Barriers to Building Trust when Communicating about Agricultural Biotechnology: The Role of Confirmation Bias

by

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ABSTRACT

BARRIERS TO BUILDING TRUST WHEN COMMUNICATING ABOUT AGRICULTURAL BIOTECHNOLOGY: THE ROLE OF CONFIRMATION BIAS

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The current debate surrounding agricultural biotechnology (i.e. GM foods) is polarized and a more balance conversation is needed. This thesis investigates communication about agricultural biotechnology. A critical review of related literature indicates that trust can be built between agricultural organizations and consumers through public engagement that considers public concerns and addresses their outrage. In the literature, shared value based communication is deemed important for building trust. This thesis builds upon the literature by introducing confirmation bias as a potential barrier to building trust with shared values and investigates how it might be overcome. Two factors are presented as moderators of confirmation bias: exposure to shared values based communication and format of presentation. These two factors are implemented as treatments in an experimental design where participants (n=501) read various articles about a fictitious GM food product. A two-way 2x2 ANOVA analysis is applied to answer the research questions. Findings suggest that prior attitudes play a significant role in influencing people to view a more balanced selection of articles.
For my mom and dad –

The two most loving, hardworking, and brave humans I will ever know. I am so proud to be your daughter.
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1 CHAPTER ONE: Introduction

1.1 Background Information and Economic Problem

1.1.1 The Current Environment Surrounding Agricultural Biotechnology

Agricultural biotechnology is an important tool for feeding the world’s expanding population in the face of depleting natural resources (FAO 2000; FAO 2004). The FAO suggests that evaluating the appropriateness of agricultural biotechnology – or, genetically modified (GM) foods (as referred to by the general public) – involves determining the extent to which the benefits of adopting a particular GM technology outweigh the risks. In the analysis of this, impacts on biodiversity, the environment, and food safety are some of the factors that must be considered on a case-by-case basis when deeming a particular GM food to be beneficial or not (FAO 2000).

Despite the FAOs suggestion of a science-based cost-benefit approach, it is unclear whose responsibility it is to categorize GM foods as ultimately “right” or “wrong.” There exists strong scientific, ethical, and cultural support for both sides of the debate regarding GM foods (Zerbe 2014). According to the FAO, pro-biotechnology groups claim that biotechnology is “essential to addressing food insecurity and malnutrition,” while anti-biotechnology groups claim that the technology will result in greater environmental damage, increased poverty, and “a corporate takeover of traditional agriculture and the global food supply (FAO 2004).” The intense debate is currently highly polarized.

1.1.2 Identifying the Nature of the Economic Problem

Zerbe (2007) argues that the polarized nature of the GM debate categorizes it as a “wicked problem” that cannot be resolved using solely additional objective data and expert opinion. The regulation of GM foods, which deems them as either suitable or unsuitable for human consumption, requires answering ethical and normative questions concerning the nature and risk of GM foods. Zerbe suggests that a dialogue-based approach that includes many stakeholders is needed (Zerbe 2007).

Batie’s Wicked Problems and Applied Economics (2008) outlines the key properties of wicked problems. A comparison between wicked problems and tame problems suggests that the quest for finding solutions to wicked problems is “as much a social and political process as it is a
scientific endeavour” (p. 1176). While using applied economic tools such as cost benefit analysis, dynamic optimization, and willingness-to-pay estimation is appropriate for tame problems, these tools are less appropriate when dealing with wicked problems. (Batie, 2008) and Zerbe (2007) share the view that wicked problems require “meaningful engagement of stakeholders in decision making that propels knowledge into action” (Batie 2008, p. 1181) in addition to science that addresses uncertainties at hand. In adherence to the complex nature of wicked problems, such as GM food, stakeholder engagement is a necessary element for meaningful policy action to occur.

In order for stakeholders of the GM debate – the public, farmers, scientists, government, companies and organizations, etc. – to meaningfully engage in the GM debate, proper effective communication is needed. Kolodinsky (2007) suggests that consumers need “unbiased information, presented in an unbiased manner, if the marketplace is going to the be a battleground for determining whether genetically modified organisms will be the wave of the future” (p. 169), but reliance on propaganda and normative arguments in the media limits the amount of unbiased information that the public has access to. Marks and Kalaitzandonakes (2001) conducted a content analysis of five major newspaper sources in the U.S. and U.K. to examine how the media reports about agricultural biotechnology. They concluded that “sensationalism and bias” have been historically present in the media when reporting about GM safety and biosafety (Marks & Kalaitzandonakes, 2001).

