		0.005 **	0.030 *		0.006 **
Genetically modified organisms will mutate into something dangerous	3.3	3.2	3.4	3.3	3.3										
The commercialisation of biotechnology will result in more risk to the public or the environment	3.5	3.4	3.6	3.5	3.7					0.049 *		0.022 *			
The release of genetically modified organisms will damage exports by tarnishing New Zealand's image of being clean and green	3.8	3.6	3.8	3.7	3.6	0.062 *									
Biotechnology may solve a problem but it can also create more problems	4.1	3.8	4.1	3.9	4.1	0.031 *		0.093 *		0.017 **		0.038 *	0.055 *		
Average	3.80	3.62	3.84	3.68	3.83	0.053 *				0.020 **		0.025 *	0.066 *		0.078 *

1= strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree.

Table A17: Results from 'Overall attitude to biotechnology' section

Overall attitude to biotechnology	Cluster means					Differences between cluster									
Statement	**1**	**2**	**3**	**4**	**5**	**1-2**	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
Biotechnology is acceptable to me	3.2	3.4	3.1	3.2	3.3					0.031 *				0.061 *	
I am familiar with biotechnology	2.8	3.0	2.9	3.0	2.9										
I feel dread at the thought of biotechnology	2.8	2.7	2.8	2.8	2.8										
I am confident that any unexpected outcomes from biotechnology can be controlled	2.5	2.7	2.4	2.7	2.5			0.097 *		0.018 **			0.003 **		0.044 *
I fear that use of biotechnology will result in irreversible harmful outcomes	3.2	3.1	3.5	3.2	3.2		0.081 *			0.002 ***			0.042 *	0.053 *	
I feel that the use of biotechnology would be unethical	2.9	2.8	3.0	2.9	2.9										
I feel that the use of biotechnology would be unnatural	3.2	3.1	3.3	3.1	3.1									0.094 *	
Average (after inverting the negative statements)	2.93	3.04	2.82	2.98	2.98					0.026 *			0.096 *		

1= strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree.

Table A18: Results from the section on 'Buying the products of biotechnology'

Buying the products of biotechnology	Cluster means					Differences between cluster									
Statement	**1**	**2**	**3**	**4**	**5**	**1-2**	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
Butter from cows genetically modified to produce 50% less cholesterol in their milk [a]	2.7	2.7	2.5	2.9	2.6			(*)		(*)			0.013 * (***)		(*)
Meat from sheep genetically modified for 'double-muscling', producing more meat and less fat per animal	2.5	2.7	2.5	2.8	2.6			0.036 *		0.047 *			0.006 **		0.050 *
Bread made from genetically modified wheat that is 25% cheaper to grow	2.6	2.7	2.5	2.9	2.6			0.012 **		0.076 *			0.003 **		0.016 *
Apples genetically modified to produce twice as much antioxidants, which may help to prevent cancer [a]	2.7	2.9	2.5	3.0	2.7			(*)		0.100 * (**)			0.005 ** (***)		(*)
Milk from cows that are grown on pastures containing genetically modified clover [a]	2.6	2.7	2.5	2.9	2.7			(**)		(*)			0.016 ** (***)		(*)
Sweetcorn that has been genetically modified to resist insects so that it requires 50% less than the usual application of pesticides [a]	2.7	2.9	2.6	3.0	2.7			(*)		(*)			(**)		(*)
Average [a]	2.62	2.78	2.50	2.91	2.64			(*)		(*)			0.013 ** (**)		(*)

[a] Have unequal variances within clusters. The result given here is that found using Tamahane's T2 for paired comparisons for means with unequal variances. The comparison using an LSD (which assumes equality of variances) from a combined estimate of the variance is given in brackets.
1 = definitely intend not to purchase, 2 = intend not to purchase, 3 = not intention to either purchase or not purchase, 4 = intend to purchase, 5 = definitely intend to purchase.

Table A19: Results from the section on 'Attitudes to nature'

Attitudes toward nature	Cluster means					Differences between cluster									
Statement	**1**	**2**	**3**	**4**	**5**	**1-2**	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
When we interfere with nature the consequences are unpredictable	3.9	3.8	4.0	3.9	4.0					*					
If we interfere with nature our descendants will pay for it	3.6	3.4	3.8	3.6	3.6					**					
Nature can adapt to the products of genetic engineering	2.9	2.9	2.9	3.0	3.0										
The environment may have been abused but it has a tremendous ability to recover	3.2	3.2	3.3	3.4	3.2										
We have a special position in nature [a]	3.9	3.8	3.8	4.0	3.7										(**)
If we didn't have a natural desire to improve the world, we'd still be back in the caves [a]	3.2	3.5	3.2	3.6	3.5	(*)		* (**)					(**)		
It is wrong to play God with living things	3.3	3.3	3.4	3.4	3.2										
Nature knows best	3.4	3.4	3.4	3.7	3.3			**			*		*		***
Nature is morally good	3.1	3.3	3.1	3.5	3.2			***			*		***		**
Nature is pure and wild	3.4	3.4	3.4	3.7	3.4			**			***		***		*
Nature is dynamic	3.8	3.8	4.0	3.9	4.0										
Nature exists in a state of ecological harmony	3.4	3.4	3.4	3.6	3.5			*							
At least once I my life, I have felt a deep connection with nature	3.9	3.8	4.1	4.0	3.9		*	*		***	**				
I remember when the environment was more natural	3.8	3.6	3.8	3.9	3.7					*	**				*
The environment probably doesn't need as much protection as we imagine	2.4	2.7	2.3	2.8	2.8			**	*	**			***	***	
Nature may be resilient but can only absorb a very limited amount of damage [a]	3.8	3.6	3.9	3.8	3.7					** (**)				(*)	
Nature is essentially a very fragile thing. It cannot withstand what has been done to it thus far.	3.3	3.1	3.4	3.3	3.2					*					
Nature is made up of complex interdependencies. Human meddling of the kind introduced by genetic modification will cause a chain reaction with unanticipated effects.	3.6	3.4	3.7	3.5	3.6					*					
We shouldn't be too worried about environmental	2.2	2.4	2.1	2.5	2.2					*			**		

