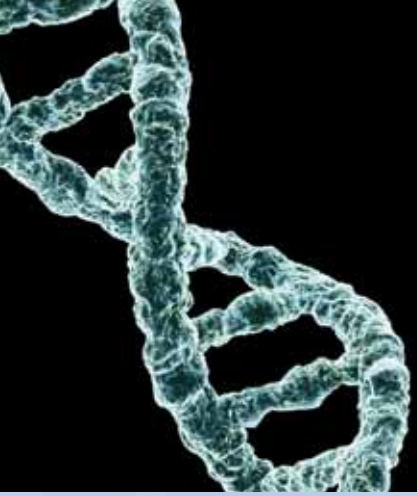


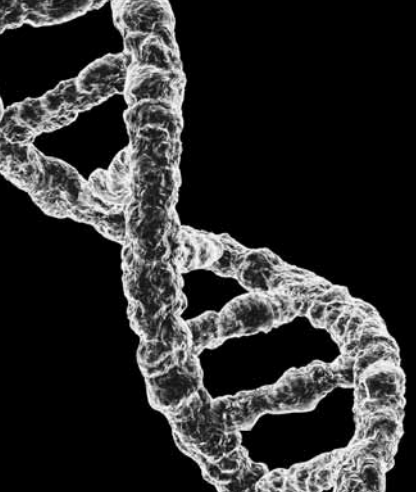
New Zealand's 'Clean Green' Image: Will GM Plants Damage It?

John G Knight
Marketing Department, University of Otago
Dunedin, New Zealand
March 2011

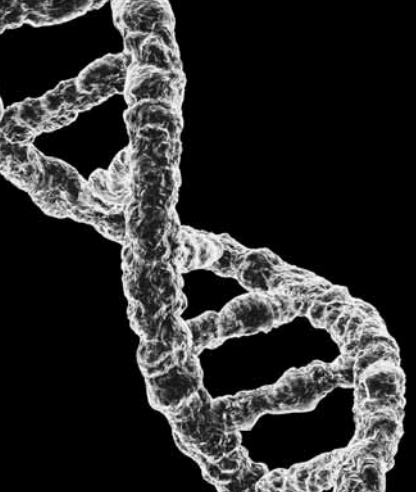
New Zealand's 'Clean Green' Image: Will GM Plants Damage It?

John G Knight
Marketing Department, University of Otago
Dunedin, New Zealand
March 2011

ISBN 978-1-877156-45-8



Contents



Executive summary

Frequently heard within New Zealand are arguments that release of genetically modified organisms (GMOs) into the environment will harm the 'clean green' image of the country, and therefore do irreparable harm to our export markets for food products and also to our tourism industry. Seldom heard is any evidence to support these arguments – instead they are typically stated as self-evident.

This report sets out to review multiple streams of evidence that can enable public policy decisions regarding whether introduction of specific GMOs, in particular GM drought-tolerant pasture plants, are at all likely to have the conjectured harmful effect on market perceptions.

These streams of evidence are derived from:

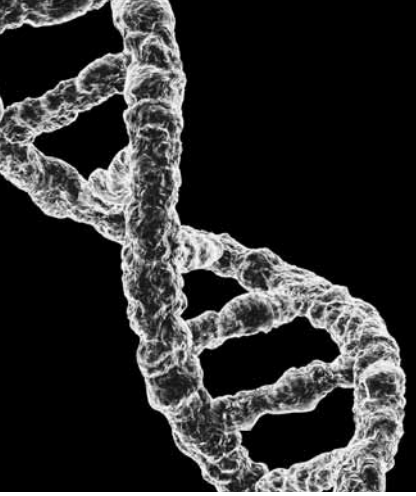
- Face-to-face interviews with seventeen gatekeepers in the food distribution channel in five countries in Europe
- Face-to-face interviews with twenty gatekeepers in China
- Face-to-face interviews with twenty gatekeepers in India
- Choice modelling studies involving 2,736 consumers making actual choices (not just giving opinions) in real shopping situations in five countries in Europe and in New Zealand
- Choice modelling studies involving an additional 1,800 consumers who were stating their preferences, rather than revealing them through actual purchasing behaviour
- Surveys of 515 first-time visitors to New Zealand, intercepted at Auckland International Airport soon after arrival

The various lines of evidence are drawn together and placed in context with an extensive review of the international academic literature on the subjects of: country image and factors determining it; actual consumer behaviour in relation to country of origin of products; psychological processes in consumer decision-making; the role of distribution channel gatekeepers in determining the range of products accessible to consumers; consumer perceptions of risk in regard to GM food; European safety assessments of GMOs; European consumer reactions to GM food – both reported and actual; tourist destination images; prior work on New Zealand's 'clean green' image. Also reviewed is prior research on the subject of potential damage to 'clean green' image of New Zealand if GMOs are introduced.

The report concludes that it is highly unlikely that introduction of GM drought-tolerant pasture into New Zealand would have any long-term deleterious effect on perceptions in overseas markets, particularly in Europe, of food products sourced from New Zealand. This conclusion is based on evidence that gatekeepers in food distribution channels place high value on attributes of products that are trust-related, and place much lesser weight on scenic-related imagery. They very clearly do not believe that whether or not a country already produces GM crops has any bearing on how they perceive that country as a source of high quality food products. Furthermore, this conclusion is based on evidence that the great majority of animal-derived food products already imported into the European Union are derived from animals raised on GM feed, as indeed are the great majority of animals farmed within the EU itself. The EU has been importing large quantities of GM feed for many years, and also growing GM maize since 1998. No system exists for keeping this GM feed separate from the rest of the animal feed supply of Europe. The European Parliament has recently decided against mandatory labelling of products from animals raised on GM feed.

The report also concludes that it is highly unlikely that New Zealand's image as a tourist destination would suffer if GM pasture was introduced. The surveys conducted at Auckland International Airport provide unambiguous results, showing that introduction/presence of controversial technology (nuclear power, GMOs, factory farming) in a country that tourists themselves consider "most similar" to New Zealand has essentially no effect on intentions to visit that country in future. Furthermore, the prospect of potential introduction of any of these technologies into New Zealand has no significant effect on tourist ratings of their intentions to visit New Zealand in future.

Introduction of drought-tolerant GM pasture into New Zealand would seem highly unlikely to have a damaging impact on New Zealand's 'clean green' image for either exports of food products or for tourism.



1. Introduction

Genetic Modification (GM) also known as genetic engineering (GE), has continued to be one of the most controversial new technologies of recent decades. As discussed in an influential paper published in the journal Science four decades ago, every technological advance carries some risk of adverse effects, and it becomes a juggling exercise for governments and for society to weigh up the risks and benefits in order to decide: "How safe is safe enough?" (Starr, 1969). Genetic Modification is one such technological advance that has generated intense public debate in certain countries over the right balance regarding its introduction. Worldwide, the consumption of foods derived from GM crops is rising rapidly. On the one hand, scientists, biotechnology companies, and 14 million farmers in 25 countries (James, 2010) have collectively voted by their actions that the benefits outweigh the risks. On the other hand, in several developed countries, particularly in Europe, consumers have not seen what benefits might accrue to them, and have resisted introduction of GM foods (Gaskell et al., 2006).

In New Zealand, the Royal Commission on Genetic Modification (Eichelbaum et al., 2001) concluded that: ***"New Zealand should keep its options open. It would be unwise to turn our back on the potential advantages on offer, but we should proceed carefully, minimising and managing risks".***

This measured conclusion did little to defuse the debate. The GM issue has proven to be highly controversial and long-lasting as a focal issue for the Green Party and for several environmental organizations and special interest groups. Often expressed in the news media is the view (typically without any evidence) that release of GMOs into the environment would do irreparable damage to New Zealand's country image in foreign markets, and would harm New Zealand's image as a tourist destination. This was a recurrent theme in many of the more than 10,000 submissions to the Royal Commission, the great majority of which were opposed to release of GM crops in New Zealand. Furthermore, such views have kept reappearing in the media. For example, according to an internet news report quoting Dr William Kaye-Blake, formerly of Lincoln University and now with the NZ Institute of Economic Research: *"If NZ produces genetically engineered products, it will not be able to maintain its reputation. After nearly eight years of research and surveys with thousands of consumers and food suppliers, he can say with certainty that NZ's image could not be upheld if involved with commercial production of GE products.* ***'You simply cannot convince people that a country is clean and green when it has genetic modification; these things exist as polar opposites in the consumers mind.'*** *This could have a dramatic effect on NZ's economy which, he says, trades on its image"* (Hine, 2009).

Similar claims have been made in regard to potential impacts of nuclear power generation. For example, according to Professor Tom Brooking of Otago University: *"supplementing New Zealand's energy sources with nuclear power would fatally damage the country's 'clean green' image abroad on which much of New Zealand's export trade and tourism depended"* (Gibb, 2008).

This report reviews prior research evidence regarding export trade and describes new research designed to rigorously determine the views of visiting tourists regarding possible introduction of new controversial technologies. Particular emphasis is placed on a proposal to produce drought-resistant GM pasture in New Zealand. The proposed drought tolerant GM rye grass will be "cisgenic" in contrast to "transgenic", on the assumption that cisgenic crops will prove less controversial to the public because no 'foreign' genes are involved. The term cisgenic *"applies to a crop plant that*

has been genetically modified with one or more genes … isolated from a crossable donor plant. In contrast, transgenic plants contain genes from non-crossable organisms (e.g., a selection marker gene originating from a microorganism), synthetic genes or artificial combinations of a coding gene with regulatory sequences, such as a promoter, from another gene" (Schouten et al 2008). According to a recent analysis from the New Zealand Royal Society (2010), "cisgenic transformation may be more socially acceptable, but many believe that the benefits and risks depend more upon the traits themselves, not upon the sources of the genes that deliver the traits."

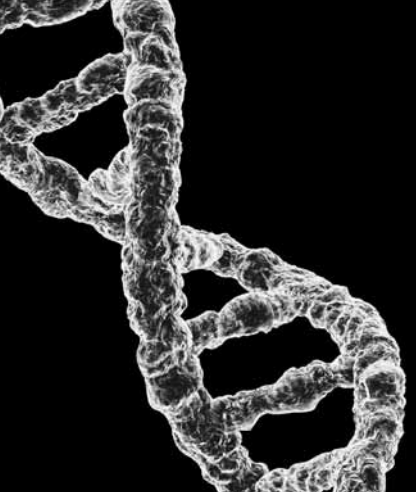
The purpose of this report is to analyze the likelihood that introduction of GM drought-resistant cisgenic ryegrass would harm New Zealand's 'clean green image' in relation to either food exports or tourism. In order to answer the overarching question that forms the title of this report, the issue will be examined from the point of view of three types of potential customer: overseas industrial buyers (distribution channel gatekeepers) of New Zealand exported food products; end consumers of New Zealand exported food products in major export markets; and visitors choosing New Zealand as a tourist destination.

We have conducted five lines of investigation from which it seems reasonable to draw inferences about the likelihood of negative market effects from introduction of this type of technology into New Zealand. First, we have investigated factors taken into account by distribution channel gatekeepers in diverse markets in Europe, in China and in India when deciding from which countries to source imported food products. Second, we have investigated the views of these gatekeepers (and in particular their reflected views of how their end-consumers might respond) towards different types of GM technology; we have specifically investigated their views in regard to GM feed for animals from which human food products are derived. Third, we have investigated how these gatekeepers view non-GM food products from other countries that have already adopted various forms of GM technology; does adoption of GM technology influence gatekeeper perceptions of such countries as a source of imported non-GM food products? Fourth, we have conducted studies involving real-life choice modelling experiments in New Zealand and in five European countries in which consumers were able to choose between GM, organic, and conventional fruit at different prices, to determine the price sensitivity of consumer preferences. In two of these European markets, and also in New Zealand, a comparison was made of revealed preferences (from actual experimental roadside fruit stalls) and stated preferences (on questionnaires containing the exact same information, experimental design, and differential prices) elicited from customers leaving genuine (non-experimental) fruit stalls. The importance of these choice modelling experiments is that they determined the reality of consumer acceptance or rejection of GM food under real market conditions.

Our fifth line of investigation involved surveying approximately 500 in-bound tourists as they entered New Zealand through Auckland International Airport in order to determine the likelihood that introduction of various specific applications of GM technology would influence their decision to visit New Zealand in future. As with the gatekeeper studies, we embedded questions about GM within the broader context of factors that these tourists considered important when choosing to visit New Zealand. In order to reduce the risk of social desirability bias, involving the respondent giving answers that they think will reflect well on them in the eyes of the host-country interviewer, we began by asking about other countries they had visited as tourists; we sought their level of

knowledge about use of controversial technology (GM crops, nuclear power, factory farming) in various countries that they had visited already. In particular, we investigated whether introduction of specific technologies would seem likely to alter their likelihood of choosing to visit a country that they nominated as being most similar to New Zealand. Then we explored their knowledge of technologies used in New Zealand, and asked them to rate the likelihood that introduction of a given technology would alter their intention to visit New Zealand in future. Included in this survey of tourists is the proposal to introduce GM cisgenic ryegrass in which a ryegrass gene, already present but inactive, is switched on to make it drought-resistant to provide more feed for animals under dry conditions.

This report begins by discussing product-country images and factors that influence consumer perceptions of source countries and hence their evaluation of specific products. It then discusses consumer decision-making processes in order to provide a context for understanding the scope of country image effects on consumer evaluations. It analyses the extent to which actual consumer behaviour (in contrast to consumer stated intentions) appears to be dictated by perceptions of countries from which products originate. Also evaluated is evidence in the literature regarding the impact of publicity surrounding particular events (either positive or negative) in source countries, and the potential role that controversial technologies might play as stimuli for adverse reactions. Then outlined is the role of distribution channel gatekeepers in determining the range of products available for consumers to choose from on the supermarket shelf; included is an account of our own research findings regarding potential effects on their perceptions of products sourced from New Zealand, together with earlier research findings by the National Research Bureau appearing as an Appendix in a report commissioned by the Ministry for the Environment (Sanderson et al., 2003). The report then discusses the phenomenon of resistance to introduction of GM technology, particularly in Europe, and factors that play a part in that resistance. Evidence regarding consumer willingness to purchase GM food products is presented, followed by results of our intercepts of tourists as they first enter New Zealand. The impact of GM technology on country image of source countries and on image of tourist destinations is discussed. Finally, conclusions are drawn regarding the likely impact of introduction of GM technology on exports and tourism.



2. Product-country image and factors that influence it

2.1 Conceptual basis

Images that consumers have of particular countries have been widely regarded as having a major impact on consumer evaluations of products sourced from those countries and, by implication, on propensity to purchase products originating from those countries (Papadopoulos and Heslop, 2002). Country image has been defined as *"the total of all descriptive, inferential and informational beliefs one has about a particular country"* (Martin and Eroglu, 1993, p.193). Drawing on the fields of stereotypy and semiotics, Ger et al (1999, p.165) argue that stereotypes associated with a given country engender "mytholological narratives" in the minds of people of other countries, and that these narratives influence people's attitudes and subsequent behaviour. A great deal of research has been conducted on country images in relation to their putative impact on consumer evaluations of products, termed the product-country image (PCI) effect (Papadopoulos and Heslop, 1993). In fact, Country-of-Origin (CoO) effects (including PCI effects) have been one of the most studied areas of international marketing, ever since Dichter (1962) proposed the importance of the "made-in" information cue (Al-Sulaiti and Baker, 1998; Bilkey and Nes, 1982; Han and Terpstra, 1988; Han, 1989; Nebenzahl, Jaffe and Lampert, 1997). Much research has compared images of countries, and examined links between these images and product assessments (Heslop and Papadopoulos, 1993), and there are more than 1200 published works in this field (Heslop, Lu and Cray, 2008).

Topics studied and reported in the literature include impact of beliefs about product quality, reliability, innovativeness, attractiveness, performance etc, on intentions to buy, willingness to buy, willingness to recommend, willingness to pay, and so forth. An extensive body of research has concluded that country images can impact on consumer evaluations of products across a broad range of product categories. The inference has been drawn that views of a country and its people influence consumer purchase behaviour through both cognitive (analytical) and affect-based (emotional) mechanisms, coupled with conation (the will to perform an action) (Laroche et al., 2005). Heslop and colleagues (2008) have proposed a model to explain the presumed impact of country image on consumer purchasing behaviour based on several inter-relationships including:

- Country-based beliefs affecting product evaluations (e.g. "French wines are high quality")
- Production-related beliefs about the capabilities or competence of the country and its people in producing desirable products (e.g. "Japan makes well-engineered reliable cars")
- Non-production-related qualities or character of a country and its people – what might be considered as the "personality" of a country (e.g. "Dutch business people are honest, reliable, likeable but highly price-conscious")
- Overall evaluations of the country-people composite (e.g. "Australia is un-crowded and sunny, the Australians are open, friendly, but keen on winning at all costs; and Australian goods are value-for-money, and generally of reasonable quality.") (Note: the stereotypic examples are added for clarification; they are not from Heslop et al).

Evidence has accumulated that consumers in many markets are willing to pay a premium for manufactured products from more industrialised (advanced) countries (Bilkey and Nes, 1982; Han and Terpstra, 1988; Papadopoulos and Heslop, 1993; Nebenzahl, Jaffe and Lampert, 1997; Al-Sulaiti and Baker, 1998; Verlegh and Steenkamp, 1999; Hulland, Todino and Lecraw, 1996; Wang and Lamb, 1983). 'Made in Germany', 'made in Switzerland', and 'made in Japan' convey the notion of high quality due to the reputation that these countries have developed. But, it has not always been the case for Japan – even among Japanese themselves (Nagashima, 1977). In the 1950s and 1960s Japanese products were generally regarded as cheap and unreliable, until ascendancy of Japanese automotive and electronic manufacturing excellence in the 1970s laid this negative perception to rest. It has been noted by many authors that country images can change over time and across product categories as the result of intense media coverage and major high-profile events. For example, staging the Seoul Olympics in 1988 was believed to cause a general shift in perceptions and to enhance the image of South Korea as a source of products (Nadeau et al., 2008; Jaffe and Nebenzahl, 1993).

Conversely, international conflicts or scandals (e.g. French nuclear testing) may lead to animosity and boycotts, and to less positive evaluations of products from the offending country (Ettenson and Klein, 2005; Heslop, Lu and Cray, 2008). However, major events that are congruent with people's existing expectations do not necessarily affect the image of a place; for example, the negative events that transpired in Tiananmen Square in 1989, although viewed adversely by US consumers, had little effect on purchasing behaviour because the events were not inconsistent with the rather negative impressions that American consumers already had of China and its products at that time (Brunner, Flaschner and Lou, 1993). The same may be true in regard to the 2008 San Lu milk crisis.

According to a recent academic article (Samiee, 2010, p.442), *"insatiable interest in the country-of-origin inquiry for nearly half a century …examines a long list of country-related issues (including country image) with the overwhelming conclusion that consumers and industrial buyers are indeed sensitive to country-of-origin cues and that country image may influence choice."* However, the great majority of country-of-origin studies have investigated attitudes and/or stated intentions rather than consumers' actual purchase behaviour. Usunier (2006) argued that CoO research is ivory tower research that has little relevance to consumers or companies because intentions are a poor indicator of actual behaviour, a view that has been robustly disputed by others (Josiassen and Harzing, 2008). According to Samiee (2010, p.442) *"whether or not under ecologically correct conditions buyers actually incorporate such images in their evaluations is not known."* In fact there is a body of research which bears on this question, as described in the next paragraph.