Ryan (2014) also discusses the various ways in which anti-GM groups use mythmaking to “capture headlines and influence public opinion about biotechnology products (p. 555).” Some mythmaking techniques include using imagery and metaphors such as “Frankenfood”, bad science such as the Séralini et al.’s rat study from 2012, and celebrity endorsement to encourage momentum, in order to sway public opinion towards a particular direction (Ryan 2014). In the above-mentioned literature, the reported use of bias, propaganda, sensationalism, and mythmaking suggest that there could be a failure on the media’s part to communicate about GM foods in a way that encourages unbiased stakeholder engagement in the GM debate.

The intersection of communication and agricultural biotechnology is worthy of investigation because ineffective relaying of information (i.e. from the scientific community to the media to the public) can create different outcomes for the adoption of the exact same
biotechnology. The risk perception of the public helps to determine the regulatory process, and risk perception of the public is linked to exposure to media. Zerbe (2007) offers possible explanations for why the U.S. and European Union have resulted in drastically different regulation systems (Table 1.1). Zerbe suggests that “European media has tended to sensationalize to a greater degree the potential risks of agricultural biotechnology” more than media in the U.S. (Zerbe 2007, p. 414). Another possible reason is that Europeans are more sensitive to agricultural biotechnology because of the several recent food crises (i.e. the dioxin crisis, hoof-and-mouth, and BSE). Ultimately, public opinion has the capacity to influence regulation processes, which can be sub-optimal if public opinion is swayed by biased media communication.

<table>
<thead>
<tr>
<th>United States</th>
<th>European Union</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Regulatory agency</strong></td>
<td>U.S. Department of Agriculture has primary regulatory authority, supplemented by the Food and Drug Administration and Environmental Protection Agency as appropriate.</td>
</tr>
<tr>
<td><strong>Philosophy of regulation</strong></td>
<td>Substantive equivalence: genetically modified food and traditional foods are governed by the same regulations.</td>
</tr>
<tr>
<td><strong>Basis of regulation</strong></td>
<td>Product-based: all products are treated the same regardless of the process used to create them.</td>
</tr>
</tbody>
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Table 1.1 The difference between regulation of GM foods in the U.S. and the EU Source: reproduced from Zerbe 2007, p. 413
1.1.3 The Economic Problem

The polarized debate about agricultural biotechnology presents two sides that are fighting respectively for the extreme book-ends of regulation, rather than a middle-ground case-by-case approach as recommended by the FAO. A pro-GM regulation may lead to overly lenient testing protocols, which could potentially increase human health or environmental risk if new GM foods are not tested properly (Figure 1.1, Pro-GM Regulation ). Alternatively, an anti-GM resolution may lead to overly stringent authorization protocols, which could result in non-implementation of beneficial GM products (Figure 1.1, Anti-GM regulation). It is unclear how to establish effective communication between the actors on either side of the debate; however, successful communication is necessary in order to reach a consensus and enable an optimal uptake level of agricultural biotechnology. Optimal uptake of agricultural biotechnology refers to a utilization level of the technology wherein safe and socially valuable GM crops are not prevented, yet harmful ones are.

![Diagram showing the possible outcomes of the GM debate as proposed by the researchers](image)

Figure 1.1 The possible outcomes of the GM debate as proposed by the researchers

In order to be within the desired middle-ground where there is “case-to-case regulation” as recommended by the FAO, the public needs to have unbiased and accurate information about each existing and potential GM product. This research project aims to contribute to the development of better communication practices that are unbiased and based on trust building with the public. The next section focuses on how this is done.
1.2 Thesis Summary