Attitudes toward nature	Cluster means					Differences between cluster									
Statement	**1**	**2**	**3**	**4**	**5**	**1-2**	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
damage.. Technology is developing so quickly that in the future people will be able to repair most of the environmental damage that has been done [a]								(*)		(**)			(***)		(**)
Average of statements about resilience of nature (after inverting the negative statements)	2.53	2.66	2.43	2.62	2.59					**			**	*	
Average of statements about romantic nature	3.41	3.44	3.45	3.68	3.48			**			**		**		*

[a] Have unequal variances within clusters. The result given here is that found using Tamahane's T2 for paired comparisons for means with unequal variances. The comparison using an LSD (which assumes equality of variances) from a combined estimate of the variance is given in brackets.
1= strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree.

Table A20: Distribution of cluster means over national identity statements

	Cluster means					Differences between cluster – p-values									
Statement	**1**	**2**	**3**	**4**	**5**	**1-2**	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
New Zealand is clean and green[a]	3.1	3.4	2.3	4.0	3.7	(0.005)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.013 (0.001)	0.000 (0.000)	0.000 (0.000)	0.013 0.003
Agriculture is important [a]	4.4	4.2	4.0	4.5	4.4	0.041 (0.009)	0.000 (0.000)			0.014 (0.009)	0.000 (0.000)	0.020 (0.003)	0.000 (0.000)	0.000 (0.000)	
Sheep are important	4.2	3.8	3.7	4.4	4.1	0.000	0.000				0.000	0.002	0.000	0.000	0.005
Winning at sport is important [a]	2.6	3.5	3.5	4.0	4.1	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)		0.000 (0.000)	0.000 (0.000)	0.001 (0.000)	0.000 (0.000)	
The kiwi is important [a]	3.6	4.2	4.3	4.5	4.5	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)		0.000 (0.000)	0.000 (0.000)	0.051 (0.008)	(0.034)	
Value something if it is useful [a]	3.2	3.8	4.0	4.2	3.9	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.032 (0.008)	0.000 (0.000)		0.044 (0.014)		0.000 (0.000)
In touch with the land [a]	2.8	3.2	2.8	4.0	3.1	0.002 (0.000)		0.000 (0.000)	(0.031)	0.000 (0.000)	0.000 (0.000)		0.000 (0.000)	(0.009)	0.000 (0.000)
Value business success [a]	3.6	3.9	4.0	4.1	2.9	0.046 (0.006)	0.004 (0.000)	0.000 (0.000)	0.000 (0.000)		0.001 (0.000)	0.000 (0.000)	(0.015)	0.000 (0.000)	0.000 (0.000)
Value science and research [a]	3.5	3.7	3.6	4.2	2.5	(0.049)		0.000 (0.000)	0.000 (0.000)		0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Value arts and craft [a]	3.1	3.3	3.4	4.0	2.8		0.047 (0.003)	0.000 (0.000)	(0.008)		0.000 (0.000)	0.001 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
World needs a more equal distribution of wealth [a]	4.0	2.4	4.3	4.1	3.8	0.000 (0.000)	0.015 (0.002)		(0.010)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)		0.000 (0.000)	0.000 (0.000)
Average	**3.41**	**3.69**	**3.56**	**4.19**	**3.59**										

1 = strongly disagree, 2 = disagree, 3 neither agree nor disagree, 4 = agree, 5 = strongly agree

[a] Have unequal variances within clusters. The result given here is that found using Tamahane's T2 for paired comparisons for means with unequal variances. The comparison using an LSD (which assumes equality of variances) from a combined estimate of the variance is given in brackets.

Note: The overall comparison of clusters 3 and 5 balanced out because sometimes cluster 3 was higher than Cluster 5 and sometimes it was the other way around. This is why doing an overall mean is worth taking note of but should not have too much weight placed on it. This interaction type effect is also occurring in other comparisons.

Table A21: Distribution of cluster means over statements about technology

Technology	Cluster means					Differences between cluster									
Statement	**1**	**2**	**3**	**4**	**5**	**1-2**	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
A technological society has the best chance of eliminating poverty	3.0	3.2	3.0	3.3	3.2			**					**		
Advances in technology mean that the goals of a society can be realised	3.0	3.3	3.0	3.4	3.3	*		***	*	*			***		
Living a simpler lifestyle is the best way to conserve energy and resources [a]	3.6	3.4	3.8	3.8	3.5			* (*)		** (***)	*** (***)			(**)	** (***)
Wealthy nations should consume less and limit their use of resources	3.6	3.3	4.0	3.8	3.7	**	***			***	***	***	**	**	
Groups that oppose the emphasis on materialistic values deserve support	3.1	3.0	3.5	3.4	3.2		**	**		***	***	*		*	
Average of pro-technology statements	2.98	3.21	3.02	3.36	3.20	*		***					***		
Average of anti-materialistic statements	3.44	3.21	3.78	3.67	3.45	**	***	**		***	***	***		***	**

1= strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree.

[a] Have unequal variances within clusters. The result given here is that found using Tamahane's T2 for paired comparisons for means with unequal variances. The comparison using an LSD (which assumes equality of variances) from a combined estimate of the variance is given in brackets.