2.2. Experimentally-revealed consumer behaviour in regard to impact of country-of-origin

Liefeld's (2004) study of 1248 consumers intercepted at the cash register in six locations in Canada and the USA found that more than 93% of those intercepted did not know the country of origin of the durable product which they had just purchased. Liefeld's conclusion (p.85) is that *"country of origin of products is not an important attribute in the choice processes of the great majority of North American consumers."* Also, according to Usunier (2006), in a survey of French consumers 65% did not know the origin of their last purchase of consumer electronics, and only 16% preferred domestically produced electronics. In regard to food products, it might be anticipated that country of origin would have greater importance for food than for consumer durables, given concerns about food safety and "food miles". However, our own study (Kemp et al., 2010) of UK supermarket shoppers, interviewed about items of fresh produce which they had already purchased, indicated that about 80% of our sample did not know where the chosen food item had originated. Furthermore, when asked what factors had influenced their purchase decision, only 5.6% nominated country of origin unprompted as one of the factors that they had considered.

These studies indicate a great need for caution in evaluating the importance of country of origin and/or country image in relation to impact on actual consumer behaviour. The reality is that most consumer purchasing of food items is what marketers term "low involvement" purchase decision-making, with relatively little cognitive effort employed (Hamlin, 2010), but with great reliance on heuristic judgments as will now be discussed.

2.3 Review of the role of heuristics in consumer decision-making

A fundamental principle of economics holds that market outcomes are determined by individuals making choices that maximize economic utility – or, in other words, are in the best financial interests of the individual. Rational choice underpins this. The 2002 Nobel Prize in economics was awarded to Daniel Kahneman for his work in social psychology on heuristics and biases and the processes that humans use when making decisions under conditions of uncertainty. Heuristics are mental shortcuts ('rules of thumb', 'gut feelings') that we rely on to make rapid choices.

Theories in cognitive psychology and neuroscience indicate two fundamental ways in which human beings comprehend risk: the 'experiential system' and the 'analytical system' (Slovic et al., 2004; Chaiken and Trope, 1999). The experiential system is intuitive, fast and mostly automatic; the analytical system uses algorithms and normative rules, is slow, and requires effort and conscious control. *"It was the experiential system that enabled human beings to survive during their long period of evolution. Long before there was probability theory, risk assessment, and decision analysis, there were intuition, instinct, and gut feeling to tell us whether an animal was safe to approach or the water was safe to drink"* (Slovic et al., 2004, p.313). The experiential system relies on images and associations, linked by experience to emotion and affect. Although analysis of risks and benefits is important in decision making under conditions of uncertainty, reliance on affect and emotion is a quicker, easier, and more efficient way to navigate in a complex, uncertain, and sometimes dangerous world. According to Epstein (1994, p.716): *"The experiential system automatically searches its memory banks for related events, including their emotional accompaniments. The*

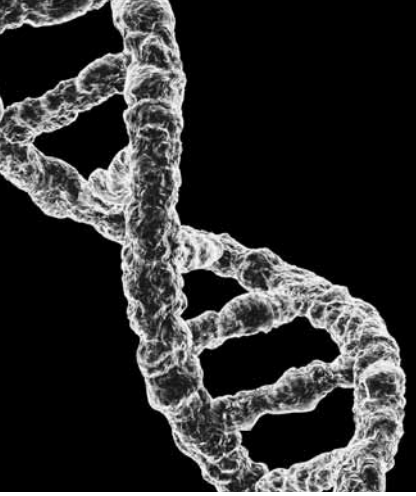
recalled feelings influence the course of further processing and reactions ... if the feelings are unpleasant, they motivate actions and thoughts anticipated to avoid the feelings."

The intuitive operations of the experiential system generate impressions of attributes while the analytical system monitors the quality of mental operations and makes corrective judgments (Kahneman, 2003). *"A defining property of intuitive thoughts is that they come to mind spontaneously, like percepts"* (Kahneman, 2002, p.452). People rely on a limited number of heuristic principles which are used subconsciously in order to reduce the complex task of assessing probabilities to a simpler judgment. In general such heuristics are useful, but sometimes they lead to biases and errors (Tversky and Kahneman, 1974).

Heuristic principles have been widely applied in understanding memory-based judgments in marketing. For example, the ease with which low-price products are recalled (i.e. the availability heuristic) acts as a cue in making store price judgments (Ofir et al., 2008). *"When consumers are asked about their perceptions of store prices in the absence of price lists, or when not actually inside the store, they have to rely on their memory from previous experiences"* (Ofir et al., 2008, p.416). Similarly, price-quality perceptions have long been understood to act as a heuristic because it is cognitively efficient for purchase decision-making by consumers daunted by *"a bewildering array of products, each with its own unique set of quality connoting attributes"* (Rao, 2005, p.401).

Heuristic principles have also been applied to consumer decision-making through the categorization approach, which implies that consumers use prior expectations about product categories to simplify decision-making (Sujan, 1985). Heuristic judgments enable *"a difficult question (to be) answered by substituting an answer to an easy one"* (Kahneman and Frederick, 2002, p.50). These principles are crucial to understanding how consumers evaluate products from diverse countries, and how they make decisions about which product to put in their shopping basket – particularly when the purchase decision in question is a low-involvement one, taking only a few seconds (Hamlin, 2010). In regard to country of origin, certain countries (eg Bangladesh, China) might act as a cue which triggers an "unsafe" response, whereas other countries (eg New Zealand, Switzerland) might trigger a "safe" response.

In regard to a technically complex issue such as genetic modification, where the public may have difficulty understanding the underlying biology and terminology, it becomes easier to simply avoid categories of product carrying a label which stimulates feelings of ambiguity and anxiety. The terms "genetic modification", "genetic engineering", "transgenic" etc have taken on negative connotations in the eyes of the general public, not only in Europe. During our study on distribution channel gatekeepers in China (discussed in section 3) we learned that the words used as a literal translation of genetic modification in Chinese have very negative connotations, implying uncontrollable spread, as in a cancer. For this reason, some advocate use of the term "biotech" rather than GM or GE, to describe novel developments in plant breeding with hopefully more positive associations of meaning (James, 2010). We shall return to consumer decision-making processes later in this report, but first we will consider how the range of products on the supermarket shelf is determined.



3. The role of distribution channel gatekeepers in determining consumer choice

3.1. Review of literature

Retail buyers essentially act as gatekeepers in regard to product availability and range for consumers to choose from (Ettenson and Wagner, 1986; Hansen and Skytte, 1998; McGoldrick and Douglas, 1983; Montgomery, 1975; Rao and McLaughlin, 1989; Sternquist, 1994). From the thousands of new products presented to retail grocery buyers every year, only a small sub-set make it into stores due to limited shelf space (Alpert et al., 2001; Heeler, Kearney and Mehaffey, 1973; McLaughlin and Rao, 1990). Consumers are therefore only able to choose from this very reduced set of manufacturer products (Hansen and Skytte, 1998; Heslop et al., 2004; Sullivan, 1997). Furthermore, in regard to imported products, there are other layers of industrial buyers who play a gatekeeper role. Among these are importers and wholesale distributors, manufacturers of value-added products based on imported raw ingredients, and suppliers to the food service sector. The role that all these "shapers" of the marketplace play can be easily overlooked (Heslop et al., 2004) but the reality is that they greatly influence the range of options open to consumer buyers and patrons of hotels, restaurants, and other food service outlets.

According to an often-cited review of industrial buying behaviour, *"similar to consumer behaviour, the industrial buyers often decide on factors other than rational or realistic criteria"* (Sheth, 1973, p.56). Wagner, Ettenson and Parrish (1989) draw a distinction between industrial buyers (buyers of components, raw materials and ingredients for manufacturers) and retail buyers, who hold the additional responsibility of controlling costs and generating revenue. Sheth (1981, p. 181) notes that *"a retailer is more like a consumer in what he buys, and more like a producer in how he buys his merchandise."* Sternquist (1994) terms such buyers "expert consumers." According to Webster and Wind (1972 , p.18) *"in the final analysis, all organizational behaviour is individual behaviour… Similar to consumer markets, it is important to understand the organizational buyer's psychological characteristics and especially his predispositions, preference structure, and decision model as the basis for marketing strategy decisions."*

3.2. Research into factors that distribution channel gatekeepers deem important when evaluating source countries for food imports

We have conducted a series of investigations in various countries in Europe, in China, and in India entailing in-depth interviews with key decision-makers in the food distribution channel, in order to investigate the factors that these key people consider most important when evaluating countries from which they may source food imports. Included in these studies have been decision-makers in major supermarket chains, importers and distributors, suppliers to the food service sector, chefs in leading hotels and restaurants, specialty food stores, and food product manufacturers. We have questioned these respondents regarding various technologies used in countries that they currently source food products from, and the extent to which their purchasing intentions would be influenced by adoption of particular technologies by those source countries in the future. In particular, we have rigorously investigated how particular types of GM technology would affect New Zealand's image as a food supplier (Knight, Holdsworth and Mather, 2003; Knight, Mather and Holdsworth, 2005a,b; Knight and Gao, 2009; Knight and Paradkar, 2008).

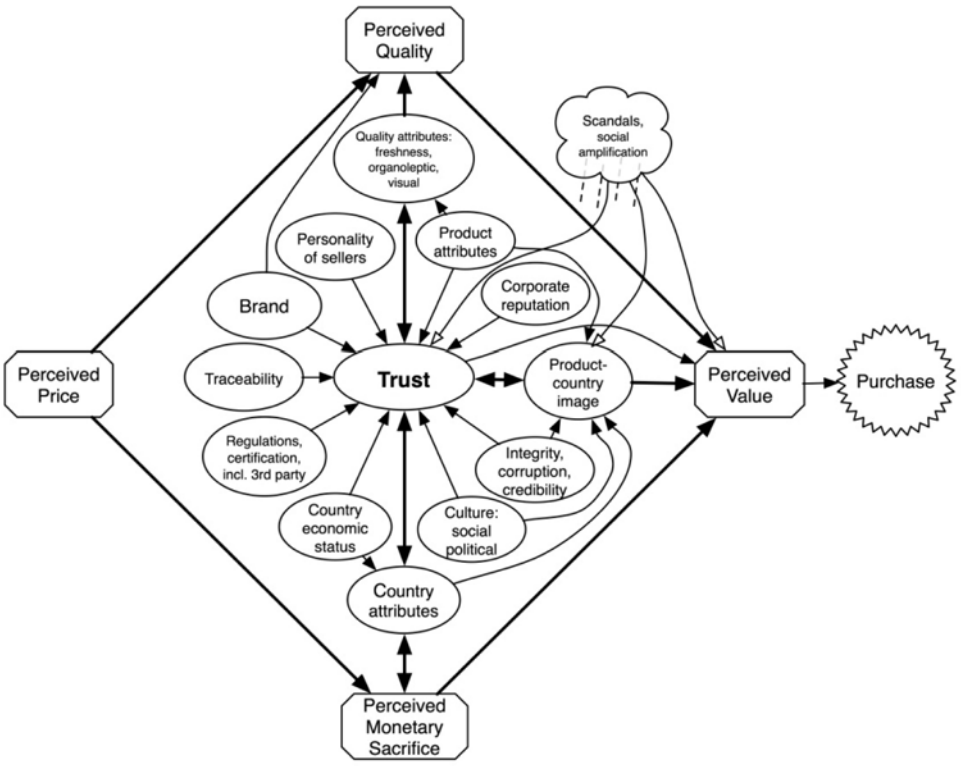
In these studies, we have embedded the GM issue within the broad context of factors that gatekeepers deem important when making purchase decisions in relation to products imported from various countries. This was a deliberate strategy to avoid the GM issue achieving artificially inflated salience, which could lead to unrealistic estimates of the relevance and prominence of GM in the decision-making process. We have included China and India in these studies because: (a) they are the world's two most populous countries; (b) China is already a very important export market for New Zealand food products, showing very strong growth since the signing of the Free Trade Agreement; (c) India seems likely to become increasingly important as an export market for New Zealand food products in future, once an FTA is implemented; and (d) neither country was themselves producing GM food crops at the time that we conducted the interviews. There seemed little point in conducting this type of research in countries that are themselves already producing GM food crops, such as the USA, Canada, several Latin American countries, certain European countries, etc; logically, if presence of GM crops in one's own country does not stop people buying locally produced food, then neither does it seem likely to greatly influence choice of imported food.

3.3. Study of European distribution channel gatekeepers and choice of food imports

We conducted comprehensive face-to-face interviews with key personnel (CEOs, Chief Purchasing Officers, owners of family-owned businesses, agents for large corporations, etc) of seventeen large and influential food importers and distributors in a range of European countries (Germany, Netherlands, Greece, Italy, UK). Many of the contacts were provided by New Zealand Trade Commissioners in Hamburg, Milan and London. Several of the importers interviewed have extensive distribution channels extending throughout Europe from a central hub, for example in Hamburg. Therefore, these channel members were able to provide a much broader perspective than from just their own country. The figure below is reprinted from our paper in Journal of International Business Studies (Knight, Holdsworth and Mather, 2007a).

Perceptions of the country image of New Zealand, and indeed any other country, among these channel members appeared to relate mostly to factors involving trust in the supply chain, in the integrity of regulatory systems in a given country, in quality, freshness and traceability of the product, and in reliability of their business contacts. Mental stereotypic images of landscape, water and sky appeared to be very much secondary to pragmatic considerations of doing business with people from a given country. The main findings of these studies have been presented in detail in a report titled "Trust and Country Image" (Knight, Holdsworth and Mather, 2003), and subsequently in the British Food Journal (Knight, Holdsworth and Mather, 2007b) and the Journal of International Business Studies (Knight, Holdsworth and Mather, 2007a).

Figure. 1. Contextual representation of factors influencing purchase of imported food products by gatekeepers. Adapted from Monroe's Price-perceived value model. Hollow arrows represent inhibitory effects.



3.4. Perceptions of European distribution channel gatekeepers regarding GM crops and GM food – summary of findings

There was a general perception among our European gatekeeper respondents that European consumers were not interested in purchasing GM food, and that consumers saw no benefits in doing so. However, we did encounter several gatekeepers who believed that this would soon change, provided consumer benefits were made explicit. In contrast to some favourable reaction to GM foods of plant origin, the prospect of GM animals that produce meat or milk for human consumption met with near-universal disapproval on the basis that consumers just would not accept such products. Concern was expressed by several gatekeepers about coexistence of GM and conventional or organic versions of the same crop, in the same region; the potential for mix-up or contamination of non-GM food with GM food was highly salient at the time of the interviews because there had been much publicity around this issue (Knight, Mather and Holdsworth, 2005a).

We explored reactions to specific applications of GM in non-food areas. In general, gatekeepers could not see any crossover between GM applications in forestry, or bioremediation, or mammalian pest control for example, and perceptions of food products originating in New Zealand, even in regard to imports of organic food products (Knight, Mather and Holdsworth, 2005a).

3.5. Perceptions of distribution channel gatekeepers in China and India regarding the GM issue

In view of the rising importance for New Zealand of export markets in China, and the likely importance of India in the future, it seemed appropriate to try to gauge sentiment towards GM technology in these two countries. Twenty key informants in the food distribution sector were interviewed in each country. In China, food importing and distribution companies, located in six main commercial centres in China, were visited by the author accompanied by a native Mandarin-speaking research colleague. Contacts were arranged mainly through New Zealand Trade and Enterprise offices. Eight of the respondents were decision-makers in supermarket chains, 4 domestically owned and 4 multinational; (included among these were two of the world's largest food retailers, Walmart and Carrefour). Nine were importers and distributors in diverse sectors including wine, meat, dairy products, packaged goods, fruit and seafood; the rest were in the hotel-restaurant-institution (HRI) sector. In India, food distribution channel companies, located in five main commercial centres, were visited by the author, accompanied by an Indian research colleague. Eight were decision-makers in supermarket or hypermarket chains; one was the owner of a long-established stand-alone supermarket; seven were importers and distributors; and three were food and beverage managers or executive chefs of five star hotels.

In China, a high degree of uncertainty regarding GM food was expressed. The prevailing view was one of ambiguity, rather than strong negativity as had been observed in Europe. This fits with a consumer survey conducted in Beijing, which concluded that respondents generally had a favourable view of GM in regard to two staples of the Chinese diet, rice and soybean oil, provided GM conferred product-enhancing properties (Li et al., 2002). Several respondents referred to the importance of government endorsement in clarifying the situation for consumers, and the need for the news media to clarify the issues and prevent the spread of ill-informed rumours. We also heard from two food science experts, one a high-level government official and the other a professor in a leading agricultural university, who conveyed the information that the Chinese Government was in the process of developing numerous GM food crops, while presently (at that time) only authorising planting of GM non-food crops, mainly Bt cotton (Knight, Holdsworth and Mather, 2008; Knight and Gao, 2009; Knight et al., 2008).

In India, the prevailing view was that consumers know little about the GM issue, and have much more pressing issues to worry about. The role of the news media and of activist groups was raised by several respondents. The main areas of concern were maintaining the right of farmers to sell seed (now protected by law) in the face of an onslaught by large American corporations such as Monsanto, and the need to prevent gene flow which could pose a risk genetic diversity in rice (Knight, Holdsworth and Mather, 2008; Knight and Paradkar, 2008). Interviews with Indian crop scientists made it very clear that India was embarking on a massive programme of developing a wide range of GM crops, particularly to make them drought-tolerant, salt-tolerant, and less susceptible to disease. The main aim was to bring lasting benefit to peasant farmers and enhance food security, and Prime Minister Dr Manmohan Singh has made several calls for a "Second Green Revolution."

3.6. Evidence from gatekeepers regarding potential impacts of GM crops on country image of source countries for food products

Our studies of gatekeepers in Germany, Italy, Greece, the Netherlands, the UK, China and India revealed no evidence that presence of GM crops in a country causes negative perceptions in general of food from that country (Knight, Mather and Holdsworth, 2005a,b; Knight and Gao, 2009; Knight and Paradkar, 2008).

This issue was carefully explored in relation to perceptions of food products sourced from Spain, from the USA, from Argentina, and from Australia – all countries that had highly favourable reputations as suppliers of high quality food products, and all of which were producers of GM crops. Even respondents who were themselves negatively disposed towards GM food could see no connection between food they were importing from a given country and whether or not there were GM crops grown in that country (Knight, Mather and Holdsworth, 2005b). Gatekeepers indicated that the fact that the USA, for example, produces GM crops has absolutely no impact on their perceptions of non-GM fruit (eg Californian grapes, oranges from Florida) or wine, or other food and beverage products sourced from the USA. Neither does it have any negative impact on perceptions of products sourced from Canada, Argentina or Australia – all countries that produce GM crops. Examples of comments from gatekeepers are shown in Table 3.1.

Table 3.1. Some examples of comments from food industry experts regarding whether perceptions of GM would transfer onto country image

"The fact that Argentina has GM crops? No, not at all. We don't feel there is a connection. But it may be in the future, because this is a main topic – what these animals eat" (Italian publisher of major European food industry magazines).

"Personally I can't see it transferring onto image of the country as a whole" (UK distributor of manufactured food products).

"GM is GM. GM-free is GM-free. It doesn't matter where it comes from. Basically it doesn't matter about the country. It's just a matter of being GM-free." (Italian meat and seafood products manufacturer).

"When consumers buy fruit from the USA, they see that as high quality. Image of US is also for grapefruit the same as the apples for New Zealand. It's the same thinking…Impact of GM? No, I think not. From America it doesn't matter" (German fruit importer and distributor).

A German seafood processor thought Canada was perceived as a source of high quality 'clean' food, and had a clean, fresh image in the eyes of consumers. GM crops grown in Canada had no impact on these perceptions, in his opinion.

A Dutch food service company respondent thought presence of GM crops in a country had no impact whatever on perceptions of food sourced from that country. "So it might become an issue, but not at this particular stage."

New Zealand should keep in step with EU policies: "From a purely commercial point of view I'd go along with what the EU does – don't go any stricter." (A UK importer of New Zealand, Australian and South African wines).

"If a country such as Australia is growing GM crops, that would have no influence on perceptions of products from Australia" (major food retailer in Pune, India).