1.2.1 How the Proposed Research Addresses the Economic Problem

The Center for Food Integrity (2014) outlines several communication barriers, including confirmation bias – the tendency to rely on information that confirms current beliefs and avoid information that contradicts currently held beliefs (Smith et al. 2008) – as a barrier to effective communication. Other barriers mentioned are cultural cognition (when people “conform their beliefs about controversial matters…to group values that define their cultural identities”)(Center for Food Integrity 2014, p. 4), tribal communication (when people largely communicate within groups who share the same beliefs and interests as themselves), and bounded rationality (the idea that when making decisions, people are bounded by their current cognitive understanding of the given situation and current circumstances)(Center for Food Integrity 2014, p. 4-6). These are all similar to confirmation bias in the sense that they are all communication barriers caused by reliance on information that confirms currently held beliefs instead of new information. Thus, confirmation bias was selected as a focus, and this research project considers it as a significant barrier to unbiased communication and investigates how this barrier can be overcome.

Literature has identified factors that influence confirmation bias. This has provided starting points for overcoming confirmation bias and generating trust in information sources. Among the many factors identified in the literature, this thesis focuses on three in particular:

1. Outrage factors and message elements (Center for Food Integrity 2014; Covello and Sandman 2001)
2. Shared values (Sapp et al. 2009; Center for Food Integrity 2014, Earle and Cvetkovich 1995; Siegrist, Cvetkovich and Roth 2000; Cvetkovich and Nakayacki 2007; Allum 2007; Poortinga and Pidgeon 2006)
3. Presentation format (Vydiswaran et al. 2015; Smith, Leandre, and Norris 2008)

Outrage factors are message characterises that influence the way in which people respond to and judge risk information (Covello and Sandman 2001). Two outrage factors are focused on in this project, process and control. These will be discussed in detail in Chapter 2. The Center for Food Integrity (2014) identifies outrage factors as believability drivers of a message, in addition to the message elements: openness and transparency, unifying message, accurate risk presentation, and leveraging trusted sources.
Even though outrage factors and message elements are considered important for the purpose of the literature review, the hypothesis testing focused on the prior two factors (shared values based communication and presentation format). Shared value based communication is simply communication with people by connecting on shared values, and presentation format refers to how information is visually presented to people.

1.2.2 Thesis Outline

This thesis consists of five chapters. Chapter 2 provides a comprehensive review of related literature in the fields of science and technology and risk communication, provides a summary and critical review of key research done by the Center for Food Integrity, and introduces confirmation bias as a potential barrier to building trust. Chapter 3 outlines the experimental design that was implemented for the purpose of this thesis, and identifies the research questions and hypotheses to be tested. Chapter 4 consists of data analysis and hypothesis testing that resulted from the study’s dataset. A discussion about result implications is also included here. To conclude, Chapter 5 provides a discussion of policy implications and suggestions for further research.
CHAPTER TWO: Review of Related Literature

2.1 Overview of Public Understanding of Science and Risk Communication Research

The purpose of the following section (2.1) is to provide an account of the development of communication research in two distinct areas, risk communication and Public Understanding of Science (PUS). Risk communication deals with how organizations address perceived risk about specific technologies or situations that the public is concerned about, whereas PUS deals with how the scientific community relates with the lay public regarding scientific knowledge. Placing these two together provides valuable background information for understanding the current state of communication about agricultural biotechnology. In addition, together these two communication literatures will guide a critical assessment of the Center for Food Integrity (CFI)’s Consumer Trust Model (2014) by providing a framework for balanced communication about agricultural biotechnology today.

2.1.1 Introduction

Covello and Sandman (2001) suggest that risk communication is an important method of dialogue that can provide reassurance (or awareness) \(^1\) when the public perceives risks of individual hazards differently from experts’ risk assessments (Covello and Sandman, 2001, p. 1). This discrepancy that sometimes arises between the public's perception of risks and experts’ actual risk estimates is due to the observation that the public tends to include outrage factors in their risk assessments, whereas experts do not. Outrage factors are emotional responses that tend to provoke outrage and anger. This often, but not always, can lead to an exaggerated sense of risk. The resulting difference in risk perception between experts and the public causes

\(^1\) Risk communication should provide reassurance when risk levels are too high and the public response is outrage, and raise awareness when risk levels are high and the public response is apathetic.
inconsistencies in the understanding of risks, and it is useful to decrease these differences for the benefit of society.