Table A22: Distribution of cluster means on statements about 'clean, green New Zealand'

Clean Green New Zealand	Cluster means					Differences between cluster									
Statement	**1**	**2**	**3**	**4**	**5**	**1-2**	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
New Zealand's natural environment is more clean and green than other countries [a]	3.5	3.6	3.4	4.1	3.9			*** (***)	** (***)	(**)	*** (***)	* (**)	*** (***)	*** (***)	
Agricultural production in New Zealand has few adverse effects on the environment	2.8	3.1	2.4	3.4	3.0	**	**	***		***	*		***	***	***
I think that New Zealand could one day become clean and green [a]	3.4	3.5	3.7	3.8	3.6		(*)	*** (***)		(*)	*** (***)				** (**)
I am proud of our current international status as a clean and green country [a]	3.6	3.8	3.4	4.1	4.0	(*)	(**)	*** (***)	*** (***)	*** (***)	*** (***)	(*)	*** (***)	*** (***)	
New Zealand used to be more clean and green than it is now	4.0	3.9	4.2	4.0	3.9		*			***			*	**	
Clean green New Zealand is a myth	3.1	2.8	3.4	2.4	2.7	*	*	***	***	***	***		***	***	*
Average (after inverting the negative statements) [a]	2.91	3.07	2.65	3.22	3.14	(**)	*** (***)	*** (***)	*** (***)	*** (***)	* (**)		*** (***)	*** (***)	

1= strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree.

[a] Have unequal variances within clusters. The result given here is that found using Tamahane's T2 for paired comparisons for means with unequal variances. The comparison using an LSD (which assumes equality of variances) from a combined estimate of the variance is given in brackets.

Table A23: Distribution of cluster means on statements about spirituality

Spirituality	Cluster means					Differences between clusters – p-values									
Statement	**1**	**2**	**3**	**4**	**5**	**1-2**	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
I often think about the meaning of life [a]	3.1	3.1	3.6	3.8	3.3		** (***)	*** (***)		*** (***)	*** (***)			(*)	*** (***)
I often have the feeling that life is meaningless	2.1	2.1	2.1	2.2	2.2										
I attend religious services on a regular basis [a]	2.3	2.0	2.3	2.5	2.1						** (***)				* (***)
I believe there is a personal God	3.0	2.8	3.1	3.4	2.8			*			***			*	***
I believe there is some sort of life force or spirit, not a person	3.2	3.1	3.4	3.4	3.3						*				
I believe that people have a soul [a]	3.7	3.6	3.7	4.0	3.6			(*)			* (**)				* (**)
I believe that sin exists [a]	3.5	3.5	3.6	3.9	3.3			* (**)			* (**)		(*)		*** (***)
I believe in life after death	3.2	3.1	3.1	3.4	3.1						*		*		*
Average of statements which represent a conservative theology (last 3)	3.46	3.40	3.46	3.77	3.30			**			***		**		***

[a] Have unequal variances within clusters. The result given here is that found using Tamahane's T2 for paired comparisons for means with unequal variances. The comparison using an LSD (which assumes equality of variances) from a combined estimate of the variance is given in brackets.

1= strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree.

Table A24: Distribution of cluster means over statements about 'General viewpoints'

General viewpoints	Cluster means					Differences between cluster									
Statement	**1**	**2**	**3**	**4**	**5**	**1-2**	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
I often feel discriminated against	2.4	2.4	2.5	2.5	2.5										
In a fair system, people who try harder should be rewarded financially [a]	3.6	3.6	3.6	3.8	3.8			* (**)			(*)		(*)		
The government should strictly limit people's personal risk-taking activities [a]	2.3	2.0	2.3	2.5	2.0	(*)		(*)	(*)	(*)	*** (***)		(*)		*** (***)
My whole life feels like it's falling apart	1.8	1.7	1.8	1.8	1.6									*	*
It is OK for society to impose a small amount of risk on individuals without their consent [a]	2.1	2.2	2.2	2.4	2.3			* (**)	(*)		(*)				
The world needs a more equal distribution of wealth [a]	4.0	2.4	4.3	4.1	3.8	*** (***)	* (**)		(**)	*** (***)	*** (***)	*** (***)		*** (***)	*** (***)
Life's ups and downs are mostly a matter of fate or divine will, not personal control [a]	2.5	2.3	2.4	2.7	2.4						* (**)		(**)		(*)
I have very little control over risks to my health	2.3	2.4	2.4	2.5	2.5			*	*						
Average – external control	2.61	2.37	2.68	2.80	2.62	***		***		***	***	***	*		***

[a] Have unequal variances within clusters. The result given here is that found using Tamahane's T2 for paired comparisons for means with unequal variances. The comparison using an LSD (which assumes equality of variances) from a combined estimate of the variance is given in brackets.
1= strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree.

Table A25: Gender distribution across clusters

			Sex		
			Male	Female	Total
Cluster Number for 5 clusters	1	Count	51	62	113
		% within Cluster Number for 5 clusters	45%	55%	100%
	2	Count	63	71	134
		% within Cluster Number for 5 clusters	47%	53%	100%
	3	Count	62	58	120
		% within Cluster Number for 5 clusters	52%	48%	100%
	4	Count	89	91	180
		% within Cluster Number for 5 clusters	49%	51%	100%
	5	Count	51	55	106
		% within Cluster Number for 5 clusters	48%	52%	100%
Total		Count	316	337	653
		% within Cluster Number for 5 clusters	48%	52%	100%

Pearson Chi-Square = 1.2, d.f. = 4, p = 0.881

Table A26: Demographics: Age of respondents for each cluster

	Cluster means					Differences between clusters – p-values									
Statement	**1**	**2**	**3**	**4**	**5**	**1-2**	**1-3**	**1-4**	**1-5**	**2-3**	**2-4**	**2-5**	**3-4**	**3-5**	**4-5**
Age	51.8	48.5	51.9	58.1	48.9			**			***		**		***

Table A27: Crosstabulation of age classes over the clusters

			Age							
			< 30	30 - 39	40 - 49	50 - 59	60 - 69	70 - 79	>80	Total
Cluster Number for 5 clusters	1	Count	14	21	24	12	16	18	6	111
		% within Cluster Number for 5 clusters	13%	19%	22%	11%	14%	16%	5%	100%
	2	Count	16	29	36	19	15	15	3	133
		% within Cluster Number for 5 clusters	12%	22%	27%	14%	11%	11%	2%	100%
	3	Count	12	24	23	19	20	19	3	120
		% within Cluster Number for 5 clusters	10%	20%	19%	16%	17%	16%	3%	100%
	4	Count	19	21	18	21	34	43	19	175
		% within Cluster Number for 5 clusters	11%	12%	10%	12%	19%	25%	11%	100%
	5	Count	13	20	26	26	9	10	4	108
		% within Cluster Number for 5 clusters	12%	19%	24%	24%	8%	9%	4%	100%
Total		Count	74	115	127	97	94	105	35	647
		% within Cluster Number for 5 clusters	11%	18%	20%	15%	15%	16%	5%	100%