"Although there are a lot of American products made from GMO, it doesn't influence the sale of American products in China" (Dairy products distributor, Shanghai, China).

"People may have negative attitudes towards GMO, but people won't care when it comes to their purchase decision" (food importer and distributor, Beijing, China).

In relation to NZ perhaps growing GM pine trees:

"It can have no effect because wood is not sold here" (German meat distributor)

"Yes, I think that would be allowable – the difference would be too big to make any difference" (Italian fruit distributor)

"I think it would obviously be a good decision to start with things that people do not have to eat" (German fruit distributor)
"Wood? Wood is not a foodstuff. It is better to avoid in food. In the other product I don't know" (Italian meat distributor)

3.7. Evidence from other studies of gatekeepers regarding potential impacts of GM crops on country image of source countries for food products

Consistent with our findings are verbatim comments presented in a market research report appended to the Ministry for the Environment commissioned report titled "Economic Risks and Opportunities from the Release of Genetically Modified Organisms in New Zealand" (Sanderson et al., 2003, Appendix 4). Informants in three major food retail chains in each of Australia, the UK, and USA were interviewed. The results were reported as follows:

Coles (Australia): *"When asked how the company would view New Zealand should it use GM, he stated that they had not changed their view of American and Canadian products (in the light of GM crops grown there). Provided a country supplied products that consumers wanted to buy, there would be no issue."*

Foodland (Australia): *"The interviewee did express that produce coming from New Zealand is generally of good quality. Should New Zealand use GM, the interviewee felt that the company's view of New Zealand would remain unchanged, as it comes back to what the market will accept."*

Woolworths (Australia): *"He did say that New Zealand was a source of high quality produce. If the company were to source products from New Zealand, New Zealand's GM status would have no impact."*

Sainsbury's (UK): *"When we found out what GM things you'd (the New Zealand Government) approved, we could then look at what we were buying from you and see if there was any potential conflict."*

Tesco (UK): *Should New Zealand start to use GM "I think that everybody in Europe would be concerned that you've taken that line at a rather early stage, so you're jumping ahead of the perceptions of customers within Europe."*

Waitrose (UK): *"We do not buy GM foods at the moment …because I don't think there's enough confidence in the marketplace in their advantages or disadvantages."*

Albertsons (USA): *"New Zealand's use of GM would not affect their view of New Zealand, provided that GM products were managed in accordance with company policy."*

Kroger (USA): *"Kroger maintains that the Food and Drug Administration have endorsed the use of GM, and are far more able to make judgments about the sale and labelling of GM food."*

Safeway (USA): *"The interviewee expressed that New Zealand was a source of good quality products, and didn't think that this opinion would change should New Zealand use GM."*

Given these very clear and forthright findings, it is mystifying that the overall report to which this material is appended appears to have ignored their implications. Instead, it has placed great weight on consumer opinion surveys conducted on 150 consumers in Australia, 144 in the USA, and 150 in the UK. The report claimed that the consumer surveys show that, should New Zealand release GMOs in pest control or livestock feed, *"approximately one-third of all respondents stated that their image of the New Zealand environment would get worse"* (Sanderson et al., 2003, p.12). Furthermore, *"when confronted with a scenario in which the respondent was choosing a non-GM*

product that came from New Zealand, which used genetic modification (GM) in other ways … between one-quarter and one-third of respondents said they would be less inclined to purchase the product under the fruit and dairy scenarios. Of these respondents, the majority stated that they would not buy the product, regardless of any discount applied" (Sanderson et al., 2003, p.13). *"Based on the NRB survey results of respondents across the three countries (Australia, US and UK), along with the Lincoln survey results of visitors' responses, were extrapolated to apply to all New Zealand export markets for dairy, meat, horticulture and tourism. The translation of these results to model input assumptions is outlined below"* (Sanderson et al., 2003, p.16). (The "Lincoln survey results of visitor's responses" were based on interviews with 93 international visitors departing from Christchurch airport. This survey is referred to further in section 7, which deals with our own survey of international visitors.) It appears that their own commissioned research on gatekeepers (which shows a marked contrast to the consumer results, and the tourist results) was largely ignored, and played no role in the economic modelling.

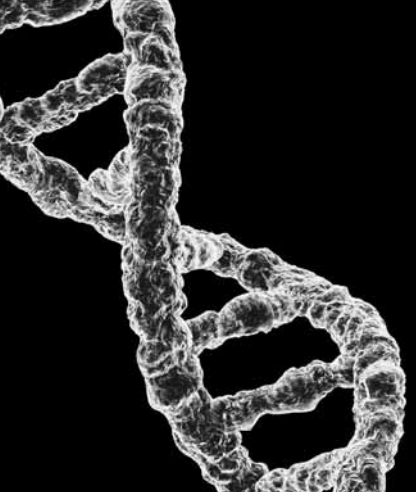
3.8. Perceptions of European gatekeepers regarding GM feed for animals

In our own research on gatekeepers in Europe, the prospect of GM pasture plants being used for raising animals for meat or milk production met with strong negative reaction. However, this finding needs to be placed in context. In late 2002 when the interviews were conducted, the interviewees did not appear to be aware that the EU was already importing and/or growing large quantities of GM soybeans and grain for animal feed, and was growing GM maize for animal feed in Spain; the author was not aware of this fact at the time either. Subsequent research, together with extensive publicity in the news media, has revealed that very large quantities of feed containing GM constituents have been used throughout the EU food production chain since at least 1998. In that year, for the first time, approximately 25,000 hectares of GM Bt corn was planted in Spain (Alcalde, 2004). The area planted rose to approximately 100,000 hectares by 2009 (James, 2010). No special distribution channel was created for GM corn, since GM-grain was regarded as substantially equivalent to conventional grain, although some feed suppliers chose to only use non-GM grain. According to Alcalde (2004) *"Most of the animal feed industry, which also uses imported GM soybean in its feed compounds, has classified grain from Bt maize according to its intrinsic properties for feed use, and not distinguished it solely on the basis of its GM production method"*.

The EU has imported great quantities of GM soybeans every year for the last several years. According to GMO Compass (2010), a website set up with EU funding (although the EU is not officially responsible for its content): *"Each year, EU Member States import approximately 40 million tonnes of soy material, primarily destined for use as cattle, swine, and chicken feed. Soybeans are also used to produce many food additives."* This website points out that the world's leading soybean producers are the United States (33%), Brazil (27%), Argentina (21%), and China (7%); the United States and Argentina produce almost exclusively GM soybeans, and Brazil has rapidly moved in that direction. *"Without the protein offered by soy, Europe would not be able to maintain its current level of livestock productivity"*(GMO-Compass, 2010).

The EU requires that animal feed containing GM ingredients exceeding 0.9% be labeled with the words 'genetically modified (name of the organism)' (or 'produced from genetically modified (name of the organism)', as appropriate, appearing in parentheses immediately following the specific name of the feed (Regulation EC 1830/2003). Despite the requirement to label feed, on 7 July 2010 Members of the European Parliament voted that food derived from animals raised on GM feed should **not** have to be labeled as such (European-Parliament, 2010). This EU vote caused much protest from certain lobby groups such as Friends of the Earth and Genewatch (Ecologist, 2010). According to a recent Farmers Guardian article about the EU vote: *"It is estimated that up to 90 per cent of meat imported into the EU has been fed on GM feed varieties, while the majority of Britain's livestock farmers are also reliant on the imported GM feed"* (Farmers-Guardian, 2010).

In view of this recent information, the negative views that we heard in 2002 regarding livestock raised on GM feed need to be reevaluated, (as do the willingness-to-pay studies reported below). Perhaps gatekeepers in the European food distribution channel need to be revisited and re-interviewed in this specific regard. Furthermore, market research ought to be conducted to determine whether labeling New Zealand meat products as "free-range, raised only on GM-free pasture" can in fact obtain a premium price in European markets. A US Department of Agriculture briefing paper from Iowa University titled "Country of Origin as a Brand: the Case of New Zealand Lamb" (Clemens and Babcock, 2004) contains an analysis that bears on this question. According to these authors, the success of New Zealand lamb in international markets is strongly based on equal or lower retail prices, despite the appeal of grass-fed. *"In North America, for example, some high-value New Zealand lamb is sold to restaurants and high-end markets, but most New Zealand lamb sells at a lower average retail price than does domestic lamb. The same situation was found in U.K. supermarkets. While country branding for New Zealand has opened markets and achieved strong consumer recognition, it has created price premiums for only a small percentage of exported product"* (Clemens and Babcock, 2004, p.18). If "free-range grass-fed" has proven insufficient to obtain a price premium, it seems highly unlikely that adding "raised on GM-free pasture" will achieve greatly more, given the figure in the Farmers Guardian cited above that *"90% of meat imported into the EU has been fed on GM feed varieties."* Changing perceptions and new information about practices in the EU have such huge implications for New Zealand's major exports that reinvestigating this topic should be given high priority.



4. Consumer perceptions of risk regarding GM food

4.1. Literature review

According to Starr (1969), society arrives by a process of trial and error at an essentially optimal balance between the risks and benefits of a given activity. However, a substantial body of work indicates that the public have a tendency to overweight rare and graphic risks (e.g. shark attacks) and underweight commonplace risks (e.g. road accidents). 'Personalities of hazard' such as dread, familiarity, catastrophic potential, ambiguity, and controllability influence willingness of the public to accept risk (Slovic, 2000). The public seems generally willing to accept hazards from voluntary activities (e.g. smoking) orders of magnitude higher than would be tolerated from involuntary activities (e.g. pesticides that 'they' have put on food) (Slovic, 2000). Events that one has no control over can lead to feelings of outrage, which the news media may exacerbate.

Particularly in Europe, media reports have contributed to a widespread fear and mistrust of GM food and GM crops, using fear appeals such as 'Frankenfoods', 'disaster', 'environmental risks', 'risk of cancer', and 'food health fears' (Laros and Steenkamp, 2004). As expressed by Heslop (2005): *"The media are keen to fill the void of uncertainty with …alarmist predictions about the next apocalypse, since as most journalists know, bad news sells more papers than good."* In Europe, a succession of food scares has resulted in a risk-sensitized society in which risk messages are subject to distortion and social amplification by news media (Slovic, 2000; Bergman, 2002). According to the World Health Organisation in its answers to 20 questions about GMOs (World Health Organization, 2010): *"Consumer confidence in the safety of food supplies in Europe has decreased significantly as a result of a number of food scares that took place in the second half of the 1990s that are unrelated to GM foods."* According to the European Commission Entransfood Report (European Commission, 2004): *"The public debate on GMOs is part of a more general discussion on the safety of foods produced in Europe, fuelled by the BSE and dioxin crises, which have resulted in low public trust in food safety assessment and management practices in Europe."* Fitzgerald and Campbell (2001, p.4) point out that: *"Contemporary concerns about GM are comparable with historical food technology scares (such as) those surrounding margarine and food irradiation. In all these scares, contested technologies disordered a central principle of familiarity and safety in Western culture in relation to a highly potent symbolic substance – food."* Former EU Commissioner for Trade Peter Mandelson stated: *"Biotech can arouse strong emotions. There is something in human nature that can make us afraid of science, nervous of new technologies"*. This has resulted in *"an almost gothic fear of genetic engineering"* in Europe (Pardo, Midden and Miller, 2002, p.10).

In part, these fears may stem from non-rational factors, as evidenced by studies showing that 'magical beliefs' and 'superstition' have both been found to correlate with negative attitudes towards GM food (Mowen and Carlson, 2003; Hagemann and Scholderer, 2007; Hagemann and Scholderer, 2006). Interestingly, a similar correlation was found in regard to 'mutation breeding'(Hagemann and Scholderer, 2007), suggesting a lack of awareness of the role of selection of mutants in developing essentially all of the food crops and animal strains that form the basis of modern agriculture (Federoff and Brown, 2004). According to Saher et al (2006, p.325): *"Signs of magical thinking can be found in GM and OF (organic foods) attitudes. GM products evoke reactions as if they were 'polluted' by the technique (Trewavas, 1999) and can be somehow contagious, while organic foods are ascribed almost esoteric properties which allegedly transfer to you in a 'you are what you eat' manner"*. A substantial literature addresses these beliefs and the thought processes underlying

them (Trewavas, 2001; Rozin et al., 2004; Gaskell et al., 2000; Makatouni, 2002). Since both GM and organic foods may be indistinguishable from conventionally produced foods, these beliefs can be interpreted as manifestations of 'pollution' and 'contagion'-beliefs, which are indicative of magical thinking (Nemeroff and Rozin, 1989; Rozin and Nemeroff, 1990).

These fears may stem from a lack of understanding of biology and the underlying science. The 2003 Eurobarometer survey of 17,000 consumers, asked respondents to agree or disagree with the statement: "Ordinary tomatoes do not contain genes, while genetically modified tomatoes do". Only 36% of the respondents across the 17 member countries were able to correctly identify this statement as false (Eurobarometer, 2003). However, a recent study conducted in Switzerland showed that basic biological knowledge had very little impact on people's risk and benefit perception of gene technology: "Narratives and metaphors will be more important for the acceptance of gene technology than basic scientific knowledge or results of risk assessments" (Connor and Siegrist, 2010, p.534).

4.2. Consumer resistance to GM food in Europe

European consumer attitudes towards GM foods have been reported in several studies as being highly negative (Frewer, Howard and Shepherd, 1995; Grunert et al., 2000; Bredahl, 2001; Gaskell et al., 2000). Consumers in the UK were found to be most concerned by health issues, animal welfare and the environment, and by lack of consumer control over what was happening (Miles and Frewer, 2003). According to Firth (1999, p.42): *"Prince Charles of Wales summed up the public mood by saying that the work done by genetic engineers was best left to "God and God alone."* The 2008 Eurobarometer survey of Attitudes of European Citizens Towards the Environment, conducted on 27,000 subjects across the 27 member countries, found that *"the majority of Europeans declare that they are opposed to the use of GMOs (58%) while around a fifth (21%) supports their use. A further 9% say they have never heard of GMOs"* (Eurobarometer, 2008, p.65).

As pointed out by a commentary in the *Times* of London:

"Asking people whether they're for or against GM crops is as ridiculous as asking whether they're for or against fire. As Prometheus found out, a mastery of flame can be a boon or a curse. It is the tool of the arsonist and (of celebrated chef) Gordon Ramsay. The technology is morally neutral. It is how it is applied that counts" (Henderson, 2003).

Resistance to GM foods in Europe has acted as a major barrier to international trade in GM food products. In contrast to the USA and Canada, which adopted the "substantial equivalence" principle in regard to GM, The EU and its member states have been guided by the "precautionary principle" – the assumption that experimentation should only proceed when there is a guarantee that the outcome will not be harmful. Wiener and Rogers (2002) argue that the conventional wisdom that Europe endorses the precautionary principle and seeks to proactively regulate risk, whereas the US opposes the precautionary principle and waits for evidence of actual harm, is over-simplified and largely incorrect. According to their analysis, the EU is more precautionary than the US in regard to GMOs, hormones in beef production, toxic substances, phthalates, climate change, guns, and antitrust/competition policy. However, in many other instances they document, the US is in fact the more cautious regulator e.g. new drug approvals, phase-out of lead in gasoline, BSE-motivated

bans on beef and blood donations, etc. It has been argued that the EU's approach to assessing the implications of GM crops and food were on shaky scientific foundations from the start (Gilland, 2005; Paarlberg, 2005).

In 2003 the USA, Canada and Argentina brought separate actions at the World Trade Organisation (WTO) against the European Communities (EC) regarding the application of a de facto moratorium against biotech products. Many countries including China, India, Australia and New Zealand joined the dispute as third parties. Protracted negotiations culminated in a WTO Dispute Settlement Body finding in 2006 that the EC had applied a general de facto moratorium that was inconsistent with obligations under the Sanitary and Phytosanitary (SPS) Agreement. The measures adopted by the EC were found to be *'not based on risk assessments satisfying the definition of the SPS Agreement and hence could be presumed to be maintained without sufficient scientific evidence'* (WTO, 2006).

4.3. European Assessments of Safety of GMOs

In 2001, the Research Directorate General of the EU released a summary of eighty-one separate scientific studies, all financed by the EU, conducted over a 15 year period and aimed at determining whether GM products were unsafe, insufficiently tested, or under-regulated. None of these studies found any scientific evidence of added harm to humans or the environment from any approved GM crops or food (Kessler and Economidis, 2001). The French Academies of Sciences and Medicine drew a similar conclusion, and blamed the rejection and over-regulation of GM technologies in Europe on what it called a "propagation of erroneous information". They argued that *"all the criticisms against GMOs can be set aside based for the most part on strictly scientific criteria. Furthermore, any generalization on the potential risks linked to GMOs is impossible since scientific rigor can only proceed from a case by case analysis"* (French Academy of Sciences, 2002). In 2003 the Royal Society in London presented two submissions to a UK government review, finding no credible evidence that GM foods were more harmful than non-GM foods (Paarlberg, 2005). The EC's own Entransfood Report (European Commission, 2004, p.51) concluded that *"current regulatory requirements and testing regimes are much more rigorous for GM crops than for conventionally bred crops"*. Furthermore (p.60) *"there is no inherent unique risk in the deployment of recombinant DNA techniques"*, and this report advocates adoption of the principle of "substantial equivalence", which has been the US position on this issue since the 1980s. The UK GM Science Review Panel Report (King, 2003) found that *"to date world-wide there have been no verifiable untoward toxic or nutritionally deleterious effects resulting from the cultivation and consumption of products from GM crops."* However, the Entransfood Report points out that responses of members of the public to different risks are socially constructed. The work of Slovic and colleagues (Slovic, 2000; Slovic et al., 2002; Slovic et al., 2004) demonstrates the gulf that exists between technical risk estimates provided by experts and perceptions of risk by the public – particularly when "dread" abounds.

Gaskell and colleagues (2004, p. 193) concluded: *"the risk issue has been misperceived in the case of GM foods. In some sections of the public the perception of risks appears to be relevant and this, along with perception of benefits, informs public attitudes. But for a larger group of the European public…, risks appear to be less relevant. Their opposition to GM foods arises from a perception of the absence of benefits, a sufficient condition for rejection, as would be predicted by any model of the diffusion of innovations."*

The debate in Europe continues. In a news report dated 27 September 2010, EU health commissioner John Dalli proposes that over and above EU-wide scientific restrictions, nations be able to ban them across all or part of their territory for socio-economic, ethical or moral reasons. Dalli said recently that the commission was neither for nor against GMs. *"But in today's world, they are a reality,"* he said. *"Europe cannot stand idle and deny itself the political responsibility to take decisions and implement a policy of responsible innovation" (EU Business, 2010).*

4.4. The Campaign Against Biotechnology

Patrick Moore, a founding member of Greenpeace and former president of Greenpeace Canada, writes (Moore, 2005, p.180): *"The environmental movement's campaign against biotechnology in general, and genetic engineering in particular, has clearly exposed its intellectual and moral bankruptcy. By adopting a zero-tolerance policy toward a technology with so many potential benefits for humankind and the environment, activists have …alienated themselves from scientists, intellectuals and internationalists. It seems inevitable that the media and the public will, in time, see the insanity of their position."*

Norman Borlaug, Nobel Peace laureate, had this to say:

"Extreme environmental elitists seem to be doing everything they can to derail scientific progress. Small, well-financed, vociferous, and anti-science groups are threatening the development and application of new technology, whether it is developed from biotechnology or more conventional methods of agricultural science" (Borlaug, 2000, p.490).

Sir David King, former scientific advisor to the UK Government, argues that unjustified vilification of GM in Europe is leading to needless deaths from starvation in poor countries (Economist, 2009). Despite the ongoing public debate in Europe, vast amounts of GM crops enter the European food chain as domestic animal feed (as detailed above in section 3.8), and numerous food products containing GM ingredients are found on European supermarket shelves.