Covello and Sandman (2001) outline the four stages of risk communication that organizations have gone through since the 1980s in an attempt to deal with public outrage, including communication strategies that organizations have attempted to use when dealing with the problems faced in each of these stages. These stages largely align with the three significant research paradigms observed in Public Understanding of Science (PUS) research described by Bauer, Allum, and Miller (2007). Bauer, Allum, and Miller review three research paradigms in the PUS field, highlighting the prevailing problems that scientific stakeholders have faced in communicating with the public (Bauer, Allum, and Miller 2007, p. 80). In addition, they reveal how the research agenda throughout each paradigm guided proposed solutions.

Both literatures agree that the stages/paradigms do not replace each other; rather the previous stage/paradigm informs the next one. In addition, the chronological timing of the stages/paradigms, the attribution of the problems, and the proposed solutions point to similarities between risk communication and PUS. Most importantly, both are describing tensions in communication that arise when organizations aim to communicate with a skeptical public about risks and benefits of certain technologies. There is consensus in both that the communication practices of organizations can provide a context for meaningful organizational change that acknowledges the role of the public and their concerns.

2.1.2 The Phases of Science and Risk Communication

The PUS literature organizes the research paradigms into various deficit problems, whereas the risk communication literature explains how organizations dealt with the public in each stage. The proposed problems and solutions in both literatures are similar (see Figure 2.1). Due to the overlaps in theme and timing, Paradigm 1 and Stage 1 will be referred to together as Phase 1 (light grey in Figure 2.1); Paradigm 2 and Stage 2 will be referred to as Phase 2 (medium grey in Figure 2.1); and Paradigm 3 along with Stages 3 and 4 will be referred to as Phase 3 (dark grey in Figure 2.1).

Phase 1: The public is uninformed

In Phase 1, before the mid-1980’s, the public was seen as ignorant and generally deficient in scientific literacy by decision makers (Figure 2.1). For organizations, simply ignoring the
public was the dominant risk communication strategy (Covello and Sandman 2001), while PUS research focused on measuring scientific literacy knowledge and changing education curricula to increase it (Bauer, Allum, and Miller 2007). Further, the public was excluded from the policy-making process at this point, as this was seen as a task for the experts. However, this perspective gave too much power to the technical experts, scientists, and institutional actors and the so-called unknowledgeable public was alienated from the decision-making process (Bauer, Allum, and Miller 2007). Eventually, the public’s demands to participate in environmental policy decision-making caused organizations to re-evaluate how they viewed the public (Covello and Sandman 2001).

![Figure 2.1 Phases of risk communication and public understanding of science research](image)

Source: Covello and Sandman (2001) and Bauer, Allum, and Miller (2007)

|Legend:|
|Light grey: Phase 1|
|Medium grey: Phase 2|
|Dark grey: Phase 3|

Phase 2: Public attitudes can be changed through education
Phase 2 emerged as organizations realized that it was in their best interest to explain risk data better in order to educate the public instead of ignoring them due to their lack of knowledge (Covello and Sandman 2001). This motive to educate, starting in the mid-1980’s, is mirrored in the PUS research. The two papers suggest that the communication problem at this time was being attributed to the public’s lack of knowledge, and the best strategy was to educate the public in hopes of changing their attitudes. Thus, PUS research during the second paradigm was focused primarily on the correlation between knowledge and attitudes: It was believed that the public would approve of ideas scientists put forth more easily if they understood the facts. However, research on the correlation between knowledge and attitudes at this time revealed that knowledge does not predict attitudes or technology acceptance (Bauer, Allum, and Miller 2007). Similarly, as risk communicators realized that a discrepancy still existed between risk estimates and public perception of risk despite attempts to better explain risk data to the public, it became clear to risk communicators that addressing public outrage in addition to explaining hazards was the way forward (Covello and Sandman 2001).