Pearson Chi-Square = 61.0, d.f. = 24, p = 0.000

Graph A1: Age distribution across clusters

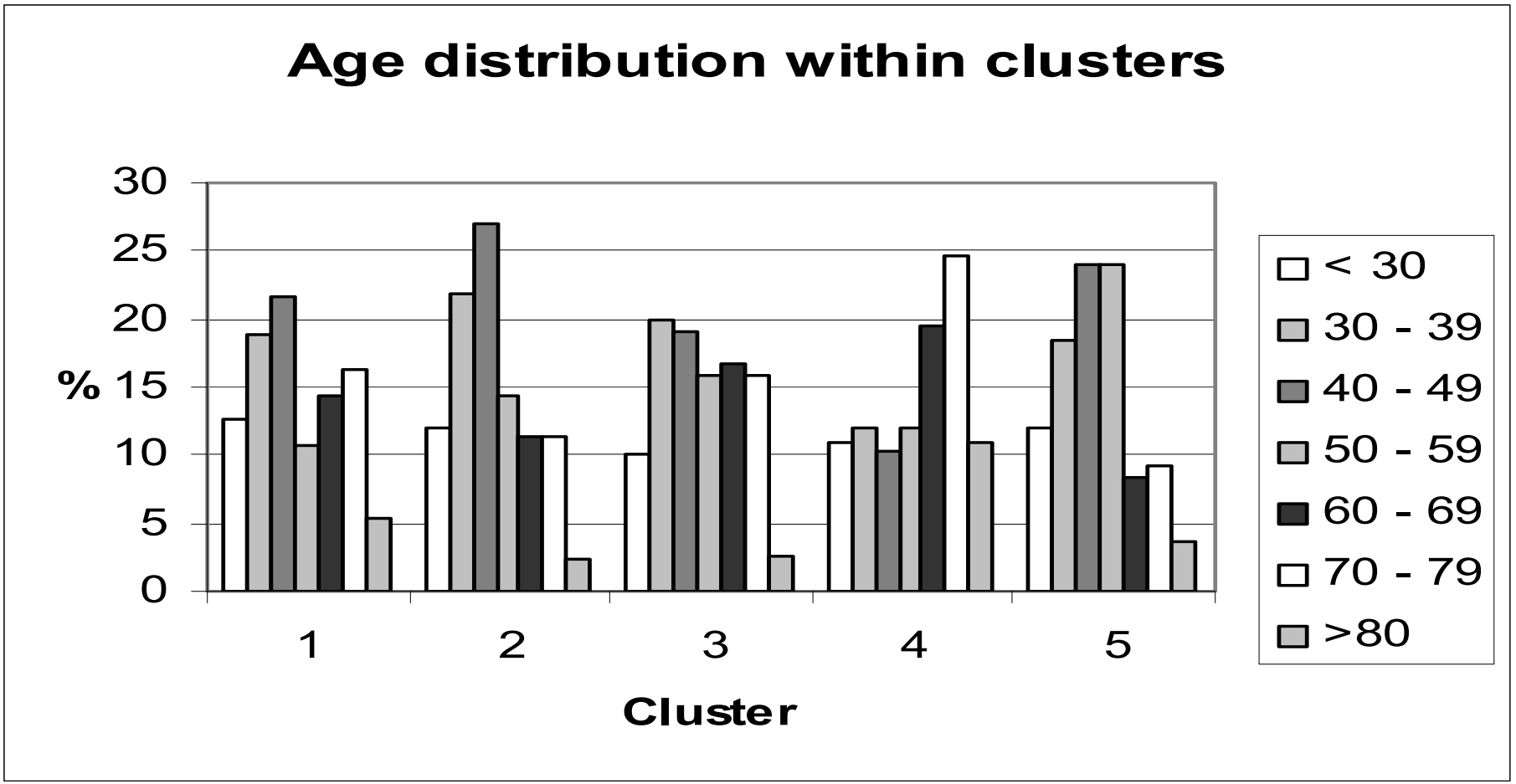

Table A28: Crosstabulation of income with cluster

			Personal income						Total
			Less than $15000	$15001 to $20000	$20001 to $40000	$40001 to $60000	$60001 to $100000	$100001 and above	
Cluster Number for 5 clusters	1	Count	25	11	26	26	11	5	104
		% within Cluster Number for 5 clusters	24%	11%	25%	25%	11%	5%	100%
	2	Count	27	12	30	22	27	11	129
		% within Cluster Number for 5 clusters	21%	9%	23%	17%	21%	9%	100%
	3	Count	28	15	40	14	13	4	114
		% within Cluster Number for 5 clusters	25%	13.2%	35%	12%	11%	4%	100%
	4	Count	55	27	45	24	13	5	169
		% within Cluster Number for 5 clusters	33%	16%	27%	14%	8%	3%	100%
	5	Count	19	8	29	27	14	7	104
		% within Cluster Number for 5 clusters	18%	8%	28%	26%	14%	7%	100%
Total		Count	154	73	170	113	78	32	620
		% within Cluster Number for 5 clusters	25%	12%	27%	18	13%	5%	100%