4.5. Do European Consumers Buy GM Foods?

A European Commission study titled "Do European Consumers Buy GM Foods?" perceived a unique opportunity to conduct a fact-based survey on the sales of GM-labelled foodstuffs as they became available for the first time in ten Member States. *"Rather than concentrating on what consumers said they might do with respect to buying GM-foods, the study has explored as far as possible what in fact they did do in those countries where such foods were on sale. In Member States with none on the shelves, attention turned to consumer responses to 'GM-free' labels"* (Moses and Fischer, 2008, p.2.5). The study involved: 1. tracking the introduction and availability of labelled GM-foods in ten Member States; 2. viewing in those countries the actual consumer purchases of GM-foods against a background of published opinion polls of expressed intentions, local public discussions, media reports, and governmental policies and statements; 3. exploring consumer actions and motivations by bar code analysis of purchases accompanied by questionnaires; questions were put to individual shoppers in Germany; 4. asking how Europeans, as represented by Poles and residents of the UK, react to the widespread presence of GM-containing foods when living in or visiting North America; 5. drawing appropriate conclusions about the predictive value of various methods of assessing public opinion and intentions in the light of actual consumer preferences as indicated by purchases. The authors concluded that the answer to the question "Do European consumers buy GM foods?" is "Yes – when offered the opportunity" (European Commission, 2008). This conclusion fits with our own findings derived from real-life choice modelling experiments in five European countries (plus New Zealand) to determine consumer willingness to buy GM fruit (with a consumer benefit) at differential prices, in order to determine the price sensitivity of consumer choices (Knight et al., 2007). These studies are reviewed in Chapter 5 of this report.

4.6. Estimates of consumer willingness-to-pay for either GM food or non-GM food

Several researchers have estimated consumer willingness to pay for either GM or GM-free food in different countries. James and Burton (2003) conducted a choice modelling mail-out survey in Australia and concluded (p.515): *"The results of the present study show that most consumers will require some form of discount if they are to purchase GM foods although the size of this discount would depend to some extent on any effects (e.g., chemical, environmental) of the new technology and on the age and sex of the consumers themselves."* For example, (p.514): *"a woman aged 35 years would pay a premium of approximately 8 per cent to avoid a basket with 30 per cent GM foods"*. They found that about two thirds of consumers were prepared to consume GM foods under certain conditions. An experimental auction conducted in New Zealand found that a majority of participants were ready to pay for GM apples (Kassardjian, Gamble and Gunson, 2005).

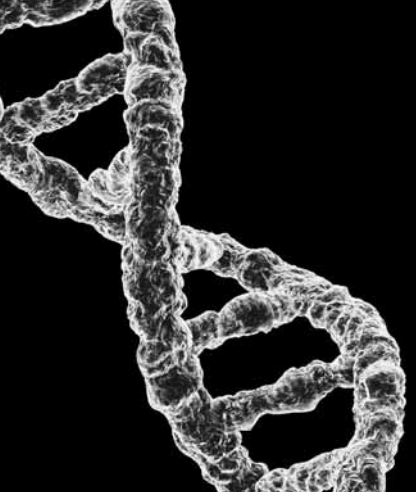
Using a contingent valuation approach in China and Japan, Hu (2006) concluded that Japanese consumers were willing to pay a much higher premium for GM-free cooking oil than were Chinese consumers. McCluskey et al (2003) found that Japanese consumers required on average a discount greater than 50% for noodles made with GM ingredients. Burton et al (2001) in a study of consumer attitudes towards GM in the UK concluded that male shoppers were willing on average to pay an extra 26% to avoid GM, whereas female shoppers were willing to pay an extra 49.3%.

A choice experimental mail-out survey conducted in the US, Germany, France and the UK found that European consumers were prepared to pay a great deal more for beef from animals not fed genetically modified corn than were US consumers (Lusk, Roosen and Fox, 2003). However, there were very low response rates in the European countries (12% in France, 7% in Germany, 15% in the UK), which raises the possibility that there was over-representation of those who may have felt strongly about the issue, and may therefore have inflated the results.

Studies in North America have generally found consumers to be more accepting of GM food. For example, a national telephone survey found 37% of respondents were completely willing, and 39% were neutral to somewhat willing, to consume orange juice from GM oranges (Hossain and Onyango, 2004). Another study in the US found that 70% of consumers were not willing to pay any premium for GM-free corn chips (Lusk et al., 2001).

Willingness-to-pay research needs to be tempered by the large body of literature indicating that willingness-to-pay is overstated in hypothetical valuation questions as compared to when actual payment is required (Lusk, 2003). The "some number is better than no number fallacy" seems to encourage continued use of such methods, even though they are known to be potentially highly misleading (Diamond and Hausman, 1994). Cummings and Taylor (1999) introduced a method for eliminating hypothetical bias by employing "cheap talk", which has been described in game theory as non-binding communication between participants. In the context of surveys, this method involves the researcher making the participant aware of the issue of hypothetical bias prior to answering the survey questions, in order to lessen or eliminate the problems associated with social desirability and other biases that might otherwise lead to grossly inflated results regarding consumer willingness to pay extra for a given attribute. Lusk (2003) employed the "cheap talk" method in a survey mailed to 4,900 randomly selected US respondents to determine willingness to pay extra for a GM product with enhanced consumer benefit. The product investigated was golden rice, which has been engineered to contain daffodil genes so that it produces beta-carotene, which the body converts to vitamin A. Vitamin A deficiency can cause blindness, sickness, and in extreme cases death. The primary objective of the study was to investigate the effect of cheap talk, and respondents who were given cheap talk were far more price sensitive than those who were not. However, the study found that more than half of consumers preferred golden rice to white rice at all prices offered, and the estimated average willingness to pay for golden rice was 24% higher than for white rice.

Good taste is perhaps the most central consumer benefit of food products (Grunert et al., 2004). Their study conducted in the four Nordic countries showed that a positive sensory experience could have a positive impact on purchase intention. GM products that provide enhanced taste benefits, and/or price advantages, are much more likely to win over consumers than are products conveying benefits only to producers, or abstract benefits that are difficult to judge (Grunert et al., 2004).



5. Revealed versus stated preferences in regard to GM food in diverse markets

5.1 Research of others

Whether consumer concerns about GM necessarily translate into buying behaviour is debatable and has been questioned by researchers in various markets. In a "topic blind" study in the UK, 93% of 100 individuals willingly tasted and ate what they believed to be GM food in an experimental setting, and 48% said they would buy GM food in the future – results that the researchers found *"surprising in the context of other reports about attitudes and intentions toward GM food"* (Townsend and Campbell, 2004, p.1385). Powell et al (2003), in a rare example of research into actual purchasing behaviour as distinct from surveys regarding attitudes or purchase intentions, placed GM sweetcorn (insecticide-free) on sale alongside conventional non-GM sweetcorn at a farm and market in Ontario, Canada. The GM version outsold the regular version and *"the majority of consumers interviewed said they were more concerned about pesticides than genetic engineering"* (Powell et al., 2003, p.700). Because the GM issue has been far less controversial in North America than in Europe (Wansink and Kim, 2001), it could be argued that Powell et al's findings might not apply elsewhere.

5.2. Choice modelling experiments to reveal real consumer decisions

Our own studies of revealed preferences involved setting up actual roadside fruit stalls in six countries (Knight et al., 2007). The fruit stalls were set up and run by student research assistants who were native speakers of the language appropriate for the given market. These laborious and expensive studies, funded by AGMARDT, were inspired by the suggestion from some of the European gatekeepers we interviewed that European consumers were in fact ready for GM food provided there was a stated consumer benefit and/or price advantage. The study used choice modelling with a fractional factorial design in order to determine the price sensitivity of consumer choices in regard to this controversial issue. We began with a pilot experiment in New Zealand, in which cherries labelled as spray-free GM, organic, or conventional were placed side-by-side at different price levels, which changed every 50 customers. If customers asked about the GM trait, they were told that the plant contained the *Bt* gene (from *Bacillus thuringiensis*) to make it insect-resistant. Once consumers had made their choice, but before money changed hands, they were told that this was a university experiment that had ethics approval, that all fruit was in fact identical, and that they could purchase what they had just chosen at the lowest of the prices shown. The experiment was extended to Sweden, Belgium, France, UK and Germany, in each case using a fruit type (strawberries, cherries, grapes) that might be eaten without washing, in order to make the spray-free attribute salient. All are countries where the GM controversy has been prominent.

A total of 2,736 consumers visited the fruit stalls in the six countries. The study showed that when all fruit were at the same price, organic produce gained the highest market share in each market. The scenario that we consider most realistic is where a 15% premium was charged for organic, and a 15% discount was given for the GM spray-free option, to reflect the lower cost of inputs. A significant percentage of consumers visiting the stalls were willing to purchase GM fruit provided there was at least a modest price advantage coupled with a consumer benefit. Under this scenario, the GM option gained the dominant market share in the New Zealand, Swedish and German stalls, and reached 30% or more in the UK and French stalls (Knight et al., 2007).

Our results are broadly consistent with the 2006 Eurobarometer survey of 25,000 respondents across the then 25 member countries of the EU (Gaskell et al., 2006). Although 'strong opposition' to the overall concept of GM food technology was expressed, when respondents were asked whether they would buy GM food 'if it contained fewer pesticide residues than other food', 51% indicated 'yes, definitely' or 'yes, probably'. Furthermore, 36% indicated 'yes definitely' or 'yes, probably' 'if it were cheaper than other food' (although how much cheaper was not stated.)

In three countries (New Zealand, Sweden and Germany), we conducted the fruit stall choice modelling study in two different ways. After completing the revealed preference study as described above, we conducted stated preference surveys in which customers leaving an actual (non-experimental) fruit stall were intercepted and invited to complete a paper-based survey. These surveys contained exactly the same price and attribute information (according to the same fractional factorial design) as was used in the experimental fruit stall, but coloured photographs of fruit replaced the real fruit on offer. To our considerable surprise, the results of the revealed preference and stated preference measurements were very different – there was a much lower stated willingness to buy the GM option than the revealed willingness that was apparent when people were making real choices, with their own money at risk.

Table 5.1. Comparison of revealed preference (RP) and stated preference (SP) market share simulation estimates with the scenario where organic is priced at a premium and a discount is offered for the GM option, in three countries.

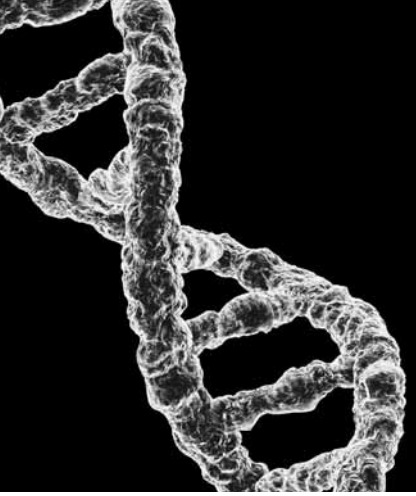
		% Market Shares		
Price level		Organic "Biogrow" certified	Ordinary Low residue	Spray-free Genetically Modified
New Zealand:				
15% premium for organic,	RP	20	20	60
15% discount for spray-free GM	SP	38	32	30
Sweden:				
15% premium for organic,	RP	20	38	43
15% discount for spray-free GM	SP	39	30	31
Germany:				
15% premium for organic,	RP	33	31	36
15% discount for spray-free GM	SP	28	59	12

Comparison of revealed and stated preferences indicates that under conditions of social pressure and controversy, such as surrounds the GM issue, the parameter estimates differ substantially in the two methods, and are not scalable (data submitted for publication). This implies that different mental processes are invoked in making choices under the two regimes. In a revealed preference situation, consumers are not expecting that their decision – and their reasons for it – will be subjected to scrutiny by others. In contrast, in a stated preference situation, where respondents are being asked to complete a paper-based questionnaire containing exactly the same set of price and attribute information, but accompanied by coloured photographs of the fruit rather than the actual fruit, it is readily apparent that one's response will be scrutinized – and in fact respondents may be completing the questionnaire under the administrator's gaze. Under these circumstances, perceptions of social expectancy seem likely to be over-riding price-quality judgments. Impression-motivation is well understood to influence attitudes, which are likely to reflect the "shared reality" of others' expectations (Agrawal and Maheswaran, 2005; Chen, Shechter and Chaiken, 1996; Ratner and Kahn, 2002). In our experiments, we see a clear difference in price sensitivity, and in turn choice, depending on the circumstances under which choices are being recorded.

Noussair et al (2004, p.103) point out that *"surveys place respondents in the role of citizens, who make judgments from society's point of view, rather than consumers, who make actual purchase decisions."* They state (p.117): *"A consumer's market behaviour would neglect the externality his consumption imposes, whereas his response to a survey would not. This is analogous to the consumer of electricity who is opposed to nuclear power but uses the electricity from the power grid, despite the fact that some of the electricity is generated with nuclear power."*

It is well-known that consumers' self-reported purchase intentions do not perfectly predict their future purchase behaviour (Chandon, Morwitz and Reinartz, 2005). A meta-analysis of 87 behaviours found a frequency-weighted average correlation between intentions and behaviour of .53, with wide variations across measures of intentions and types of behaviour (Sheppard, Hartwick and Warshaw, 1988).

In their willingness-to-pay experiment, Noussair et al (2004) found 42% of French consumers were willing to purchase products made with GMOs if they were sufficiently inexpensive; 23% were indifferent, and 35% were unwilling to purchase them no matter what the price. According to Noussair et al (p.116) these results show "a sharp contrast to the predominantly negative views of French survey respondents toward genetically modified organisms in food products." (See discussion regarding willingness-to-pay experiments in Section 4.6).



6. Impact of GM and other controversial technologies on image of New Zealand as a tourist destination

6.1. Overview

Tourism represents a major part of the New Zealand economy. To the year ended 31 August 2010, approximately two and a half million tourists (2,514,951) visited New Zealand, generating 16.4% of New Zealand's total export earnings (Ministry-of-Economic-Development, 2010). This industry is of such economic importance that it is critical to understand factors that might endanger it, and avoid taking unnecessary risks. Therefore, it is sensible to evaluate possible negative consequences related to proposals to introduce any kind of controversial technology, including GM technology of various kinds. Before presenting data that relate to this specific issue, we will analyze how country images influence tourist destination choice.

6.2. Country image and tourist destination choice

Whether the image that one has of a place is of a tropical paradise, a country filled with beautiful scenery, a vibrant metropolitan centre, a market for great deals and haggling, or a place known for a friendly obliging local population, or other characteristics, it seems obvious that the country image will play a key role in determining the appeal of a destination to tourists. Indeed, this is what a body of research has found (Baloglu and McCleary, 1999; Hunt, 1975; Goodrich, 1978; Tapachai and Waryszak, 2000; Pike and Ryan, 2004; Nadeau et al., 2008; Beerli and Martin, 2004). Destination image has been defined as *"the expression of all objective knowledge, impressions, prejudice, imagination, and emotional thoughts an individual or group might have of a particular place"* (Lawson and Baud-Bovy, 1977, p.10). This concept has been further developed to accommodate fantasy and the possibility of the image becoming stronger than the reality (Hashimoto and Telfer, 2006). According to Butler (1998, p.122) *"created images may be a true reflection of history, nature and tradition, or a fantasized or even distorted reflection to suit consumers' tastes."*

6.3. Theoretical models of tourist destination image

Sirakaya and Woodside (2005) advocated building and testing theories of decision-making by travellers, calling for greater empirical testing of theoretical propositions. Echtner and Ritchie (1993) and Baloglu and McCleary (1999) argue that destination image is formed by rational and emotional interpretations consisting of a cognitive component (knowledge about perceived attributes of a destination) and an affective component (an individual's feelings towards and about a destination). Nadeau et al (2008) developed a model applying PCI understanding to tourist destination image (TDI) and its relationship to travel intentions and destination choice. The model is based on cognitive, affective and conative components, and emphasises the connection between destination evaluation and overall perceptions of a country and its people. Their model allows for perceptions of competence of the people and of the country, and perceptions of the character of the people and of the country, to interact with perceptions of the built and natural environments.

We are interested in knowing whether, and how, perceptions of these qualities of a country and its people might be influenced by perceptions regarding use of various controversial technologies in a given country. Research to address this issue is described in Chapter 7.

6.4. Origins of New Zealand's "Clean Green" Image in Tourism

Buhrs and Bartlett (1993) define the essential elements of the 'clean green' image for New Zealand as follows: *"New Zealand is a land little affected by industrial pollution, over-population, traffic congestion, noise, urban decay. It is a country associated with national parks, scenic beauty, wilderness areas, beautiful deserted beaches, green pastures and a friendly population – an image which is carefully cultivated in tourism brochures and in our trade promotions."* They also argue that the clean green image is and always has been an inflated, if not false, representation of the country's environmental conditions and awareness. A survey of a statistically representative sample of 1114 New Zealanders found that approximately equal numbers thought that the 'clean green' image was a myth, (41.8%) or was not a myth (39.3%), (Gendall et al., 2001).

According to Coyle and Fairweather (2005) the clean green image of New Zealand is a well-known example of what has been called a 'place myth'. Sanderson et al (2003, p.3) state *"the origins of the concept of a 'clean green' image for New Zealand are comparatively recent, commencing in the mid-1980s around the time of the Rainbow Warrior incident (1985) and the passing of the New Zealand Nuclear Free Zone, Disarmament, and Arms Control Act (1987)".* Even though the initial focus was on nuclear weapons, public opposition to nuclear technology in general (with the obvious exception of medical applications) has been widespread, and "Nuclear Free New Zealand" has been a long-standing catch-cry.

Increasingly, nuclear power is being considered in other countries as a method of electricity generation that contributes far less to greenhouse gas emissions than use of fossil fuels. A vigorous nuclear industry does not appear to damage the image of Switzerland, Sweden or Canada as tourist destinations, even though all three have strong perceptual similarities to New Zealand (see Fig 7.3). The image of France – where 78% of its electricity generation is nuclear – and which is the world's number 1 destination for tourists – does not appear to suffer.

As discussed above, many New Zealanders see "GE Free New Zealand" as being part of the "100% Pure New Zealand" branding position. As pointed out by a Ministry for the Environment report titled 'Valuing New Zealand's Clean Green Image' (Thornton, Paul and Kerr, 2001): *"It is important to note that New Zealand is by no means the only country which takes advantage of such 'clean green' positioning. Countries such as Australia and Canada have also adopted similar marketing strategies."* The irony here is that both of these countries grow GM crops, and Canada produces nuclear power as well. So how do international tourists, many of whom come from countries where nuclear power generation is thoroughly entrenched, and GM crops are widely grown and/or consumed, view this issue in relation to New Zealand?

6.5. New Zealand's image as a tourist destination: "100% Pure New Zealand"

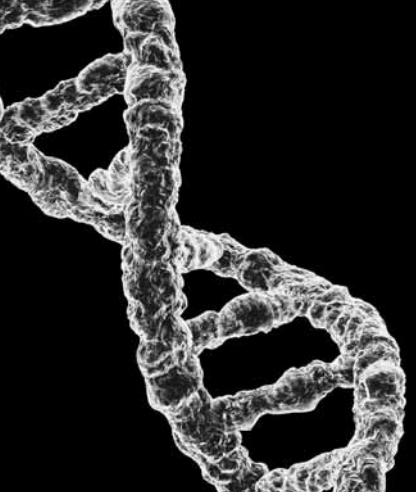
According to the Sanderson et al (2003) report commissioned by the Ministry of Economic Development, 99% of inbound tourists perceive New Zealand as having an environment which is among the best in the world. Furthermore, a 2009 survey of 165 national tourism organizations published by the United Nations World Tourism Organization found that New Zealand topped the list of countries considered to be the best at destination branding with its "100% Pure New Zealand" slogan (Tourism New Zealand, 2010). It is readily apparent that the Lord of the Rings movies have complemented this branding strategy brilliantly, and have greatly enhanced awareness of New Zealand as a highly scenic tourist destination. According to Stephen Cheliotis, Chairman of the UK Superbrands & Coolbrands Council: *"New Zealand is one of the most respected and desirable countries in the world and the Pure NZ brand successfully represents many of the positive images, assumptions and expectations people have of the country. The tourism campaign around the Pure NZ brand has undoubtedly been a success and has helped to make New Zealand one of the most highly sought after tourist destinations and one that is high on people's 'must-visit' lists"* (Tourism New Zealand, 2010).