**Phase 3: Dialogue with the public is needed**

A shift towards engagement and dialogue with the concerned public began in the late-1980’s to early 1990’s (Figure 2.1, Phase 3). In the PUS research, it was recognized that both the public and institutional actors lack trust in one another. It was now proposed that the best way to build trust was through public engagement, not by increasing scientific knowledge or attitude intervention. Covello and Sandman regard the 1988 publication of the EPA’s Seven Cardinal Rules of Risk Communication (Appendix 2.1) as an important step in Phase 3. It outlined for organizations how to begin a two-way dialogue with the public, stressing the need to go beyond just explaining risk numbers and instead listening to public concerns all while addressing their outrage (Covello and Sandman, 2001, p. 7). Similarly, PUS research during this paradigm did not clearly distinguish between analysis and intervention, often resulting in political advice to change institutions and policy in order to rebuild public trust (Bauer, Allum, and Miller 2007, p. 85). Covello and Sandman (2001) elaborate on this idea of required fundamental changes within organizations in the fourth stage of risk communication. This stage can only be achieved when an organization is fully committed to implementing stage 3 and accepts the public as a full partner in their organization. However, Covello and Sandman suggest that organizational
changes in culture and values are very difficult to achieve for a variety of reasons, making it unlikely for most organizations to reach this point (Covello and Sandman 2001, p. 8-9).

**Moving Forward**

Today, many organizations might still be in phase 2 (or even phase 1) if they have not begun to engage with and listen to the public and their concerns. In the case of agricultural biotechnology where public outrage and resistance is common (Frewer, Miles, and Marsh 2002) and risks are perceived to be high (Allum 2007, p. 939), it is useful for organizations to consider the recommendations in phase 3 for their communication efforts.

The Center for Food Integrity (2014)(CFI) recently published a set of trust building communication recommendations for organizations similar to the EPA Handbook (see Table 2.1). Central to the Center for Food Integrity model is communication based on shared values (Figure 2.2). Using the communication phases outlined above serves as a useful guide to critically assess the CFI research and recommendations.

### 2.2 An Application to Food and Agriculture: The CFI Consumer Trust Model

#### 2.2.1 The Center for Food Integrity (CFI)

The Center for Food Integrity is an American not-for-profit organization made up of a number of food system stakeholders, such as farmers, food companies, universities, non-governmental organizations, restaurants, retailers, and food processors. CFI’s mission is “to help today’s food system earn consumer trust,” envisioning in the future “a transparent, sustainable food system in which practices align with consumer expectations and the public discussion is well-informed and balanced.” (Center for Food Integrity 2016).

To fulfill its mission and work towards their future vision, CFI aims to empower food system stakeholders in a way that allows them to engage with the public. They do this in three ways (Center for Food Integrity 2016):

1. By “being a leading voice in a balanced public discussion about food and agriculture, serving also as a resource for media and online influencers”;
2. By “[providing] strategic direction and training to improve alignment between good system practices and consumer expectations”;
3. By “[convening, empowering, and supporting their] members in developing best practices that earn consumer trust.”

A large part of this is introducing their research based consumer trust model, which CFI claims to be the first of its kind. This model goes beyond just discussing facts and science with the public and focuses on shared values in communication, and will be discussed in this section more thoroughly (Center for Food Integrity 2016).

CFI is funded through the public charity organization Foundation for Food Integrity (FFI). FFI funds research and consumer education and outreach activities. Overall, CFI claims that they do not support any “certain outcome” or lobbying/advocacy for brands/companies/food production methods. Instead, they seek to provide consumers with balanced information about the food system that will allow them to make informed choices (Center for Food Integrity 2016).

The 2014 Center for Food Integrity (CFI) consumer trust research was motivated by the observation that the public at times rejects scientific consensus. CFI further suggests that there are several communication barriers to “informed decision making” such as confirmation bias, cultural cognition, tribal communication, the complexity of science, and bad news bias\(^2\) (Center for Food Integrity 2014, p. 4-6). These barriers point to the complexity of the decision making process, and provide a reason for why scientific consensus isn’t the only factor at play. As a result of the complexity of the decision making process and the state of mutual lack of trust between science and the public in phase 3 of science and risk communication, innovative technologies may not be utilized at an optimal level (Center for Food Integrity, 2014, p. 2).