Pearson Chi-Square = 41.5, d.f. = 20, p = 0.003

Table A29: Crosstabulation of ethnic group with cluster

			Ethnic group									
			NZ Maori	1.2	NZ European	European	Tongan	Samoan	Indian	Chinese	Other Asian	Total
Cluster Number for 5 clusters	1	Count	1	1	83	20	0	0	1	2	0	108
		% within Cluster Number for 5 clusters	1%	1%	77%	19%	0%	0%	1%	2%	0%	100%
	2	Count	4	2	113	14	0	0	0	0	0	133
		% within Cluster Number for 5 clusters	3%	2%	85%	11%	0%	0%	0%	0%	0%	100%
	3	Count	8	4	92	12	1	1	0	0	0	118
		% within Cluster Number for 5 clusters	7%	3%	78%	10%	1%	1%	0%	0%	0%	100%
	4	Count	9	1	145	17	0	0	2	1	1	176
		% within Cluster Number for 5 clusters	5%	1%	82%	10%	0%	0%	1%	1%	1%	100%
	5	Count	2	1	84	15	0	0	0	2	1	105
		% within Cluster Number for 5 clusters	2%	1%	80%	14%	0%	0%	0%	2%	1%	100%
Total		Count	24	9	517	78	1	1	3	5	2	640
		% within Cluster Number for 5 clusters	4%	1%	81%	12%	0%	0%	1%	1%	0%	100%

Too many empty cells so recoded grouping NZ Maori, those who said they were NZ Maori and N.Z. European, Tongan, Samoan. Omitted Indian, Chinese, other Asian as only 10 in these categories (1.6%).

Table A30: Crosstabulation of ethnic group with cluster (reduced)

			Ethnicity			
			Maori, Samoan, Tongan	N.Z. European	European	Total
Cluster Number for 5 clusters	1	Count	2	83	20	105
		% within Cluster Number for 5 clusters	2%	79%	19%	100%
	2	Count	6	113	14	133
		% within Cluster Number for 5 clusters	5%	85%	11%	100%
	3	Count	14	92	12	118
		% within Cluster Number for 5 clusters	12%	78%	10%	100%
	4	Count	10	145	17	172
		% within Cluster Number for 5 clusters	6%	84%	10%	100%
	5	Count	3	84	15	102
		% within Cluster Number for 5 clusters	3%	82%	15%	100%
Total		Count	35	517	78	630
		% within Cluster Number for 5 clusters	6%	82%	12%	100%

Pearson's Chi-Square = 19.0, d.f. = 8, p = 0.015

Table A31: Crosstabulation of education with cluster

			Education						Total
			Attended primary and/or secondary	S.C. in one or more subjects	Sixth From Certificate in one or more subjects, U.E. before 1986 in one or more subjects, Higher School Certificate, Higher Leaving Certificate	Diploma or Trade Certificate	Bachelor's degree	Posgraduate qualification	
Cluster Number for 5 clusters	1	Count	24	11	18	29	17	14	113
		% within Cluster Number for 5 clusters	21%	10%	16%	26%	15%	12%	100%
	2	Count	21	17	17	51	19	10	135
		% within Cluster Number for 5 clusters	16%	13%	13%	38%	14%	7%	100%
	3	Count	21	14	11	35	17	22	120
		% within Cluster Number for 5 clusters	18%	12%	9%	29%	14%	18%	100%
	4	Count	43	22	27	43	22	24	181
		% within Cluster Number for 5 clusters	24%	12%	15%	24%	12%	13%	100%
	5	Count	7	12	9	36	25	17	106
		% within Cluster Number for 5 clusters	7%	11%	9%	34%	24%	16%	100%

		Education						Total
		Attended primary and/or secondary	S.C. in one or more subjects	Sixth From Certificate in one or more subjects, U.E. before 1986 in one or more subjects, Higher School Certificate, Higher Leaving Certificate	Diploma or Trade Certificate	Bachelor's degree	Posgraduate qualification	
Total	Count	116	76	82	194	100	87	655
	% within Cluster Number for 5 clusters	18%	12%	13%	30%	15%	13%	100%

Some categories have been grouped as shown.
Pearson's Chi-Square = 36.2, d.f. = 20, p = 0.015

Table A32: Crosstabulation of religious belief with cluster

			Religious belief								
			Buddhist	**Christian**	**Hindu**	**Islam/Moslem**	**Agnostic**	**Atheist**	**Spiritual but not religious**	**Other**	**Total**
Cluster Number for 5 clusters	1	Count	1	56	1	0	10	16	19	0	103
		% within Cluster Number for 5 clusters	1%	54%	1%	0%	10%	16%	18%	0%	100%
	2	Count	0	71	0	0	10	20	27	0	128
		% within Cluster Number for 5 clusters	0%	56%	0%	0%	8%	16%	21%	0%	100%
	3	Count	1	51	0	0	9	11	36	0	108
		% within Cluster Number for 5 clusters	1%	47%	0%	0%	8%	10%	33.	0%	100%
	4	Count	3	105	1	0	8	7	39	2	165
		% within Cluster Number for 5 clusters	2%	64%	1%	0%	5%	4%	24%	1%	100%
	5	Count	1	41	0	1	10	16	27	0	96
		% within Cluster Number for 5 clusters	1%	43%	0%	1%	10%	17%	28%	0%	100%
Total		Count	6	324	2	1	47	70	148	2	600
		% within Cluster Number for 5 clusters	1%	54%	0%	0%	8%	12%	25%	0%	100%

Some categories too small, so omitted them in next analysis – 11 respondents (1.8%).