Len Murray, Managing Director of Value Tours (Australia) says: *"100% Pure conveys that NZ is clean, green, uncrowded (in a congested world) and adventurous. 100% Pure is a simple statement that appeals to most people. More importantly it is believable and what many people want to escape to."* (Tourism New Zealand, 2010).

According to former Tourismnewzealand CEO George Hickton: *"we make a promise of 100% Pure New Zealand and we deliver on that. Ninety-seven per cent of the people who come to our country actually say the promise is kept, and that's incredibly important"* (Tourism New Zealand, 2010).

6.6. Prior research on tourist perceptions of GM and New Zealand as a holiday destination

The 2003 BERL Report prepared for the Ministry for the Environment (Sanderson et al., 2003) contains survey results based on a sample of 150 people in Australia, 150 in the UK, and 144 in the USA. *"When choosing a holiday, respondents were less likely to be affected by New Zealand's GM status, with 72% overall stating that they would feel no different about choosing a New Zealand holiday should New Zealand use GM."* An additional survey (termed 'Lincoln survey', Appendix 5 in the BERL report) of 93 international visitors departing Christchurch Airport reported that *"just over one quarter stated that they would be less inclined to purchase New Zealand products or holidays"* (Sanderson et al., 2003, p.16). The authors of the main report acknowledge *"possible bias in terms of the 'be kind to host' effect"* (p.14).



7. Surveys of in-bound tourists entering New Zealand

7.1. Introduction

Seldom researched are the views of tourists who have just arrived in the country – partly because it is difficult to access such respondents who are typically in a hurry to find their way out of the airport and begin their tourist experience. We considered that it was critical to undertake research in this setting in order to determine views of people who have recently 'purchased' New Zealand and are about to 'consume' it, so that they might reflect on their purchase decision while it was still top-of-mind.

A face-to-face survey of 515 overseas tourists was conducted at Auckland International Airport, which is the gateway for approximately 70% of tourists arriving in New Zealand. Foreign tourists seeking information from the i-SITE information centre were approached, and invited to participate in a survey taking a few minutes. A pictorial fridge magnet was offered as a token of appreciation for their time. Care was taken to approach the next tourist in line after each completion, to minimize risk of selection bias. The i-SITE location was designated by the management of the airport on the basis that people visiting the information centre might be less likely to feel pestered than people who were rushing to catch local transportation, or otherwise go about their business. Furthermore, people visiting the i-SITE are likely to comprise a high proportion of first-time visitors to New Zealand and, being information seekers, they are likely to be particularly interested in anything and everything to do with their recently-chosen experience. Under-represented will be tourists who are being shepherded on group tours.

7.2. Interview procedure

The interviewer first confirmed that the respondent was a first-time visitor to New Zealand. A survey based on the principles developed by Liefeld (2004) for country of origin research was then administered. The interviewer asked what factors the tourist considered when choosing to visit New Zealand, and probed until the respondent could not suggest any additional reasons for visiting New Zealand. Tourists were then asked to nominate a country that they considered was "most similar" to New Zealand, based on whatever criteria the tourist chose to use. Then followed prompted questions designed to elicit specific information regarding knowledge about certain controversial technologies that might be used in that country. Tourists were asked to rate on 6-pt Likert scales the likelihood that introduction of a given technology in the country they deemed most similar to New Zealand would affect their future travel intentions regarding that country. Then followed questions to determine what they knew about certain methods of electricity generation, crop production and farming practices in New Zealand. Respondents were then asked to evaluate on 6-pt Likert scales the likely impact that introduction of a given technology would have on their future intentions to visit New Zealand. Full details of the survey instruments used are presented in the Appendix.

The survey was conducted over two time periods: June-July 2009, then December 2009-January 2010. In this way, we hoped to cover both winter travellers and summer travellers to broaden the representativeness of the study.

7.3. Demographics of the sample

Table 7.1. Gender of respondents

	Frequency	Percentage
Male	261	50.7%
Female	254	49.3%
Total	**515**	**100%**

Table 7.2. Age distribution of respondents

Age Group	Frequency	Percentage
20-29	241	46.8%
30-39	106	20.6%
40-49	34	6.6%
50-59	82	15.9%
60-69	50	9.7%
70+	2	0.4%
Total	**515**	**100%**

Table 7.3. Origin of Respondents

Origin	Frequency	Percentage
Continental Europe	124	24.1%
UK	95	18.4%
USA	92	17.9%
Australia	88	17.1%
Asia	43	8.3%
South America	39	7.6%
Other	32	6.2%
Did not answer	2	0.4%
Total	**515**	**100%**

Under-represented in this sample are Australians, who make up 44.6% of tourist arrivals to New Zealand. However, large numbers of these may well be repeat visitors, who would have been excluded by our initial screening. Also under-represented are tourists from Asian countries, probably because many of those will be travelling on group tours and would be more likely to seek information from a tour leader, rather than from an i-SITE.

7.4. Results of the tourist surveys

Fig 7.1. Top of mind reasons given for having chosen to visit New Zealand

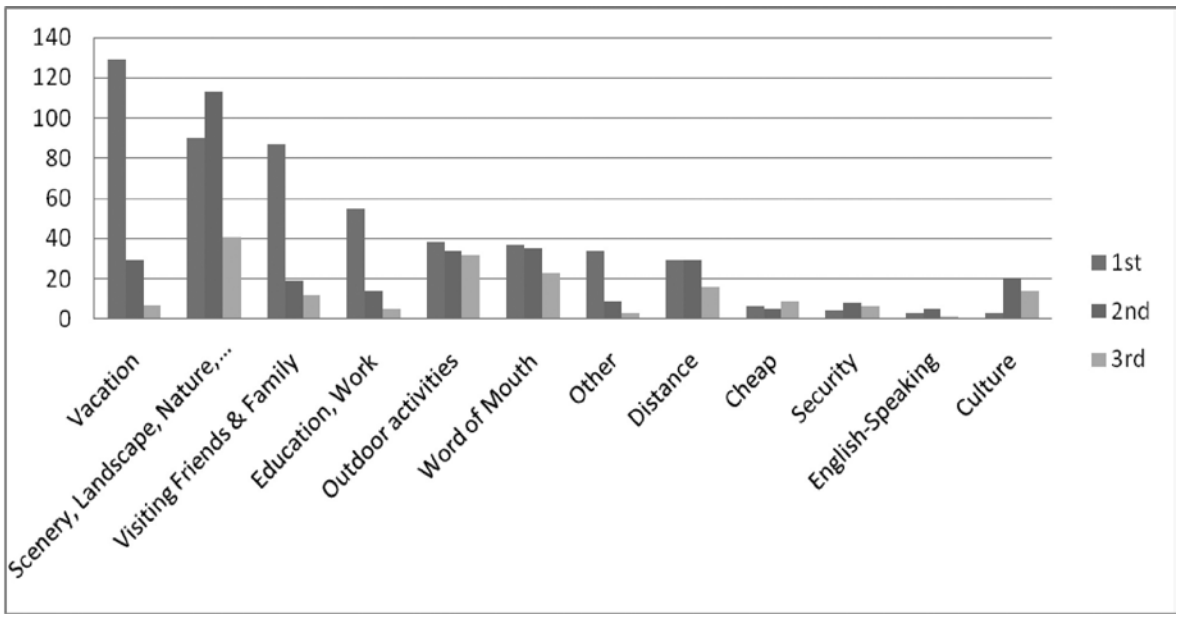
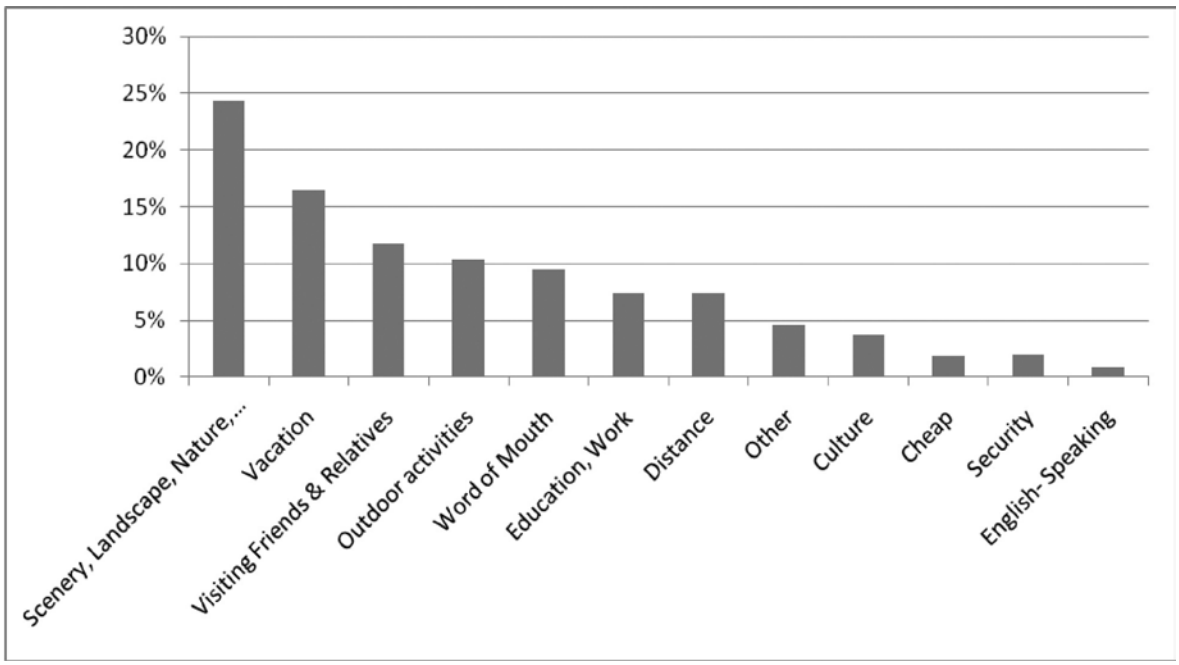


Fig 7.2. Reasons given for visiting New Zealand (expressed as % of total)



As can be seen in Figures 7.1 and 7.2, the commonest reason given for choosing to visit New Zealand rather than an alternative destination is indeed related to perceptions of scenery, landscape and the natural environment. Tourists who nominated "vacation" as their first response are focussing on their reasons for travelling anywhere, rather than on their reasons for choosing New Zealand as their destination. This explains why "scenic, landscape, nature" etc emerges as the commonest second reason given. "Distance" indicates perception that New Zealand is not too far away to travel to, so is most likely to have been nominated by Australians.

Fig 7.3. Countries perceived as "most similar" to New Zealand

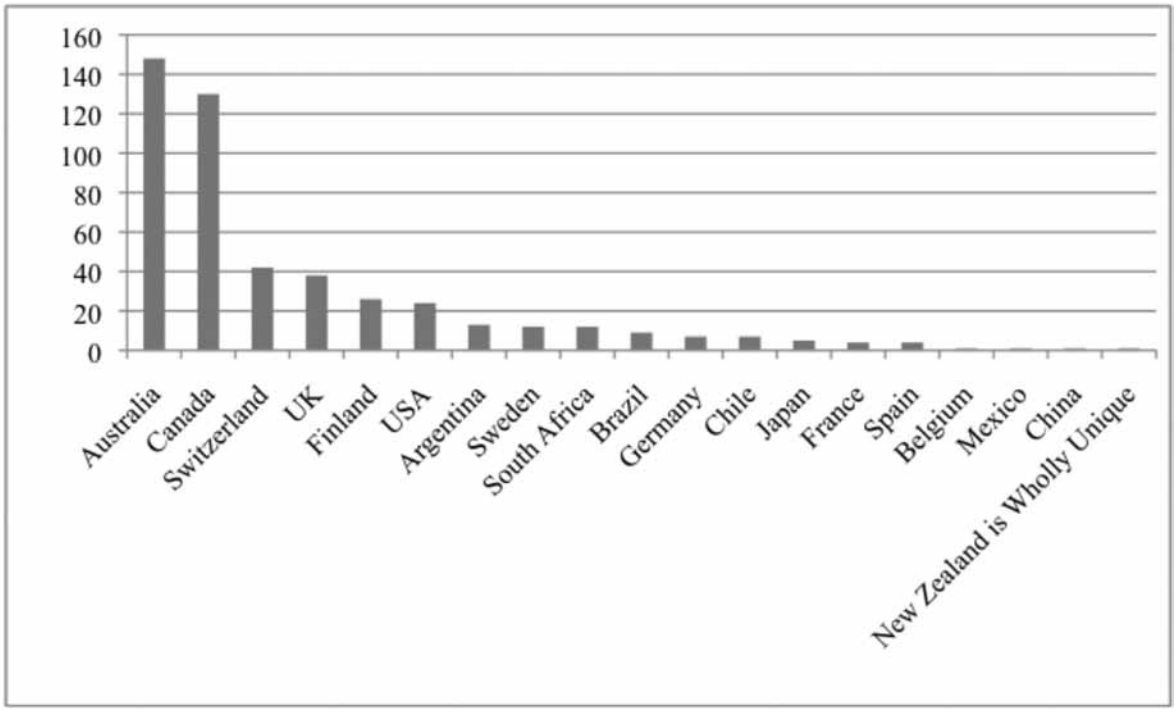


Figure 7.3 shows that Australia and Canada were nominated by a large proportion of tourists as "most similar" to New Zealand – based on whatever criteria the tourist considered relevant when making this assessment. Switzerland and the UK were the next most commonly perceived as "most similar" to New Zealand.

The interviewer then used the answer given to this question as the basis for asking about likely changes in travel intentions to that country, given the information that the country they had nominated uses nuclear electricity generation, and/or GM methods in crop production and/or "factory farming" methods (see Table 7.4). This was very straightforward, since Australia, Canada, USA, Argentina, South Africa and Brazil all produce GM crops (James, 2010), and Canada, Switzerland, UK, Finland, USA, Argentina, Sweden, South Africa, Brazil and Germany all use nuclear power generation (World Nuclear Association, 2009), and "factory farming" methods are near universal.

Table 7.4. Countries using nuclear electricity generation and/or growing GM crops

Nuclear power	GM crops	Crop type
Argentina	**Argentina**	soybean, maize, cotton
Armenia	Australia	cotton, canola, carnations
Belgium	Bolivia	soybean
Brazil	**Brazil**	soybean, maize, cotton
Bulgaria	Burkina Faso	cotton
Canada	**Canada**	canola, maize, soybean, sugarbeet
China	Chile	maize, soybean, canola
Czech Republic	**China**	cotton, tomato, poplar, papaya, sweet pepper
Finland	Colombia	cotton
France	Costa Rica	cotton, soybean
Germany	**Czech Republic**	maize
Hungary	Egypt	maize
India	Honduras	maize
Japan	**India**	cotton,
Korea (South)	**Mexico**	cotton, soybean
Mexico	Paraguay	soybean
Netherlands	Philippines	maize
Pakistan	Portugal	maize
Romania	**Romania**	maize
Russia	**Slovakia**	maize
Slovakia	**South Africa**	maize, soybean, cotton
Slovenia	**Spain**	maize
South Africa	**Sweden**	potato (approved 2010)
Spain	Uruguay	soybean, maize
Sweden	**USA**	soybean, maize, cotton, canola, squash, papaya, alfalfa,
Switzerland		sugarbeet
Ukraine		
UK		
USA		

Countries in **bold** have both nuclear power and GM crops
Data from World Nuclear Association (www.worldnuclear.org/) and ISAAA (James, 2010)

Table 7.5. Impact of controversial technologies on deterring tourists from revisiting a destination they deem "most similar to NZ"

	Definitely agree	Somewhat agree	Slightly agree	Slightly disagree	Somewhat disagree	Definitely disagree	**Total**
Nuclear Power	6 **1.3%**	23 4.9%	19 4.1%	25 5.4%	90 19.3%	303 65.0%	**466**
	Total who definitely, somewhat, slightly **agree** would deter from revisiting: 10.3%			Total who definitely, somewhat, slightly **disagree** would deter from revisiting: 89.7%			
GM	3 **0.6%**	17 3.6%	28 5.9%	37 7.9%	100 21.2%	286 60.7%	**471**
	Total who definitely, somewhat, slightly **agree** would deter from revisiting: 10.1%			Total who definitely, somewhat, slightly **disagree** would deter from revisiting: 89.9%			
Factory Farming	1 **0.6%**	6 3.5%	9 5.2%	15 8.7%	28 16.3%	113 65.7%	**172**
	Total who definitely, somewhat, slightly **agree** would deter from revisiting: 9.3%			Total who definitely, somewhat, slightly **disagree** would deter from revisiting: 89.7%			
Free stall Farming	1 **0.6%**	8 4.7%	7 4.1%	17 9.9%	48 27.9%	94 54.7%	**172**
	Total who definitely, somewhat, slightly **agree** would deter from revisiting: 9.4%			Total who definitely, somewhat, slightly **disagree** would deter from revisiting: 89.6%			

As can be seen in Table 7.5, the number of respondents who "definitely agree" that their travel intentions to that country would now change, given this "new" information, is extremely tiny, less than 1.5% for any of the technologies mentioned. Furthermore, even when we widen the net to include those who "somewhat" or "slightly" agree that their travel intentions to such a country would alter, we only see approximately 10% who claim this.

We now turn to what tourists know about the methods used to generate electricity in New Zealand, and about whether or not the country uses GM methods in crop production, or "factory farming" methods in dairying. This latter question was asked in two different ways, to see whether the rather pejorative term "factory farming" caused a different reaction to the term "free stall farming" – that is quite commonly used in Europe to distinguish this method from the much more controversial but common technique of tethering or chaining cows in cubicles (a method that is certainly not used in New Zealand, so far as we are aware). We would argue that if a tourist does not know whether or not New Zealand (or any other country for that matter) uses nuclear generation, or GM crop production, etc, then it seems most unlikely that this technology enters into their tourist destination decision-making. Indeed, how can it, if they do not know of it?

Table 7.6. Knowledge of electricity generation methods used in NZ

	Frequency	**Percentage**
Recognised at least 1 method of electricity generation used by NZ and correctly excluded nuclear	352	68.3%
Nuclear incorrectly mentioned as a method of electricity generation in NZ	29	5.7%
Could not identify any method that was used for electricity in NZ	134	26%

Overall, the data in Table 7.6 show that nearly 70% of respondents were aware that New Zealand does not use nuclear electricity generation, because they did not select "nuclear" as one of the options on the list.