2.2.2 The CFI Consumer Trust Model

The key outcome of the 2014 CFI research is the Consumer Trust Model (Figure 2.2). In line with the CFI mission, it is meant to guide agricultural organizations in “introducing and discussing complex controversial issues,” and it “can be applied when communicating and

\(^{2}\text{As defined by the Center for Food Integrity (Center for Food Integrity 2014, p. 4-6): Confirmation Bias: “the tendency of people to favour information that confirms their existing beliefs and opinions regardless of whether the information is true”; Cultural Cognition: “the tendency of people to conform their beliefs about controversial matters to group values that define their cultural identities”; Tribal Communication: When the internet, for instance, is used to as a platform for people to “lead and impact change” through bonding together in “silos of interest” (or “tribes”) wherein everyone’s “values and interests align with ours”; Bad News Bias: “Negative information weighs more heavily on our decision than positive information.”}
engaging with consumers to build trust around topics that are critical to our ability to meet the growing demand for food while preserving and protecting our natural resources” (Center for Food Integrity, 2014, p. 8).

According to their research, CFI claims that the two most important factors for building trust are Confidence and Competence. Confidence is defined as the perceived shared values and ethics of the organization, whereas Competence is the perceived skills and abilities of the organization. Lastly, Influential Others - such as family, friends and credentialed individuals - also play a role (Center for Food Integrity, 2014, p. 1). While all three factors contribute to building trust between an organization and the public, Confidence (shared values) has been found to be three to five times more important than Competence and Influential Others (Center for Food Integrity, 2014, p. 14). When it comes to communication efforts, this indicates that instead of simply providing more information to people as has been attempted previously in risk communication efforts (Figure 2.1, stage 1), it is more crucial to develop a sense of shared values in order to build trust.
According to the Consumer Trust Model (Figure 2.2), once trust is established between the public and an organization, the organization is able to earn a Social License from the public. This is the ultimate goal for agricultural organizations because the Social License allows the organization to have a Freedom to Operate, which is “the privilege of operating with minimal formalized restrictions” (Center for Food Integrity, 2014, p. 1).
2.2.3 Recommendations based on the Consumer Trust Model

The CFI 2014 research makes five recommendations for communicating with the public in a way that builds trust around these controversial issues (Center for Food Integrity, 2014, p. 17). The recommendations are as follows:

1. “Believability is a key driver in creating information that is trusted. Evaluate the information you want to share against the Fundamental Message Elements and Outrage Factors (see section 2.2.3 for further detail) in the research models and modify where necessary to align your information with the models.”

2. “Identify the groups you would like to engage. Who are the Early Adopters - or opinion leaders - within these groups? What are their values and concerns? Who are the likely sources they view as credible? Listen to the concerns and understand their values before developing your strategy.”

3. “Meet them where they are. Today’s monitoring technology allows you to identify the digital and physical communities where conversations about food and agriculture are taking place. Select those communities that are important to you and develop engagement strategies. Be a good neighbour when you “move in” to the community and remember how you choose to engage will determine how your new neighbors respond.”

4. “Develop a values-based engagement strategy that starts with listening and embracing skepticism. Engage with the groups you’ve identified and focus on building relationships before sharing information. Understand and appreciate the group expectations and cultural norms as they will influence how to best share information.”

5. “Commit to engaging over time. Building trust is a process, not an event. Authentic transparency and continued engagement using the models developed through this research will encourage objective evaluation of information that supports informed decision making.”

Of these, two recommendations are the most relevant and testable for this research project: Engagement strategies should be based on common values shared between the organization and the public (4), and: Believability is the number one driver in creating and sharing information that is trusted (1). The other three recommendations [(2);(3);(5)] will not be the focus of this research project because it is difficult to mimic engagement over time, and it would limit the generalizability of the results if a target group and specific public communication venue were focused on. On the other hand, the “believability drivers” that CFI highlights in the form of outrage factors and message elements, and common shared values are testable communication elements that are broadly applicable and align with this research project.
2.3 Critical Review of CFI Recommendations 1 (Shared Values) and 2 (Believability Drivers)

Section 2.3.1 and 2.3.2 review critically and describe in depth how the concepts of shared values (recommendation #1) and believability drivers (recommendation #2) contribute to building trust, according to CFI. Following this, Section 2.2.5 provides a critical assessment of the Consumer Trust Model with support from additional related literature, including the risk and science communication literature that was presented in section 2.1.