Table A33: Crosstabulation of religious belief with cluster (reduced)

			Religious belief				
			Christian	**Agnostic**	**Atheist**	**Spiritual but not religious**	**Total**
Cluster Number for 5 clusters	1	Count	56	10	16	19	101
		% within Cluster Number for 5 clusters	55%	10%	16%	19%	100
	2	Count	71	10	20	27	128
		% within Cluster Number for 5 clusters	56%	8%	16%	21%	100%
	3	Count	51	9	11	36	107
		% within Cluster Number for 5 clusters	48%	8%	10%	34%	100%
	4	Count	105	8	7	39	159
		% within Cluster Number for 5 clusters	66%	5%	4%	25%	100%
	5	Count	41	10	16	27	94
		% within Cluster Number for 5 clusters	44%	11%	17%	29%	100%
Total		Count	324	47	70	148	589
		% within Cluster Number for 5 clusters	55%	8%	12%	25%	100%

Appendix 2
The Questionnaire

LINCOLN
UNIVERSITY
Te Whare Wānaka O Aoraki

NEW ZEALANDERS AND BIOTECHNOLOGY:

A NATIONWIDE SURVEY OF PUBLIC OPINION

November, 2003

Definition of Biotechnology

"BIOTECHNOLOGY IS A BROAD TERM FOR A GROUP OF TECHNOLOGIES THAT ARE BASED ON APPLYING BIOLOGICAL PROCESSES. IT INVOLVES THE USE OF LIVING THINGS OR THEIR DERIVATIVES TO SOLVE PROBLEMS AND MAKE PRODUCTS" (MINISTRY OF RESEARCH, SCIENCE AND TECHNOLOGY).

Biotechnologies have been used for a long time. For instance, traditional biotechnologies include fermentation for beer, bread-making, and animal and plant breeding techniques. There are now many environmental, agricultural and medical biotechnologies. Some of these include the use of genetic modification, or genetic engineering, to produce genetically modified organisms.

New Zealanders and Biotechnology

Instructions: For each question, please select the number for the option that best indicates your response and write it in the box provided on the right hand side of the page.

Section A

1. Issues facing society

When asked to think broadly about the kind of issues facing society today, some people mention the following items. Please indicate how concerned or unconcerned you are about each of the following.

Very unconcerned	Unconcerned	Neither concerned nor unconcerned	Concerned	Very concerned
1	**2**	**3**	**4**	**5**

Industrial pollution	
Unemployment	
Air pollution	
Climate change	
Loss of animal and plant species	
Crime and violence	
Biotechnology	
Illegal drug use	
Decline in water quality	
Natural hazards (e.g., earthquake, cyclones, floods, etc)	
Use of genetically modified organisms in agriculture	
Pesticide use	
The availability and quality of public health care	
Terrorism	
Motor vehicle accidents	
Global warming	

2. Acceptability of Biotechnology Items

The following are a number of environmental, agricultural and medical examples of biotechnology. Based on your current knowledge, please indicate your opinion about the acceptability or unacceptability of <u>each</u> example.

Very unacceptable	Unacceptable	Neither acceptable nor unacceptable	Acceptable	Very acceptable
1	**2**	**3**	**4**	**5**

(a) Environmental uses:

Use of genetically modified bacteria to help clean unwanted toxins in soil	
Producing a low pollution grain-based fuel for cars by genetically modifying a crop	
Developing a virus (genetically modified) that reduces fertility in possums	
Use of aerial sprays made from soil bacterium (Bacillis thuringiensis) to control unwanted insect pests in urban areas	
Cloning a kakapo to ensure the survival of the species	

(b) Medical uses:

Using bacteria in throat lozenges to prevent serious infections	
Inserting human genes into a cow to produce milk for the treatment of multiple sclerosis	
Preventing stomach cancer by modifying a person's genetic code	
Removing, repairing and then reinserting brain stem cells to help a sufferer of Huntington's disease	
Using new cells (stem cells) from a 5 day old human embryo to treat an Alzheimer sufferer	
Transplanting copies of pancreatic cells from pigs into a person to help treat diabetes	
Using DNA (gene) testing to help convict criminals	
Using a microscopic device to carry chemotherapy drugs through the blood-brain barrier to treat a brain tumor	
Using a miniature biosensor implanted into a human body to monitor blood sugar levels in diabetics	
Manipulating the molecular structure of sunscreen so that it penetrates the skin to provide greater protection against UV radiation	

(c) Agricultural uses:

Using genetic screening to breed sheep that produce twins or triplets	
Raising hormone levels in farm animals to increase fertility	
Genetically modifying potatoes to resist common pests or diseases	
Genetically modifying pine trees to produce stronger timber	
Genetically modifying kumara to resist common pests or diseases	
Inserting a plastic device containing bacteria into a sheep's stomach to reduce the production of harmful greenhouse gases	
Genetically modifying an apple to make it more nutritious	

3. Specific Examples of Biotechnology

Next, you will find descriptions of five biotechnologies. Based on your current knowledge, please indicate your level of agreement or disagreement with the statements following each example.

(a) A genetically modified bacterium can be developed that helps to repair soil damaged by DDE contamination (DDE is a harmful toxin that has remained in the soil from the use of the pesticide DDT).

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1	**2**	**3**	**4**	**5**

This use of biotechnology is acceptable to me	
I am familiar with this use of biotechnology	
I feel dread at the thought of this use of biotechnology	
I am confident that any unexpected outcomes from this biotechnology can be controlled	
I fear that use of this biotechnology will result in irreversible harmful outcomes	
I feel that use of this biotechnology would be unethical	
I feel that use of this biotechnology would be unnatural	

(b) Bacterium found naturally in some people's saliva can be manufactured and introduced into throat lozenges. A protein produced by these bacteria fights a more harmful form of bacteria that can cause throat infections, rheumatic fever and in some cases rheumatic heart disease.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1	**2**	**3**	**4**	**5**

This use of biotechnology is acceptable to me	
I am familiar with this use of biotechnology	
I feel dread at the thought of this use of biotechnology	
I am confident that any unexpected outcomes from this biotechnology can be controlled	
I fear that use of this biotechnology will result in irreversible harmful outcomes	
I feel that use of this biotechnology would be unethical	
I feel that use of this biotechnology would be unnatural	

(c) New Zealand's main source of Greenhouse gases that can harm the environment come from methane in the stomachs of sheep. A plastic device containing bacteria can be inserted into a sheep's stomach to reduce the production of methane gas