Table 7.7. Knowledge of New Zealand's use of GM, Factory farming & Freestall farming methods

NZ uses already:	Definitely agree	Somewhat agree	Slightly agree	Slightly disagree	Somewhat disagree	Definitely disagree	**Total**
GM in food production	18 4.8%	52 14.0%	39 10.5%	67 18.0%	138 37.1%	58 15.6%	**372**
	Total who definitely, somewhat, slightly **agree** NZ uses: 29.3%			Total who definitely, somewhat, slightly **disagree** NZ uses: 70.7%			
Factory Farming in Dairy production	7 3.7%	23 12.3%	17 9.1%	39 20.9%	50 26.7%	51 27.3%	**187**
	Total who definitely, somewhat, slightly **agree** NZ uses: 25.1%			Total who definitely, somewhat, slightly **disagree** NZ uses: 74.9%			
Free stall Farming	3 1.6%	19 10.2%	12 6.5%	41 22.0%	66 35.3%	45 24.2%	**186**
	Total who definitely, somewhat, slightly **agree** NZ uses: 18.3%			Total who definitely, somewhat, slightly **disagree** NZ uses: 81.7%			

Of interest are the figures shown in Table 7.7 indicating that 5% of tourists "definitely" agree that New Zealand already uses GM technology in food production, and 29% "definitely", "somewhat" or "slightly" agree that this is the case. In a sense they may be correct, given that recombinant chymosin is widely used in cheese production (and particularly in vegetarian cheese production) – although that fact would perhaps not be generally known. The EU study discussed earlier refers to this issue:

"Nor have we paid attention to products (such as vegetarian cheese) produced with the aid of materials (chymosin in that case) from a GM-source but do not contain GM-ingredients. EU regulations distinguish between these cases, obliging the latter to carry a label but not the former. The average consumer cannot be expected to know about chymosin from genetically modified microorganisms used for the preparation of some cheeses and we have therefore ignored such materials" (Moses and Fischer, 2008, p.2.1). (In fact, according to the UK National Centre for Biotechnology Education, about 90% of the hard cheese in the UK is made using chymosin from genetically-modified microbes.

www.ncbe.reading.ac.uk/ncbe/materials/enzymes/maxiren.html)

Table 7.8. Impact of introduction of certain technologies on future travel to NZ

	Definitely agree	Somewhat agree	Slightly agree	Slightly disagree	Somewhat disagree	Definitely disagree	**Total**
Still visit NZ if Nuclear Power used in future	250 67.0%	66 17.7%	28 7.5%	8 2.1%	17 4.6%	4 **1.1%**	**373**
	Total who definitely, somewhat, slightly **agree** would still visit NZ: 92.2%			Total who definitely, somewhat, slightly **disagree** would still visit NZ: 7.8%			
Still visit NZ if disease resistant GM Pines Grown	309 60.2%	120 23.4%	47 9.2%	15 2.9%	18 3.5%	4 **0.8%**	**513**
	Total who definitely, somewhat, slightly **agree** would still visit NZ: 92.8%			Total who definitely, somewhat, slightly **disagree** would still visit NZ: 7.2%			
Still visit NZ if factory farming used	121 64.7%	29 15.5%	20 10.7%	4 2.1%	8 4.3%	5 **2.7%**	**187**
	Total who definitely, somewhat, slightly **agree** would still visit NZ: 90.9%			Total who definitely, somewhat, slightly **disagree** would still visit NZ: 9.1%			
Still visit NZ if free stall farming used	114 61.3%	36 19.4%	16 8.6%	9 4.8%	7 3.8%	4 **2.2%**	**186**
	Total who definitely, somewhat, slightly **agree** would still visit NZ: 89.3%			Total who definitely, somewhat, slightly **disagree** would still visit NZ: 10.7%			

Table 7.9. Impact of introduction of certain GMO applications on future travel to NZ

	Definitely agree	Somewhat agree	Slightly agree	Slightly disagree	Somewhat disagree	Definitely disagree	**Total**
Still visit NZ if GM rye grass grown for animal welfare	128 68.4%	31 16.6%	12 6.4%	3 1.6%	8 4.3%	5 **2.7%**	**187**
	Total who definitely, somewhat, slightly **agree** would still visit NZ: 91.4%			Total who definitely, somewhat, slightly **disagree** would still visit NZ: 8.6%			
Still visit NZ if GM rye grass grown	119 64.7%	35 19.0%	17 9.2%	7 3.8%	4 2.2%	2 **1.1%**	**184**
	Total who definitely, somewhat, slightly **agree** would still visit NZ: 92.9%			Total who definitely, somewhat, slightly **disagree** would still visit NZ: 7.1%			
Still visit NZ if GM bacterium used to clean up DDT	228 56.4%	116 22.7%	57 11.2%	24 4.7%	15 2.9%	11 **2.2%**	**511**
	Total who definitely, somewhat, slightly **agree** would still visit NZ: 90.3%			Total who definitely, somewhat, slightly **disagree** would still visit NZ: 9.7%			
Still visit NZ if GM bacteria used to reduce methane	201 54.6%	82 22.3%	46 12.5%	15 4.1%	15 4.1%	9 **2.4%**	**368**
	Total who definitely, somewhat, slightly **agree** would still visit NZ: 89.4%			Total who definitely, somewhat, slightly **disagree** would still visit NZ: 10.6%			

Tables 7.8 and 7.9 show that only a tiny number of tourists say that introduction of a particular technology would "definitely" stop them from choosing to visit New Zealand as a tourist. Furthermore, if we include those who "somewhat" or "slightly" disagree that they would still visit New Zealand if a particular technology were introduced, the percentage who indicate this is still only 10% or less.

Table 7.10. Beliefs regarding acceptability of forms of technology

	Definitely agree	Somewhat agree	Slightly agree	Slightly disagree	Somewhat disagree	Definitely disagree	**Total**
Nuclear power is an acceptable form of electricity generation	74 19.9%	80 21.5%	51 13.7%	38 10.2%	68 18.3%	61 16.4%	**372**
	Total who definitely, somewhat, slightly **agree** is acceptable: 55.1%			Total who definitely, somewhat, slightly **disagree** is acceptable: 44.9%			
Genetic Modification is an Acceptable Form of Technology for Food Production/ Environ-mental Protection	42 11.3%	76 20.4%	65 17.5%	57 15.3%	75 20.2%	57 15.3%	**372**
	Total who definitely, somewhat, slightly **agree** is acceptable: 49.2%			Total who definitely, somewhat, slightly **disagree** is acceptable: 50.8%			
Factory Farming is an Acceptable Form of Dairy Production	15 8.0%	16 8.6%	25 13.4%	29 15.5%	47 25.1%	55 29.4%	**187**
	Total who definitely, somewhat, slightly **agree** is acceptable: 30%			Total who definitely, somewhat, slightly **disagree** is acceptable: 70%			

Freestall Farming is an Acceptable Form of Dairy Production	18 9.7%	23 12.4%	17 9.1%	32 17.2%	43 23.1%	53 28.5%	**186**
	Total who definitely, somewhat, slightly **agree** is acceptable: 31.2%			Total who definitely, somewhat, slightly **disagree** is acceptable: 68.8%			

7.5. Cross-tabulation of results

In tables 7.11, 7.12 and 7.13, statistical comparisons are made between those who came for "scenery/nature etc" reasons and those who came for reasons other than scenery/nature etc.

Table 7.11. Relationship between "scenic" reasons for visiting NZ and travel intentions if nuclear electricity generation was introduced

	Scenery, Landscape, Nature, Beautiful	Other reason	Total	Difference Chi Square
I **would** stop visiting NZ if nuclear power generation introduced	27 12.3%	21 8.5%	48	*NS
I **would not** stop visiting NZ if nuclear power generation introduced	192 87.7%	226 91.5%	418	
Total	**219**	**247**	**466**	

*NS = not significant

Table 7.12. Relationship between "scenic" reasons for visiting NZ and travel intentions if GM was introduced

	Scenery, Landscape, Nature, Beautiful	Other reason	Total	Difference Chi Square
I **would** stop visiting NZ if GM crops introduced	21 9.6%	27 10.7%	48	*NS
I **would not** stop visiting NZ if GM crops introduced	198 90.4%	225 89.3%	423	
Total	**219**	**252**	**471**	

*NS = not significant

Table 7.13. Relationship between "scenic" reasons for visiting NZ and travel intentions if free stall or factory farming was introduced (results combined for the two versions)

	Scenery, Landscape, Nature, Beautiful	Other reason	Total	Difference Chi Square
I **would** stop visiting NZ if free stall/factory farming introduced	13 9%	19 9.5%	32	*NS
I **would not** stop visiting NZ if free stall/factory farming introduced	132 91%	180 90.5%	312	
Total	**145**	**199**	**344**	

*NS = not significant

In tables 7.14, 7.15 and 7.16, statistical comparison are made between those who originate from USA and those who originate from Europe.

Table 7.14. The relationship between USA or Europe origin of tourists and travel intentions if nuclear electricity generation were introduced in NZ

	USA visitors	European visitors	Total	Difference Chi Square
I **would** stop visiting NZ if Nuclear Power Generation introduced	7 8.2%	8 6.6%	15	*NS
I **would not** Stop Visiting NZ if Nuclear Power Generation introduced	78 91.8%	113 93.4%	191	
Total	**85**	**121**	**206**	

*NS = not significant.

Table 7.15. The relationship between USA or Europe origin of tourists and travel intentions if GM crops were introduced in NZ

	USA visitors	European visitors	Total	Difference Chi Square
I **would** stop Visiting NZ if GM Crops introduced	8 9.4%	10 8.1%	18	*NS
I **would not** Stop Visiting NZ if GM Crops introduced	77 90.6%	113 91.9%	190	
Total	**85**	**123**	**208**	

Table 7.16. The relationship between USA or Europe origin of tourists and travel intentions if factory farming/free stall methods were introduced in NZ

	USA visitors	European visitors	Total	Difference Chi Square
I **would** stop Visiting NZ if Factory Farming introduced	4 6.3%	6 6.6%	10	*NS
I **would not** Stop Visiting NZ if Factory Farming introduced	60 93.7%	85 94.4%	145	
Total	**64**	**90**	**155**	

*NS = not significant

In each comparison made in the above six tables, the terms "would" and "would not" include all three levels of agreement with the statement: (definitely, somewaht, slightly).

7.6. Discussion of tourist survey results

Results from the in-bound tourist surveys provide very clear and unambiguous evidence that tourist destination choice is scarcely affected at all by technologies that are in use in a particular country, even if the individual tourist may hold very negative views of that type of technology. This is perhaps already intuitively obvious, given that many of the countries from where our tourists come do themselves use one or more of the three controversial technologies that we have investigated in this study (Table 7.4). As noted above, there is a certain irony in France being the number one tourist destination country in the world, but generating 80% of its electricity from nuclear power stations.

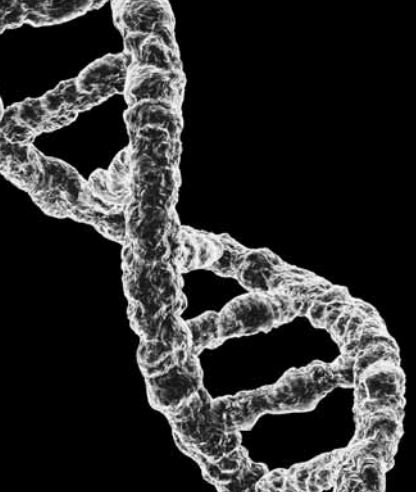
In order to minimize the chance of biasing the results, we began by asking tourists to name a country they had visited that is, in their opinion, "most similar" to New Zealand (by whatever criteria they chose). We then asked them to evaluate the likelihood that their travel intentions in regard to that country would change, given certain information about technology used in that country. The purpose of this indirect questioning was to minimise the risk of "social desirability" – the natural tendency to cast oneself in a favourable light in the eyes of an observer. This is well-recognized as a confounding factor in surveys and interviews (Schuman and Presser, 1981). Only after respondents had considered this other country did we ask them to consider their travel intentions to New Zealand, if certain technologies were introduced in future. Furthermore, rather than focusing just on GM as an issue, we asked about 3 different types of controversial technologies so that the GM issue did not attain unrealistic salience compared to other considerations. Already commented on (Chapter 5) is the substantial literature expressing concern about whether intentions really predict behaviour. We have gone to great lengths to minimize the potential for bias in this survey.

The questioning about a country that tourists deemed "most similar" to New Zealand reveals that none of the technologies would have more than a tiny effect on travel intentions to that country. When the questioning turned to consideration of travel to New Zealand, the results are near identical to those regarding the country deemed "most similar" to New Zealand.

In order to test whether controversial technologies seem likely to have a negative effect on perceptions of "clean green" image of New Zealand, we compared responses of those who said they chose New Zealand as a destination for reasons related to scenery/landscape/nature/ beauty with those who nominated reasons other than these for choosing New Zealand. As can be seen in Tables 7.11, 7.12 and 7.13, there was no statistical difference between the two groups in regard to likelihood that introduction of any of the 3 technologies would change their travel intentions in regard to New Zealand. Finally, given the reported strong differences between Americans and Europeans in regard to GM particularly, we compared these two groupings in regard to reported changes in travel intentions if New Zealand introduced each of the three technologies. We anticipated that Europeans might have shown greater negativity than Americans towards GM in particular, but this is certainly not the case (Tables 7.14, 7.15, 7.16).

We asked some of the questions in two different ways in order to test whether language greatly influences the outcome. In particular, the GM rye grass question was posed either with a statement of benefit for animal welfare, or neutral without any stated benefit. No meaningful difference is apparent. Similarly, the differences in responses to the "factory farming" versus "free stall farming" questions seem negligible, suggesting that there is little difference in perception of the two concepts.

Our results need to be compared to the prior research provided in the BERL report (Sanderson et al., 2003) claiming (based on 93 responses) that just over a quarter of tourists would be less inclined to travel to New Zealand if GM crops were introduced.



8. Overall Discussion

The main question addressed in this report is whether introduction of GM drought-resistant forage for raising farm animals would harm New Zealand's "clean green" image in export markets for food products, or as a destination for tourists. The evidence that we can draw together to answer this question comes from face-to-face interviews with 57 gatekeepers in 7 countries, choice modeling experiments involving more than 4,000 actual consumers in 6 countries, and surveys of 515 international tourists entering Auckland International Airport. Table 8.1 presents a comparison of sample sizes used in our work and in work of others, which may have a bearing on discrepancies in data and interpretation.

Table 8.1. Comparison of numbers of respondents used in different NZ studies used to predict impact on country image of introducing GM into New Zealand

Gatekeeper surveys	Number of respondents	Reference
NRB interviews with gatekeepers In Australia, UK, USA	9	Sanderson et al 2003
Our interviews with gatekeepers in: Germany, Netherlands, Greece, Italy, UK, China, India	57	Knight et al 2003; 2005a,b; 2007a, b, 2008a,b; Knight & Paradkar 2008; Knight & Gao 2009
Consumer surveys to determine intentions		
NRB survey of consumers in Australia	150	Sanderson et al 2003
NRB survey of consumers in USA	144	Sanderson et al 2003
NRB survey of consumers in UK	150	Sanderson et al 2003
Consumer experiments to reveal actual behaviour		
Our Choice Modelling: revealed preferences of consumers regarding GM food in 5 European countries and NZ	2,736	Knight et al 2007c
Our Choice Modelling: stated preferences of consumers regarding GM food in Sweden, Germany and NZ	1,800	Knight et al 2011 (under review)
Surveys of tourists regarding impact on travel intentions		
Lincoln survey of tourists departing from Christchurch	93	Sanderson et al 2003
Our survey of tourists entering Auckland	515	Knight 2011: this report

Extrapolations that have been made in the form of elaborate econometric modeling (Sanderson et al., 2003; Saunders, Kaye-Blake and Cagatay, 2003) are only as good as the data that form the inputs to the models.

The question of possible negative impact of introducing GM rye grass into New Zealand was addressed in the BERL report (Sanderson et al., 2003). The data collected by the National Research Bureau from telephone interviews with the 150 respondents in each of Australia and the UK, and the 144 respondents in the USA appear in Appendix 3 of that report. The question posed was:

"Suppose New Zealand was one of two or three countries to use a strain of rye grass modified by genetic technology. The gene of the grass would be changed to increase its food value. Farmers would plant fields of the modified rye grass to feed their livestock. Would your image of that country's environment get better, stay the same, or get worse?"

The report states (p.14): "When confronted with a scenario in which rye grass was genetically modified in order to feed livestock, the majority of respondents said that their image of the New Zealand environment would worsen." However, the accompanying graph shows that in the Australian sample 58% said their "image of NZ's environment" would "get better" or "stay the same", compared to 34% who said it would "get worse" or they "don't know". In the UK sample, 51% said their image of NZ's environment would "get worse" (which is indeed "a majority"), and 41% said it would "get better" or "stay the same". In the US sample, 66% said their image would get better or stay the same, compared to 24% only who said it would get worse. In fact, across the 3 countries, 163 respondents said their image would "get worse", and 215 respondents said their image would either improve or stay the same.

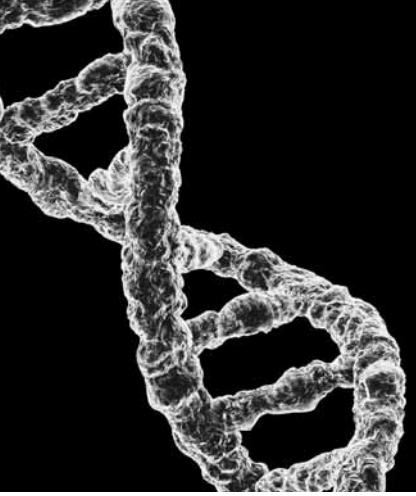
The Lincoln Survey of 93 tourists departing from Christchurch Airport used the same question as above. Twenty four percent (22 respondents) said their image would get worse, and 62% said their image would stay the same or get better – figures that are almost identical to the 24% reported to be "less inclined to choose New Zealand for a holiday" and the 63% who would feel "no different than before" (Question 7 in the report of Fairweather and Maslin, which forms Appendix 5 of the BERL report (Sanderson et al., 2003).

8.1 Drawing it all together

Our extensive set of interviews with food distribution channel gatekeepers in Europe, in China and in India provide clear evidence that introducing specific GM technology into New Zealand will have no harmful effect on perceptions of New Zealand as a country that is the source of high quality food and beverage imports. The data provided in Appendix 4 of the BERL report, based on interviews with informants in 3 major supermarket chains in each of the UK, Australia, and the US is congruent with our own findings. There is no evidence that presence of GM in a given country downgrades that country in the eyes of distribution channel members. There is most certainly no evidence that GM applications in non-food areas (forestry or pest control) would irreparably harm New Zealand's image in the export sector – as has been frequently claimed.

The earlier gatekeeper concerns in regard to GM pasture for raising animals need to be reviewed in the context that the EU has been importing and growing GM feed for animals for more than a decade, and has made little attempt to separate GM from non-GM feed in the supply chain. We now have the estimate that 90% of all the meat imported into Europe is raised on GM feed, and the assertion that the great majority of animals raised within the EU (including the UK) are in fact raised at least in part on GM feed. Furthermore, the EU Parliament has decided to not require labeling of animal products that are produced from animals raised on GM feed. Taken together, these various strands of evidence make it highly unlikely that the EU (or its consumers) will discriminate against animal products of New Zealand origin if New Zealand introduces GM pasture.

Our surveys of international tourists entering Auckland International Airport provide strong evidence that introduction of specific GM applications will not harm New Zealand's 'clean green' image as a tourist destination. Presence of controversial technologies in countries that tourists regard as "most similar to New Zealand" have minimal effect on intentions of tourists to revisit those countries, whether the technology used is nuclear power, factory farming, or GM. The same is true in regard to New Zealand itself: the survey data indicate that any negative effect would be tiny. In particular, introduction of GM drought-resistant pasture seems highly unlikely to damage New Zealand's image for tourism. Many factors should be considered when deciding whether or not to approve GM plants – supposed harm to 'clean green' image in international markets is not among them.



9.0. Conclusion

In the words of the Royal Commission on Genetic Modification (Eichelbaum et al., 2001, p.2):

"Genetic modification has been used freely in New Zealand for more than a decade as a research tool, for medical purposes, and in food ingredients. It holds exciting promise, not only for conquering diseases, eliminating pests and contributing to the knowledge economy, but for enhancing the international competitiveness of the primary industries so important to our country's economic well-being."