2.3.1 Recommendation 1: Shared Values Generate Trust

*Develop a values-based engagement strategy that starts with listening and embracing skepticism. Engage with the groups you’ve identified and focus on building relationships before sharing information. Understand and appreciate the group expectations and cultural norms as they will influence how to best share information.*

(Center for Food Integrity, 2014, p. 17)

The Recreancy Theorem and Consumer Trust

Sapp *et al.* (2009)’s research provided the conceptual framework for the CFI Consumer Trust Model. Sapp *et al.* (2009) anchored their study around the Recreancy Theorem, introduced by Freudenburg (1993), which proposes that most of the variance in consumer trust can be explained by how people evaluate the organization or social institution behind the technology in question rather than by socio-demographic or ideological variables (i.e. political position and association) (Sapp *et al.*, 2009, p. 530).

Sapp *et al.* (2009) applied the Recreancy Theorem to their work to determine if it applies to consumer trust in the U.S. food system. Following the theorem, the premise of their study was that the two most important factors for building trust are the perceived competence of institutional actors, and public confidence in institutional actors that they will act with fiduciary responsibility (Sapp *et al.*, 2009, p. 529).3

The proposed model suggested that trust in institutional actors determines acceptance of their recommendations by the public. Trust is influenced by Fiduciary Responsibility and Competence (Figure 2.3) (Sapp *et al.*, 2009, p. 531). In order to determine if these relationships

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3 The term “fiduciary responsibility” used by Sapp *et al.* is considered, by the researchers, to be synonymous with the CFI concept of Confidence/Shared Values.
existed, Fiduciary Responsibility and Competence measures were tested as determinants of trust in relation to five activities\(^4\) relating to the U.S. food system. For each of these five activities, several institutional actors\(^5\) were presented in the survey and participants were asked to rate each actor on competence, fiduciary responsibility, trust, and the participant’s support towards the institutional actor (Appendix 2.2 provides the specific measures that participants were asked to evaluate in the survey).

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Figure 2.3 Causal model of consumer trust with the recreancy theorem
Source: Sapp et al., 2009, p. 531

Sapp et al.’s (2009) empirical results support that Competence and Fiduciary Responsibility explain variance in trust more than the control variables. More importantly, it was found that the effect of Fiduciary Responsibility on trust was two to five times stronger than the effect of Competence (Sapp et al., 2009, p. 537). This key finding corresponds to

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\(^4\) Activities relating to the food system in the U.S.: food safety, the nutritional quality of food, the fair treatment of food-related workers, the humane treatment of animals grown for food, and the protection of the environment as part of the production, processing, and retailing of food.

\(^5\) Institutional actors included but were not limited to: farmers and producers; food companies/processors; grocery stores; restaurants; regulatory agencies; advocacy groups; K-12 schools; doctors/dietitians; labour unions; employees; people like yourself; federal regulatory agencies; state regulatory agencies; the U.S. Humane Society; PETA.
recommendation #1 in the 2014 CFI research (CFI, 2014), to develop a values-based engagement strategy.

Given the effect of Fiduciary Responsibility, the researchers suggested the need for “communication approaches that convey a sense of responsibility to the public in addition to educating [the public] about skills and expertise.” Further on this point, Sapp et al. suggest “that actions rather than words are needed to promote public confidence in fiduciary responsibility”\(^6\), and recommended that future research should address “building confidence in institutional fiduciary responsibility” through risk communication practices (Sapp et al., 2009, p. 542-3).

In sum, Sapp et al. provided a foundation for the 2014 CFI research, finding that Fiduciary Responsibility (i.e. shared values) is the most important factor for building trust when communicating about controversial food topics. In the Consumer Trust Model, CFI replaced Sapp et al.’s concept of “Willingness to Support” with “Social License” and “Freedom to Operate”. Both CFI and Sapp et al. emphasize that the process of building trust between an organization and the public is largely dependent on communicating a sense of Fiduciary Responsibility, or as CFI refers to it, connecting on Shared Values (Figure 2.2). This mirrors the Phase 3 (science and risk communication literature) suggestion that an approach to risk communication that emphasizes a two-way dialogue with the public is needed (Figure 2.1). In order to identify additional concepts that overlap or don’t overlap with the CFI Consumer Trust Model, the remainder of section 2.2.2 reviews additional related literature on building trust with the public.