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1	**2**	**3**	**4**	**5**

This use of biotechnology is acceptable to me	
I am familiar with this use of biotechnology	
I feel dread at the thought of this use of biotechnology	
I am confident that any unexpected outcomes from this biotechnology can be controlled	
I fear that use of this biotechnology will result in irreversible harmful outcomes	
I feel that use of this biotechnology would be unethical	
I feel that use of this biotechnology would be unnatural	

(d) Using genetic modification a synthetic toad gene can be inserted into a potato in order to increase its resistance to disease.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1	**2**	**3**	**4**	**5**

This use of biotechnology is acceptable to me	
I am familiar with this use of biotechnology	
I feel dread at the thought of this use of biotechnology	
I am confident that any unexpected outcomes from this biotechnology can be controlled	
I fear that use of this biotechnology will result in irreversible harmful outcomes	
I feel that use of this biotechnology would be unethical	
I feel that use of this biotechnology would be unnatural	

(e) New cells (stem cells) from a 5 day-old human embryo can be inserted into the brain of a person with Alzheimer's disease. This serves to regenerate some of the brain cells that have been destroyed and therefore slow down or even reverse the disease's progression.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1	**2**	**3**	**4**	**5**

This use of biotechnology is acceptable to me	
I am familiar with this use of biotechnology	
I feel dread at the thought of this use of biotechnology	
I am confident that any unexpected outcomes from this biotechnology can be controlled	
I fear that use of this biotechnology will result in irreversible harmful outcomes	
I feel that use of this biotechnology would be unethical	
I feel that use of this biotechnology would be unnatural	

4. Views on Biotechnology

Some people said the following when we invited them to talk about biotechnology. Please indicate your level of agreement or disagreement with <u>each</u> of the following statements.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1	**2**	**3**	**4**	**5**

Biotechnology can improve on the imperfections of nature	
Biotechnology can fix environmental problems that have been caused by humans	
Animals and plants that have been genetically modified have a right to live and reproduce	
Genetic modification is a major step because nature hasn't done anything like this before	
Biotechnology simply harnesses and uses natural processes	
Part of natural evolution is that people will start to play with genes	
The genetic make up of humans and other animals is very similar	
We are made in the image of God and shouldn't destroy this	
When we try to play God we make mistakes	
God made people responsible for the welfare of other living things	
It feels wrong to mix genetic material from plants and animals	
It was wrong to lift the moratorium on field trials of genetically modified plants	
It is worrying that the food we eat might have been produced using genetic modification	
The use of biotechnology needs to be transparent, so that we all know about what is being developed	

5. Information about biotechnology

Please indicate your agreement or disagreement with information from each of the following sources of information about biotechnology.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1	**2**	**3**	**4**	**5**

I usually believe statements by regulatory agencies	
I usually believe statements by university scientists	
I usually believe reports in newspapers and on the radio or TV	
I usually believe statements made by crown research institutes	
I usually believe statements made by politicians	
I usually believe statements by biotech companies	

6. Who benefits from Biotechnology?

Some people express concern about who benefits from biotechnology. Based on your current knowledge, please indicate your level of agreement or disagreement with each of the following statements about who benefits from biotechnology.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1	**2**	**3**	**4**	**5**

Biotechnology will benefit private corporations or companies	
Biotechnology will benefit the New Zealand public	
Biotechnology will benefit the New Zealand economy	
Biotechnology will improve the quality of life for all New Zealanders	
Myself or a member of my immediate family would benefit from a medical treatment developed using biotechnology	

7. Concerns about biotechnology

Some people we have interviewed mentioned the following concerns about biotechnology. Please indicate your level of agreement or disagreement with <u>each</u> of the following concerns about biotechnology.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1	**2**	**3**	**4**	**5**

The use of genetically modified plants will result in the cross contamination of non-GM seeds	
Genetically modified organisms will spread into places we do not want them	
People will not always comply with rules or regulations governing the development and release of genetically modified organisms	
Genetically modified organisms will mutate into something dangerous	
The commercialisation of biotechnology will result in more risk to the public or the environment	
The release of genetically modified organisms will damage exports by tarnishing New Zealand's image of being clean and green	
Biotechnology may solve a problem but it can also create more problems	

8. Overall Attitude to Biotechnology

Please provide your view of biotechnology as a whole given that it means the use of living things to solve problems and make products. Based on your current knowledge, please indicate your level of agreement or disagreement with <u>each</u> of the following statements

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1	**2**	**3**	**4**	**5**

Biotechnology is acceptable to me	
I am familiar with biotechnology	
I feel dread at the thought of biotechnology	
I am confident that any unexpected outcomes from biotechnology can be controlled	
I fear that the use of biotechnology will result in irreversible harmful outcomes	
I feel that use of biotechnology would be unethical	
I feel that use of biotechnology would be unnatural	

9. Buying the products of biotechnology

(a) As well as gauging the acceptability of biotechnology we are interested in whether you would purchase products made using biotechnology. Please indicate whether or not you intend to purchase the following products.

Definitely intend not to purchase	Intend not to purchase	No intention to either purchase or not purchase	Intend to purchase	Definitely intend to purchase
1	**2**	**3**	**4**	**5**

Butter from cows genetically modified to produce 50% less cholesterol in their milk	
Meat from sheep genetically modified for 'double-muscling', producing more meat and less fat per animal	
Bread made from genetically modified wheat that is 25% cheaper to grow	
Apples genetically modified to produce twice as much antioxidants, which may help prevent cancer	
Milk from cows that are grown on pastures containing genetically modified clover	
Sweetcorn that has been genetically modified to resist insects so that it requires 50% less than the usual application of pesticides	

(B) NOW PLEASE INDICATE THE MOST YOU WOULD PAY FOR EACH OF THE FOLLOWING PRODUCTS. FOR SOME PRODUCTS YOU MAY BE WILLING TO PAY MORE OR ONLY CONSIDER PURCHASING IF THEY COST LESS. FOR THE PRODUCTS YOU DO NOT WISH TO PURCHASE PLEASE WRITE AN X IN THE BOX.