And on p.3:

"Technology is integral to the advancement of the world. Fire, the wheel, steam power, electricity, radio transmission, air and space travel, nuclear power, the microchip, DNA: the human race has ever been on the cusp of innovation. Currently biotechnology is the new frontier. Continuation of research is critical to New Zealand's future. As in the past we should go forward but with care."

The many studies reviewed in this report provide substantial evidence from which it can be inferred that introduction of GM drought-tolerant pasture into New Zealand is highly unlikely to do lasting damage to perceptions in overseas markets of the image of New Zealand as a source of high quality food products or as a highly desirable scenic and 'clean green' tourist destination.

New Zealand can "go forward – but with care".

Acknowledgements

I acknowledge the efforts of my many research colleagues at Otago University in helping provide the data on which this report is based. I especially acknowledge the input of Dr David Holdsworth, Dr Damien Mather, Dr Andrea Insch, David Ermen, Dr Hongzhi Gao, Amit Paradkar, Tim Breitbarth, Allyson Clark, plus many other student research assistants who have participated in various parts of the data collection.

I am very grateful to my wife Dr Allison Knight for her hours of painstaking proof reading, many helpful and perceptive suggestions, and for providing the cover photograph.

The financial support of AGMARDT, and of the University of Otago is gratefully acknowledged.

References

Agrawal, N. & Maheswaran, D. (2005) Motivated reasoning in outcome-bias effects. *Journal of Consumer Research*, 31, 798-805.

Al-Sulaiti, K. & Baker, M. (1998) Country of origin effects: a literature review. *Marketing Intelligence and Planning*, 16, 150-199.

Alcalde, E. (2004) Co-existence of GM Maize in Spain. www.jcci.unimelb.edu.au/.../Coexistence%20Spain%20maize.pdf accessed 7 October 2010.

Alpert, F., Kamins, M. A., Sakano, T., Onzo, N. & Graham, J. (2001) Retail buyer beliefs, attitude and behavior toward pioneer and me-too follower brands: a comparative study of Japan and the USA. *International marketing review*, 18, 160-187.

Baloglu, S. & Mccleary, K. (1999) A model of destination image formation. *Annals of Tourism Research*, 26, 868-897.

Beerli, A. & Martin, J. (2004) Factors influencing destination image. Annals of Tourism Research, 31, 657-681.

Bergman, K. (2002) *Dealing with Consumer Uncertainty: Public Relations in the Food Sector*, Berlin, Springer-Verlag.

Bilkey, W. J. & Nes, E. (1982) Country-of-origin effects on product evaluation. *Journal of International Business Studies*, 13, 89-99.

Borlaug, N. E. (2000) Ending world hunger: the promise of biotechnology and the threat of antiscience zealotry. *Plant Physiology*, 124, 487-490.

Bredahl, L. (2001) Determinants of consumer attitudes and purchase intentions with regard to genetically modified foods - results of a cross-national survey. *Journal of Consumer Policy*, 24, 2361.

Brunner, J., Flaschner, A. & Lou, X. (1993) Images and events: China before and after Tiananmen Square. IN PAPADOPOULOS, N. & HESLOP, L. (Eds.) *Product-Country Images: Impact and Role in International Marketing*. Binghampton, International Business Press.

Buhrs, T. & Bartlett, R. (1993) *Environmental policy in New Zealand - the politics of clean and green*, Auckland, Oxford University Press.

Burton, M., Rigby, D., Young, T. & James, S. (2001) Consumer attitudes to genetically modified organisms in food in the UK. *European Review of Agricultural Economics*, 28, 479-498.

Butler, R. (1998) Tartan mythology: the traditional tourist image of Scotland. IN RINGER, G. (Ed.) *Destinations: Cultural Landscape of Tourism*. London, Routledge.

Chaiken, S. & Trope, Y. (1999) *Dual Process Theories in Social Psychology*, New York, Guilford Press.

Chandon, P., Morwitz, V. & Reinartz, W. (2005) Do intentions really predict behavior? Self-generated validity effects in survey research. *Journal of Marketing*, 69, 1-14.

Chen, S., Shechter, D. & Chaiken, S. (1996) Getting at the truth or getting along: accuracy versus impression-motivated heuristic and systematic processing. *Journal of Personality and Social Psychology*, 71, 262-275.

Clemens, R. & Babcock, B. A. (2004) Country of Origin as a brand: the case of New Zealand lamb. *MATRIC Briefing Paper* 04-MBP 9.

Connor, M. & Siegrist, M. (2010) Factors influencing people's acceptance of gene technology: the role of knowledge, health expectations, naturalness, and social trust. *Science Communication*, 32, 514-538.

Coyle, F. & Fairweather, J. (2005) Challenging a place myth: New Zealand's clean green image meets thye biotechnology revolution. *Area*, 37, 148-158.

Cummings, R. & Taylor, L. (1999) Unbiased value estimates for environmental goods: a cheap talk design for the contingent valuation method. *American Economic Review*, 89, 649-665.

Diamond, P. A. & Hausman, J. A. (1994) Contingent valuation: is some number better than no number? *Journal of Economic Perspectives*, 8, 45-64.

Dichter, E. (1962) The world customer. *Harvard Business Review*, 40, 113-122.

Echtner, C. & Ritchie, B. (1993) The measurements of destination image: an empirical assessment. *Journal of Travel Research*, 31, 3-13.

Ecologist (2010) http://www.theecologist.org/News/news_round_up/532007/eu_votes_against_compulsory_gm_food_labelling.html.

Economist (2009) http://www.economist.com/node/15580864?story_id=15580864.

Eichelbaum, T., Allan, J., Fleming, J. & Randerson, R. (2001) Report of the Royal Commission on Genetic Modification. *Report of the Royal Commission on Genetic Modification*. Wellington, New Zealand.

Epstein, S. (1994) Integration of the cognitive and the psychodynamic unconscious. *American Psychologist*, 49, 709-724.

Ettenson, R. & Klein, J. (2005) The fallout from French nuclear testing in the South Pacific: a longitudinal study of consumer boycotts. *International Marketing Review*, 22, 199-224.

Ettenson, R. & Wagner, J. (1986) Retail buyers' saleability judgments: a comparison of information use across three levels of experience. *Journal of Retailing*, 6, 41-63.

Eurobarometer (2003) Europeans and biotechnology in 2002: Eurobarometer 58.0.

Eurobarometer (2008) Attitudes of European Citizens Towards the Environment. http://ec.europa.eu/public_opinion/archives/ebs/ebs_295_en.pdf

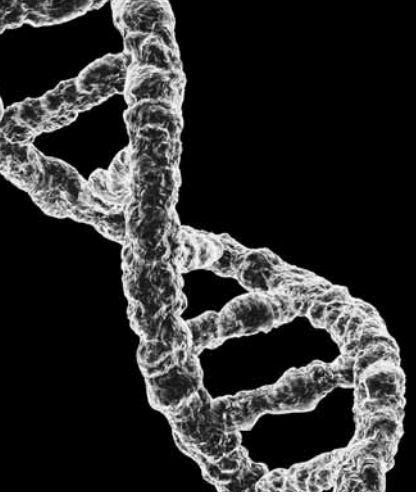
EU Business (2010). www.eubusiness.com/news-eu/farm-food-industry.babaccessed 1 March 2011.
European-Parliament (2010) http://www.europarl.europa.eu/en/pressroom/content/20100706IPR77911/.
European Commission (2004) Genetically modified crops in the EU: food safety assessment, regulation, and public concerns. IN WWW.ENTRANSFOOD.COM. (Ed.).
European Commission (2008) Do European Consumers Buy GM Food?
Farmers-Guardian (2010) http://www.farmersguardian.com/home/latest-news/gm-food-labelling-rejected-by-meps/33023.article. . 8 July 2010.
Federoff, N. & Brown, N. (2004) *Mendel in the Kitchen: A Scientist's View of Genetically Modified Foods*, Washington DC, Joseph Henry Press.
Firth, P. (1999) Consuming fears. *Scientific American*, 280, 41-43.
Fitzgerald, R. & Campbell, H. (2001) Food scares and GM: Movement on the Nature/Culture Fault Line. http://www.econ.usyd.edu.au/drawingboard/digest/0110/fitzgerald_campbell.html, 30/06/2003, 1-6.
Frenchacademyofsciences (2002) Les plantes genetiquement modifiees. http://www.academie-sciences.fr/publications/rapports/pdf/RST13_summary.pdf.
Frewer, L. J., Howard, C. & Shepherd, R. (1995) Genetic engineering and food: what determines consumer acceptance? *British Food Journal*, 97, 31-36.
Gaskell, G., Allansdottir, A., Allum, N., Cordero, C., Fischler, C., Hampel, J., Jackson, J., Kronberger, N., Mejlgaard, N., Revuelta, G., Schreiner, C., Stares, S., Togersen, H. & Wagner, W. (2006) Europeans and biotechnology in 2005: patterns and trends: Eurobarometer 64.3. *Europeans and biotechnology in 2005: patterns and trends: Eurobarometer 64.3*.
Gaskell, G., Allum, N., Bauer, M., Durant, J., Allansdottir, A. & Bonfadelli, H., Et Al (2000) Biotechnology and the European public. *Nature Biotechnology*, 18, 935-938.
Gaskell, G., Allum, N., Wagner, W., Kronberger, N., Torgersen, H., Hamper, J. & Bardes, J. (2004) GM foods and the misperception of risk perception. *Risk Analysis*, 24, 185-194.
Gendall, P. J., Healey, B., Robbie, P., Gendall, K., Patchett, S. & Bright, N. (2001) New Zealanders and the Environment. Massey University, New Zealand.
Ger, G., Askegaard, S. & Christensen (1999) Experiential nature of product-place images: image as a narrative. *Advances in Consumer Research*, 26, 165-169.
Gibb, J. (2008) Nuclear option not in NZ's interests: academic. *Otago Daily Times*.
Gilland, T. (2005) Trade war or culture war? The GM debate in Britain and the European Union. IN ENTINE, J. (Ed.) *Let Them Eat Precaution: How Politics is Undermining the Genetic Revolution in Agriculture*. Washington DC, AEI Press.
Gmo-Compass (2010) http://www.gmo-compass.org/eng/grocery_shopping/crops/19.genetically_modified_soybean.html, accessed 10 October 2010.
Gomez-Barbero, M., Berbel, J. & Rodriguez-Cerezo, E. (2008) Bt corn in Spain - the performance of the EU's first GM crop. *Nature Biotechnology*, 26, 384-386.
Goodrich, J. (1978) The relationship between preferences forand perceptions of vacation destinations. *Journal of Travel Research*, 17, 8-13.
Gouse, M., Pray, C., Schimmelpfennig, D. & Kirsten, J. (2006) Three seasons of subsistence insect-resistant maize in South Africa: Have smallholders benefited? *AgBioForum* 9, 15-22.
Grunert, K. G., Bech-Larsen, T., Lahteenmaki, L., Ueland, O. & Astrom, A. (2004) Attitudes towards the use of GMOs in food production and their impact on buying intention: the role of positive sensory experience. *Agribusiness*, 20, 95-107.
Grunert, K. G., Lahteenmaki, L., Nielsen, N. A., Poulsen, J. B., Ueland, O. & Astrom, A. (2000) Consumer perception of food products involving genetic modification: results from a qualitative study in four Nordic countries., Nordic Industrial FundWorking Paper no 72, July 2000.
Hagemann, K. & Scholderer, J. (2006) Balancing the unknown: consumer judgement of unfamiliar technologies. *35th European Marketing Academy Conference Proceedings*. Athens, Greece.
Hagemann, K. & Scholderer, J. (2007) Consumer versus expert hazard identification: A mental models study of mutation-bred rice. *Journal of Risk Research*, 10, 449-464.
Hamlin, R. P. (2010) Cue-based decision making. A new framework for understanding the uninvolved consumer. *Appetite*, 55, 89-98.
Han, C. (1989) Country image: Halo or summary construct? *Journal of Marketing Research*, 26, 222-229.
Han, C. & Terpstra, V. (1988) Country-of-origin effects for uni-national and bi-national products. *Journal of International Business Studies*, 19, 235-255.
Hansen, T. H. & Skytte, H. (1998) Retailer buying behaviour: a review. *International Review of Retail, Distribution and Consumer Research*, 8, 277-301.
Hashimoto, A. & Telfer, D. (2006) Selling Canadian culinary tourism: branding the global and the regional product. *Tourism Geographies*, 8, 31-55.

Heeler, R. M., Kearney, M. J. & Mehaffey, B. J. (1973) Modelling supermarket product selection. *Journal of Marketing Research*, 10, 34-37.
Henderson, M. (2003) Who cares what "the people" think of GM foods? *Times* (London), June 13.
Heslop, L. (2005) Editorial: Maslow was wrong! And other thoughts on the way to the supermarket. *Journal of Public Affairs*, 5, 193-199.
Heslop, L. & Papadopoulos, N. (1993) But who knows where or when: Reflections on the images of countries and their products. IN PAPADOPOULOS, N. & HESLOP, L. (Eds.) *Product-Country Images: Impact and Role in International Marketing*. New York, International Business Press.
Heslop, L. A., Lu, I. I. R. & Cray, D. (2008) Modeling country image effects through an international crisis. *International Marketing Review*, 25, 354-378.
Heslop, L. A., Papadopoulos, N., Dowdles, M., Wall, M. & Compeau, D. (2004) Who controls the purse strings: a study of consumers' and retail buyers' reactions in an America's FTA environment. *Journal of Business Research*, 57, 1177-1188.
Hine, S. (2009) Fears GE research will tarnish exports. *Country-Wide*, http://www.country-wide.co.nz/article/10454.html.
Hossain, F. & Onyango, B. (2004) Product attributes and consumer acceptance of nutritionally enhanced genetically modified foods. *International Journal of Consumer Studies*, 28, 255-267.
Hu, W. (2006) Comparingconsumers' preferences and willingness to pay for non-GM oil using a contingent valuation approach. *Empirical Economics*, 31, 143-150.
Hulland, J., Todino, H. S. & Lecraw, D. J. (1996) Country-of-origin effects on sellers' price premiums in competitive Philippine markets. *Journal of International Marketing*, 4, 57-79.
Hunt, J. (1975) Image as a factor in tourism development. *Journal of Travel Research*, 13, 1-7.
Jaffe, E. & Nebenzahl, I. (1993) Global promotion of country image: do the Olympics count? IN PAPADOPOULOS, C. & HESLOP, L. (Eds.) *Product-Country Images*. New York, International Business Press.
James, C. (2010) Global Status of Commercialized Biotech/GM Crops: 2009. www.isaaa.org.
James, S. & Burton, M. (2003) Consumer preferences for GM food and other attributes of the food system. *Australian Journal of Agricultural and Resource Economics*, 47, 501-518.
Josiassen, A. & Harzing, A.-W. (2008) Descending from the ivory tower: reflections on the relevance and future of country-of-origin research. *European Management Review*, 5.
Kahneman, D. (2002) Maps of Bounded Rationality: A Perspective on Intuitive Judgement and Choice. *Nobel Prize Lecture*. Princeton University.
Kahneman, D. (2003) Maps of Bounded Rationality: Psychology for Behavioral Economics. *The American Economic Review*, 93, 1449-1475.
Kahneman, D. & Frederick, S. (2002) Representativeness revisited: Attribute substitution in intuitive judgment. IN GILOVICH, T., GRIFFIN, D. & KAHNEMAN, D. (Eds.) *Heuristics and Biases: Psychology of Intuitive Judgment*. New York, Cambridge University Press.
Kassardjian, E., Gamble, J. & Gunson, A. (2005) A new approach to elicit consumers' willingness to purchase genetically modified apples. *British Food Journal*, 107.
Kaye-Blake, W., Saunders, C. & Cagatay, S. (2008) Genetic modification technology and producer returns: the impacts of productivity, preferences, and technology uptake. *Review of Agricultural Economics*, 3, 692-710.
Kemp, K., Insch, A., Holdsworth, D. & Knight, J. (2010) Food miles: Do Uk consumers actually care? *Food Policy*, Forthcoming.
Kessler, C. & Economidis, I. (2001) EC-Sponsopred Research on Safety of Genetically Modified Organisms: A Review of Results. Luxembourg, Office for Official Publications of the European Communities.
King, D. (2003) London, UK, The GM Science Review Panel.
Knight, J., Holdsworth, D. & Mather, D. (2003) Trust and Country Image: Perceptions of European Food Distributors Regarding Factors That Could Enhance or Damage New Zealand's Image - Including GMOs. University of Otago, NZ.
Knight, J., Holdsworth, D. & Mather, D. (2007a) Country-of-origin and choice of food imports: an in-depth study of European distribution channel gatekeepers. J*ournal of International Business Studies*, 38, 107-125.
Knight, J., Holdsworth, D. & Mather, D. (2007b) Determinants of trust in imported food products: perceptions of European gatekeepers. *British Food Journal*, 109, 792-804.
Knight, J., Holdsworth, D. & Mather, D. (2008) GM food and neophobia: connecting with the gatekeepers of consumer choice. *Journal of the Science of Food and Agriculture*, 88, 739-744.
Knight, J., Mather, D. & Holdsworth, D. (2005a) Genetically modified crops and country image of food exporting countries. *British Food Journal*, 107, 653-662.
Knight, J., Mather, D. & Holdsworth, D. (2005b) Impact of Genetic Modification on Country Image of Imported Food Products in European Markets: Perceptions of Channel Members. *Food Policy*, 30, 385-398.
Knight, J., Mather, D., Holdsworth, D. & Ermen, D. (2007) Genetically modified food acceptance: an experiment in six countries. *Nature Biotechnology*, 25, 507-508.
Knight, J. G. & Gao, H. (2009) Chinese gatekeeper perceptions of genetically modified food. *British Food Journal*, 111, 56-69.

Knight, J. G., Gao, H., Garrett, T. & Deans, K. (2008) Quest for social safety in imported foods in China: gatekeeper perceptions. *Appetite*, 50, 146-157.
Knight, J. G. & Paradkar, A. (2008) Acceptance of genetically modified food in India: perspectives of gatekeepers. *British Food Journal* 110, 1019-1033.
Laroche, M., Papadopoulos, N., Heslop, L. & Mourali, M. (2005) The influence of country image structure on consumer evaluations of foreign products. *International Marketing Review*, 22, 96-115.
Laros, F. & Steenkamp, J.-B. E. M. (2004) Importance of fear in the case of genetically modified food. *Psychology and Marketing*, 21, 889-908.
Lawson, F. & Baud-Bovy, M. (1977) *Tourism and Recreational Development*, London, Architectural Press.
Li, Q., Curtis, K., Mccluskey, J. & Wahl, T. (2002) Consumer attitudes toward genetically modified foods in Beijing, China. *AgBioForum*, 5, 145-152.
Liefeld, J. (2004) Consumer knowledge and use of country-of-origin information at the point of purchase. *Journal of Consumer Behaviour*, 4, 85-96.
Lusk, J. (2003) Effects of cheap talk on consumer willingness-to-pay for golden rice. *American Journal of Agricultural Economics*, 85, 840-856.
Lusk, J., Daniel, M., Mark, D. & Lusk, C. (2001) Alternative calibration and auction institutions for predicting consumer willingness to pay for nongenetically modified corn chips. *Journal of Agricultural and Resource Economics*, 26, 40-57.
Lusk, J., Roosen, J. & Fox, J. (2003) Demand for beef from cattle administered growth hormones of fed genetically modified corn: a comparison of consumers in France, Germany, the United Kingdom, and the United States. *American Journal of Agricultural Economics*, 85, 16-29.
Makatouni, A. (2002) What motivates consumers to buy organic food in the UK?. *British Food Journal*, 104, 345-352.
Marra, M., Pardey, P. & Alston, J. (2002) The payoffs to agricultural biotechnology: An assessment of the evidence. *EPTD Discussion Paper No 87*, Washington DC.
Martin, I. & Eroglu, S. (1993) Measuring a multi-dimensional construct: country image. *Journal of Business Research*, 28, 191-210.
Mccluskey, J., Grimsrud, K., Ouchi, H. & Wahl, T. (2003) Consumer response to genetically modified food products in Japan. *Agricultural and Resource Economics Review*, 32, 222-231.
Mcgoldrick, P. & Douglas, R. (1983) Factors influencing the choice of supplier by grocery distributors. *European Journal of Marketing*, 17, 13-27.
Mclaughlin, E. W. & Rao, V. R. (1990) The strategic role of supermarket buyer intermediaries in new product selection: implications for systemwide efficiency. *American Journal of Agricultural Economics*, 72, 358-370.
Miles, S. & Frewer, L. (2003) Public perception of scientific uncertainty in relation to food hazards. *Journal of Risk Research*, 6, 267-283.
Ministry of Economic Development (2010) http://www.tourismresearch.govt.nz/Documents/Key%2StatisticsKeyTourism Statistics
Oct2010.pdf *accessed 10 October 2010*.
Montgomery, D. (1975) New product distribution: an analysis of supermarket buyer decisions. *Journal of Marketing Research*, 12, 255-264.
Moore, P. (2005) Challenging the misinformation campaign of antibiotechnology environmentalists. IN ENTINE, J. (Ed.) *Let Them Eat Precaution: How Politics is Undermining the Genetic Revolution in Agriculture*. Washington DC, AEI Press.
Moses, V. & Fischer, S. (2008) Do European Consumers Buy GM Food? *European Commission: Framework Six*, http://www.kcl.ac.uk/consumerchoice.
Mowen, J. & Carlson, B. (2003) Exploring the antecedents and consumer behavior consequences of the trait of superstition. *Psychology and Marketing*, 20, 1045-1065.
Nadeau, J., Heslop, L., O'reilly, N. & Luk, P. (2008) Destination in a country image context. *Annals of Tourism Research*, 35, 84-106.
Nagashima, A. (1977) A comparative "Made In" product image survey among Japanese businessmen. *Journal of Marketing*, 41, 95-100.
Nebenzahl, I., Jaffe, E. & Lampert, S. (1997) Towards a theory of country image effect on product evaluation. *Management International Review*, 37, 27-49.
Nemeroff, C. & Rozin, P. (1989) You are what you eat: applying the demand-free 'impressions' technique to an unacknowledged belief. *Ethos*, 17, 50-69.
Noussair, C., Robin, S. & Ruffieux, B. (2004) Do consumers really refuse to buy genetically modified food? *The Economic Journal*, 114, 102-121.
Ofir, C., Raghubir, P., Brosh, G., Monroe, K. B. & Heiman, A. (2008) Memory-based store price judgments: the role of knowledge and shopping experience. *Journal of Retailing*, 84, 414-423.
Paarlberg, R. L. (2005) Let them eat precaution: Why GM crops are being over-regulated in the developing world. IN ENTINE, J.

(Ed.) *Let Them Eat Precaution*. Washington DC, AEI Press.
Papadopoulos, N. & Heslop, L. (1993) What product-country images are and are not. IN PAPADOPOULOS, N. & HESLOP, L. (Eds.) *Product-Country Images*. New York, International Business Press.
Papadopoulos, N. & Heslop, L. (2002) Country equity and country branding: problems and prospects. *Journal of Brand Management*, 9, 294-314.
Pardo, R., Midden, C. & Miller, J. (2002) Attitudes toward biotechnology in the European Union. *Journal of Biotechnology*, 98, 9-24.
Pike, S. & Ryan, C. (2004) Destination positioning analysis through a comparison of cognitive, affective and conative perceptions. *Journal of Travel Research*, 42, 333-342.
Powell, D. A., Blaine, K., Morris, S. & Wilson, J. (2003) Agronomic and consumer considerations for Bt and conventional sweet-corn. *British Food Journal*, 105, 700.
Rao, A. R. (2005) The quality of price as a quality cue. *Journal of Marketing Research*, 42, 401-405.
Rao, V. R. & Mclaughlin, E. W. (1989) Modelling the decision to add new products by channel intermediaries. *Journal of Marketing*, 53, 80-88.
Ratner, R. K. & Kahn, B. F. (2002) The impact of private versus public consumption on variety-seeking behavior. *Journal of Consumer Research*, 29, 246-257.
Royal-Society-of-New-Zealand (2010) Genetically modified forages: emerging issues. www.royalsociety.org.nz.
Rozin, P. & Nemeroff, C. (1990) The laws of sympathetic magic. IN STIGLER, J., SHWEDER, R. & HERDT, G. (Eds.) *Cultural Psychology: Essays on comparative human development*. Cambridge, Cambridge University Press.
Rozin, P., Spranca, M., Krieger, Z., Neuhas, R., Surillo, D., A, S. & Al, E. (2004) Preference for natural: instrumental and ideational/moral motivations, and the contrast between foods and medicines. *Appetite*, 43, 147-154.
Saher, M., Lindeman, M. & Koivisto Hursti, U.-K. (2006) Attitudes towards genetically modified and organic foods. *Appetite*, 46, 324-331.
Samiee, S. (2010) Advancing the country image construct - a commentary essay. *Journal of Business Research*, 63, 442-445.
Sanderson, K., Saunders, C., Nana, G., Stroombergen, A., Campbell, H., Fairweather, J. & Heinemann, A. (2003) Economic risks and opportunities from the release of genetically modified organisms in New Zealand. Wellington, New Zealand, Ministry for the Environment.
Saunders, C., Kaye-Blake, W. & Cagatay, S. (2003) Economic impacts on New Zealand of GM crops: results from partial equilibrium modelling. *Agricultural Economics Research Unit, Lincoln University*, Report Number 261.
Schuman, H. & Presser, S. (1981) *Questions and answers in attitude surveys*, New York, Academic Press.
Sheppard, B. H., Hartwick, J. & Warshaw, P. R. (1988) The theory of reasoned action: a meta-analysis of past research with recommendations for modifications and future research. *Journal of Consumer Research*, 15, 325-343.
Sheth, J. (1973) A model of industrial buying behavior. *Journal of Marketing*, 37, 50-56.
Sheth, J. (1981) A theory of merchandise buying behavior. IN STAMPFL, R. & HIRSCHMAN, E. (Eds.) *Theory in Retailing*. American Marketing Association.
Sirakaya, E. & Woodside, A. (2005) Building and testing theories of decision-making by travellers. *Tourism Management*, 26, 815-832.
Slovic, P. (2000) *The Perception of Risk*, London, Earthscan.
Slovic, P., Finucane, M., Peters, E. & Macgregor, D. (2002) The affect heuristic. IN GILOVICH, T., GRIFFIN, D. & KAHNEMAN, D. (Eds.) *Heuristics and biases* Cambridge, Cambridge University Press.
Slovic, P., Finucane, M., Peters, E. & Macgregor, D. (2004) Risk as analysis and risk as feelings: some thoughts about affect, reason, risk and rationality. *Risk Analysis*, 24, 311-322.
Starr, C. (1969) Social benefit versus technological risk. *Science*, 165, 1232-1238.
Sternquist, B. (1994) Gatekeepers of consumer choice: a four-country comparison of retail buyers. *International Review of Retail Distribution and Consumer Research*, 4, 159-176.
Sujan, M. (1985) Consumer Knowledge: Effects on Evaluation Strategies Mediating Consumer Judgments. *Journal of Consumer Research*, 12, 31-46.
Sullivan, M. (1997) Slotting allowances and the market for new products. *Journal of Law and Economics*, 40, 461-493.
Tapachai, N. & Waryszak, R. (2000) An examination of the role of beneficial image in tourist destination selection. *Journal of Travel Research*, 39, 37-44.
Thornton, S., Paul, S. & Kerr, G. (2001) Valuing New Zealand's Clean Green Image. Wellington, PA Consulting Group.
Tourism New Zealand (2010) (http://www.tourismnewzealand.com/media/106877/10%20year%20anniversary%20of%2010%20%20pure%20new%20zealand%20campaign%20-%20pure%20as%20magazine.pdf).
Townsend, E. & Campbell, S. (2004) Psychological determinants of willingness to taste and purchase genetically modified food. *Risk Analysis*, 24, 1385-1393.
Trewavas, A. (1999) Much food, many problems. *Nature* 402, 231-232.
Trewavas, A. (2001) Urban myths of organic farming. *Nature*, 410, 409-410.

Tversky, A. & Kahneman, D. (1974) Judgment under uncertainty: heuristics and biases. *Science*, 185, 1124-1131.
Usunier, J.-C. (2006) Relevance in business research: the case of country-of-origin research in marketing. *European Management Review*, 3, 60-73.
Verlegh, P. W. J. & Steenkamp, J.-B. E. M. (1999) A review and meta-analysis of country-of-origin research. *Journal of Economic Psychology*, 20, 521-546.
Wagner, J., Ettenson, R. & Parrish, J. (1989) Vendor selection among retail buyers: an analysis by merchandise division. *Journal of Retailing*, 65, 58-79.
Wang, C.-K. & Lamb, C. W. (1983) The impact of selected environmental forces upon consumers' willingness to buy foreign products. *Journal of the Academy of Marketing Science*, 11, 71-85.
Wansink, B. & Kim, J. (2001) The marketing battle over genetically modified foods: False assumptions about consumer behavior. *American Behavioral Scientist*, 44, 1405-1417.
Webster, F. E. & Wind, Y. (1972) A general model for understanding organizational buying behavior. *Journal of Marketing*, 36, 12-19.
Wiener, J. B. & Rogers, M. D. (2002) Comparing precaution in the United States and Europe. *Journal of Risk Research*, 5, 317-349.
World Health Organization (2010) Answers to 20 questions about GMOs. (http://www.who.int/foodsafety/publications/biotech/20questions/en/) accessed 5 October 2010.
Worldnuclearassociation (2009) Nuclear power in the world today. http://www.worldnuclear.org/.
WTO(2006) www.wto.org/english/tratop_e/dispu_e/cases_e/ds291_e.htm.



Appendix: Tourist survey questionnaires

This survey was administered in repeating sequential sets of 8 versions, where some questions had alternate versions to determine whether the way a question was framed altered the response.

(Version 1) IS THIS YOUR FIRST TIME TO NZ?

1. When deciding to visit NZ, what factors did you take into account?
    - Probe –Anything else?
2. From the list below which of these countries do you think is the MOST similar to NZ as a tourist destination? (Please select one, that is not your home country)
    - Argentina
    - Brazil
    - Canada
    - China
    - Germany
    - India
    - Mexico
    - South Africa
    - Spain
    - USA
    - Australia
    - Chile
    - Belgium
    - Finland
    - France
    - Hungary
    - Japan
    - Russia
    - South Korea
    - Sweden
    - Switzerland
    - UK
3. Which of these countries from the list above have you previously visited? (Choose more than one) (Tick the countries) (If haven't been anywhere go to Q 10)
4. Do you know which if any of the countries that you have visited uses nuclear power generation?
5. Do you know which of these countries that you have visited grows GM crops?
6. Do you know which of these countries that you have visited use "factory farming" methods in which dairy cows are kept indoors in "freestalls" for several months at a time? (If asked what are "freestalls", say it is a system that allows cows to move freely, but provides individual space for lying down) *(In half the questionnaires, the term "factory farming" was omitted in order to test the impact of the pejorative term. This also applied to questions that are labelled Q.9 , Q.15 and Q.23 in this questionnaire version 1.)*

The next question I will ask, I would like you to respond to on a scale from 1 to 6 as shown

7. If I were to tell you country X (answer from Q2) uses nuclear generated electricity, it would stop you wanting to visit?

☐	☐	☐	☐	☐	☐
Definitely agree	Somewhat agree	Slightly agree	Slightly disagree	Somewhat disagree	Definitely disagree

8. If I were to tell you country X (answer from Q2) uses GM crops, it would stop you wanting to visit?

☐	☐	☐	☐	☐	☐
Definitely agree	Somewhat agree	Slightly agree	Slightly disagree	Somewhat disagree	Definitely disagree

9. If I were to tell you country X (answer from Q2) uses "factory farming" with cows housed indoors in freestalls, it would stop you wanting to visit?

☐	☐	☐	☐	☐	☐
Definitely agree	Somewhat agree	Slightly agree	Slightly disagree	Somewhat disagree	Definitely disagree

10. Do you know what methods are used to generate electricity in NZ?

- Hydro
- Coal
- Oil/Gas
- Geothermal
- Nuclear
- Wind

11. Genetic Modification is a technology which I think NZ uses in food production?

☐	☐	☐	☐	☐	☐
Definitely agree	Somewhat agree	Slightly agree	Slightly disagree	Somewhat disagree	Definitely disagree

12. "Factory farming" with cows housed indoors in freestalls is a technology which I think NZ uses in dairy production?

☐	☐	☐	☐	☐	☐
Definitely agree	Somewhat agree	Slightly agree	Slightly disagree	Somewhat disagree	Definitely disagree

13. If NZ uses nuclear generation for electricity in the future, I would still choose New Zealand as a country to visit?

☐	☐	☐	☐	☐	☐
Definitely agree	Somewhat agree	Slightly agree	Slightly disagree	Somewhat disagree	Definitely disagree

14. If NZ grew GM pine forests that were disease resistant, I would still choose New Zealand as a country to visit?

☐	☐	☐	☐	☐	☐
Definitely agree	Somewhat agree	Slightly agree	Slightly disagree	Somewhat disagree	Definitely disagree

15. If New Zealand used "factory farming" methods in which cows were housed indoors in freestalls, I would still choose New Zealand as a country to visit?

☐	☐	☐	☐	☐	☐
Definitely agree	Somewhat agree	Slightly agree	Slightly disagree	Somewhat disagree	Definitely disagree

16. If New Zealand grew GM rye grass in which one of its own genes (already present, but inactive) is switched on to make grass drought-resistant so that fewer cows and sheep go hungry, I would still choose New Zealand as a country to visit?

    (In half the questionnaires, the words "so that fewer cows and sheep go hungry" were omitted, in order to test whether the animal welfare benefit had any influence on results)

☐	☐	☐	☐	☐	☐
Definitely agree	Somewhat agree	Slightly agree	Slightly disagree	Somewhat disagree	Definitely disagree

17. If NZ were to use a GM bacterium to clean up DDT Contamination, I would still choose New Zealand as a country to visit?

☐	☐	☐	☐	☐	☐
Definitely agree	Somewhat agree	Slightly agree	Slightly disagree	Somewhat disagree	Definitely disagree

    (If they ask "What is DDT?" you say "DDT was a toxic insecticide that was widely used in farming around the world until the 1970s, when it became known that it was a serious environmental hazard")

18. A majority of NZ's greenhouse gases are from farm animals burping methane produced by bacteria in their gut. If cows in NZ were given GM bacteria that stopped methane, to reduce green house gases, I would still choose New Zealand as a country to visit?

☐	☐	☐	☐	☐	☐
Definitely agree	Somewhat agree	Slightly agree	Slightly disagree	Somewhat disagree	Definitely disagree

19. Do you recognise any slogans/ advertising statement that is used in relation to NZ, from the list below? *(In alternate questionnaires, these questions Q .19 and Q. 20 appeared as Q.4 and Q.5 in order to test whether priming altered responses)*

- Where the bloody hell are you?
- Creative, cool, contrasting, credible
- Clean and green
- Keep Exploring
- Sensational
- 100% Pure
- Down Under
- Rendezvous
- Youngest Country on Earth
- Simply inspiring
- Alive with possibility

20. What does *clean and green and/or 100% Pure* imply to you?

21. I believe nuclear power is an acceptable form of electricity generation?

☐	☐	☐	☐	☐	☐
Definitely agree	Somewhat agree	Slightly agree	Slightly disagree	Somewhat disagree	Definitely disagree

22. I believe genetic modification is an acceptable form of technology for food production and/or environmental protection?

☐	☐	☐	☐	☐	☐
Definitely agree	Somewhat agree	Slightly agree	Slightly disagree	Somewhat disagree	Definitely disagree

23. I believe "factory farming" (cows housed indoors in freestalls) is an acceptable form of dairy production?

☐	☐	☐	☐	☐	☐
Definitely agree	Somewhat agree	Slightly agree	Slightly disagree	Somewhat disagree	Definitely disagree

I am now going to ask you some further statement questions, if you could please answer them on the scale shown, in relation to your level of trust in New Zealand as a country to visit:

24. If the NZ Government states that it is not necessary to label food that contains GM material

☐	☐	☐	☐	☐	☐	☐
Trust NZ much more			No change			Trust NZ much less

25. If the NZ Government makes biotech companies liable for any damage caused by GM products

☐	☐	☐	☐	☐	☐	☐
Trust NZ much more			No change			Trust NZ much less

26. If the NZ government permits more GM field trials

☐	☐	☐	☐	☐	☐	☐
Trust NZ much more			No change			Trust NZ much less

27. If the NZ government disallows "factory farming" (cows housed indoors in freestalls) methods in dairying

☐	☐	☐	☐	☐	☐	☐
Trust NZ much more			No change			Trust NZ much less

28. If the NZ Government states that all food containing GM material should be labelled

☐	☐	☐	☐	☐	☐	☐
Trust NZ much more			No change			Trust NZ much less

29. If the NZ government allows nuclear power stations

☐	☐	☐	☐	☐	☐	☐
Trust NZ much more			No change			Trust NZ much less

30. If the NZ government closes down all existing trials of GM crops

☐	☐	☐	☐	☐	☐	☐
Trust NZ much more			No change			Trust NZ much less

31. If the NZ Government does not want to make biotechnology companies liable for any damage caused by GM products

☐	☐	☐	☐	☐	☐	☐
Trust NZ much more			No change			Trust NZ much less

32. If a study conducted by NZ government scientists concludes that GM food is safe

☐	☐	☐	☐	☐	☐	☐
Trust NZ much more			No change			Trust NZ much less

33. If the NZ government allows "factory farming" (cows housed indoors in freestalls) methods in dairying

☐	☐	☐	☐	☐	☐	☐
Trust NZ much more			No change			Trust NZ much less

34. If the NZ government disallows nuclear power stations

☐	☐	☐	☐	☐	☐	☐
Trust NZ much more			No change			Trust NZ much less

35. If the NZ Government states that it is not necessary to label food containing GM material

☐	☐	☐	☐	☐	☐	☐
Trust NZ much more			No change			Trust NZ much less

36. If a study conducted by NZ government scientists concludes that GM food is unsafe

☐	☐	☐	☐	☐	☐	☐
Trust NZ much more			No change			Trust NZ much less

Please indicate which of the following four options most closely describes your opinion about GM food:

- ☐ "GM food should be promoted"
- ☐ "GM food should be opposed"
- ☐ "I am not sure whether GM food should be promoted or opposed"
- ☐ "I don't care whether GM food should be promoted or opposed"

Please indicate which of the following four options most closely describes your opinion about nuclear power generation:

- ☐ "Nuclear-generated electricity should be promoted"
- ☐ "Nuclear-generated electricity should be opposed"
- ☐ "I am not sure whether nuclear-generated electricity should be promoted or opposed"
- ☐ "I don't care whether nuclear-generated electricity should be promoted or opposed"

Please indicate which of the following four options most closely describes your opinion about "factory farming":

- ☐ "Factory farming (housing cows indoors in freestalls) should be promoted"
- ☐ "Factory farming (housing cows indoors in freestalls) should be opposed"
- ☐ "I am not sure whether factory farming (housing cows indoors in freestalls) should be promoted or opposed"
- ☐ "I don't care whether factory farming (housing cows indoors in freestalls) should be promoted or opposed"

DEMOGRAPHIC INFORMATION

- ☐ Male ☐ Female
- ☐ Age Bracket

Country of origin

☐