Pay 40% less	Pay 30% less	Pay 20% less	Pay 10% less	Pay no more or no less	Pay 10% more	Pay 20% more	Pay 30% more	Pay 40% more
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**

Butter from cows genetically modified to produce 50% less cholesterol in their milk	
Meat from sheep genetically modified for 'double-muscling', producing more meat and less fat per animal	
Bread made from genetically modified wheat that is 25% cheaper to grow	
Apples genetically modified to produce twice as much antioxidants, which may help prevent cancer	
Milk from cows that are grown on pastures containing genetically modified clover	
Sweetcorn that has been genetically modified to resist insects so that it requires 50% less than the usual application of pesticides	

Section B

1. Attitudes Toward Nature

When people talk about biotechnology they often mention nature. Please indicate your level of agreement or disagreement with each of the following statements about nature.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1	**2**	**3**	**4**	**5**

When we interfere with nature the consequences are unpredictable	
If we interfere with nature our descendants will pay for it	
Nature can adapt to the products of genetic engineering	
The environment may have been abused but it has tremendous ability to recover	
We have a special position in nature	
If we didn't have a natural desire to improve the world, we'd still be back in the caves	
It is wrong to play God with living things	
Nature knows best	
Nature is morally good	
Nature is pure and wild	
Nature is dynamic	
Nature exists in a state of ecological harmony	
At least once in my life, I have felt a deep connection with nature	
I remember when the environment was more natural	
The environment probably doesn't need as much protection as we imagine	
Nature may be resilient but can only absorb a very limited amount of damage	
Nature is essentially a very fragile thing. It cannot withstand what has been done to it thus far.	
Nature is made up of complex interdependencies. Human meddling of the kind introduced by genetic modification will cause a chain reaction with unanticipated effects	
We shouldn't be too worried about environmental damage. Technology is developing so quickly that in the future people will be able to repair most of the environmental damage that has been done	

2. New Zealand Identity

Please indicate your level of agreement or disagreement with the following aspects of New Zealand identity. For each aspect please indicate your <u>own personal opinion</u> as well as your opinion about what you think <u>most New Zealanders believe</u>.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1	**2**	**3**	**4**	**5**

	My personal view	**What most New Zealanders believe**
New Zealand is clean and green		
Agriculture is an important part of New Zealand identity		
Sheep are an important part of New Zealand identity		
Winning at international sport is an important part of New Zealand identity		
The kiwi is an important part of New Zealand identity		
New Zealanders value something if it is useful		
New Zealanders are in touch with the land		
New Zealanders value business success		
New Zealanders value science and research		
New Zealanders value arts and craft		

3. Technology

Please indicate your level of agreement or disagreement with <u>each</u> of the following statements about technology and resource use.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1	**2**	**3**	**4**	**5**

A technological society has the best chance of eliminating poverty	
Advances in technology mean that the goals of society can be realised	
Living a simpler lifestyle is the best way to conserve energy and resources	
Wealthy nations should consume less and limit their use of resources	
Groups that oppose the emphasis on materialistic values deserve support	

4. Clean Green New Zealand

New Zealand is often described as being clean and green. Please indicate your level of agreement or disagreement with each of the following statements

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1	**2**	**3**	**4**	**5**

New Zealand's natural environment is more clean and green than other countries	
Agricultural production in New Zealand has few adverse effects on the environment	
I think that New Zealand could one day become clean and green	
I am proud of our current international status as a clean and green country	
New Zealand used to be more clean and green than it is now	
Clean green New Zealand is a myth	

5. Spirituality

Some of the people we talked to about biotechnology also mentioned their spiritual beliefs. Please indicate your level of agreement or disagreement with each of the following statements about spiritual beliefs.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1	**2**	**3**	**4**	**5**

I often think about the meaning of life	
I often have the feeling that life is meaningless	
I attend religious services on a regular basis	
I believe there is a personal God	
I believe there is some sort of life force or spirit, not a person	
I believe that people have a soul	
I believe that sin exists	
I believe in life after death	

6. General Viewpoints

Please indicate your level of agreement or disagreement with each of the following statements.

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1	**2**	**3**	**4**	**5**

I often feel discriminated against	
In a fair system, people who try harder should be rewarded financially	
The government should strictly limit people's personal risk-taking activities	
My whole life feels like it's falling apart	
It is OK for society to impose a small amount of risk on individuals without their consent	
The world needs a more equal distribution of wealth	
Life's ups and downs are mostly a matter of fate or divine will, not personal control	
I have very little control over risks to my health	

Section C

Please provide some information about yourself. We need this information to check whether this survey is representative of your local community.

Please tick a box to indicate your response to each question

1. Sex: ☐ Male ☐ Female

2. Age: _____ years

3. What was your personal income over the past 12 months?

☐ Less than $15,000	☐ $20,001 - $40,000	☐ $60,001 - $100,000
☐ $15,001 - $20,000	☐ $40,001 - $60,000	☐ $100,001 and above

4. Which ethnic group do you belong to?

☐ **NZ Maori**	☐ **Tongan**	☐ **Indian**
☐ **NZ European**	☐ **Samoan**	☐ **Chinese**
☐ **European**	☐ **Other Pacific Island**	☐ **Other Asian**
☐ **Other - Please specify**	_____	

5. Tick the box or boxes to indicate which of the following you have completed.

- ☐ Attended primary school
- ☐ Attended secondary school
- ☐ School Certificate in one or more subjects
- ☐ Sixth Form Certificate in one or more subjects
- ☐ University Entrance before 1986 in one or more subjects
- ☐ Higher School Certificate or Higher Leaving Certificate
- ☐ Diploma or trade certificate qualification resulting from at least three months full time, or part time equivalent, study
- ☐ Bachelors Degree
- ☐ Postgraduate qualification

6. Which of the following best describes your religious beliefs?

☐ Buddhist	☐ Agnostic	
☐ Christian	☐ Atheist	
☐ Hindu	☐ Spiritual but not religious	
☐ Islam/Moslem	☐ Other - Please specify	_____
☐ Jewish		

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