Salient Value Similarity Literature

Prior to the Sapp et al. (2009) and CFI (2014) research, research on the role of shared values in building trust was often done using the Salient Value Similarity model (SVS) framework. The SVS model was first developed by Earle and Cvetkovich (1995) in their book, Social Trust: Toward a Cosmopolitan Society, exploring how social trust works. According to Siegrist, Cvetkovich and Roth (2000), the two main components of the SVS model are salient values and value similarity.

\(^6\) The authors suggest that actions that show a sense of “corporate social responsibility and responsiveness to technology-related problems” can “be the keys to building successful partnerships between the public and institutional actors” (Sapp et al. 2009, p. 542).
Salient values include “the individual’s sense of what the important goals (ends) and/or processes (means) are that should be followed in a particular situation” (Siegrist, Cvetkovich and Roth 2000, p. 355). Salient values vary from one situation to another and might change over time for an individual. For example, a salient value may be the belief that recycling is important for protecting the environment. Value similarity judgements are “conclusions about the values that are salient for the person whose trustworthiness is being judged” and involves the perceiver to compare their own salient values to the person being judged (p. 355). The SVS model posits that people tend to trust those who share salient values with them. The following research made use of the SVS model.

Value Similarity driving Trust, which in turn drives Risk/Benefit Perception

Using the SVS model, Siegrist, Cvetkovich and Roth (2000) introduced perceived risks and benefits as being influenced by trust in the following way: The proposed model suggested that perceived benefits would be positively related to trust whereas perceived risks would be negatively related (Figure 2.4). As with the SVS model, Value Similarity positively influences trust such that people are more likely to trust institutions that share salient values. The cases used in the study were controversial in nature: the use of pesticides, nuclear power, and artificial sweeteners.

The results showed a positive and significant correlation between Value Similarity and Trust. In addition, a substantial amount of the variance in risk and benefit perception was correlated to social trust in the predicted directions for all three cases (Siegrist, Cvetkovich and Roth, 2000, p. 358), confirming the proposed model. The authors conclude that lay people are more likely to trust experts who are perceived to hold similar values to them, and therefore, will more likely accept the risk and benefit evaluations from these trusted experts. Accepting the risk evaluations of experts holding the same salient values is similar to an organization obtaining a Social License in the Consumer Trust Model (Figure 2.2). It could also be seen as a mental shortcut which is said to be utilized by people who are not technically trained to evaluate risks and benefits of a technology on their own (Siegrist, Cvetkovich and Roth, 2000, p. 359).
Preferred Outcomes as a Driver of Trust

Cvetkovich and Nakayacki (2007) tested the SVS model as a predictor of trust against fairness/justice and competency \(^7\) as trust dimensions \(^8\). The case used in this study - the risks imposed on a lake’s water quality by motor boat usage - is considered to be a “high concern issue”. Thus, it was predicted by the SVS that agreement on shared values is a main driver of trust, and it would play an important role in predicting trust (Cvetkovich and Nakayacki 2007, p. 226). The results showed that SVS was consistently the stronger predictor, although fairness/justice and competency were also successful in predicting trust to a lesser degree. This finding is similar to the CFI finding that shared values are more important for predicting trust than competence.

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\(^7\) Although exact definitions of justice and competence were not provided these two trust dimensions appear to align with the trust dimensions, fiduciary responsibility and competence, proposed by Sapp et al. (2008).

\(^8\) A dimension of trust approach assumes that trust is a result of being in possession of a certain characteristic, such as fairness, competency, or salient values (p. 225).
In addition, Cvetkovich and Nakayacki (2007) revealed an interesting relationship between favoured outcomes and self-interests. Consumers were asked:

1. What outcome they preferred regarding the water ban (i.e. whether they support or oppose the ban)
2. To indicate their level of self-interest regarding their use of the lake as drinking water, and their use of motorboats on the lake
3. To make judgements about each of the four groups based on: how fair/just the organization is, how competent the organization is, how similar the organization's values are to their own; and how much they trust the organization.

Further, the study distinguished four consumer segments that were represented by organizations with different preferred regulatory outcomes:

1. Organization A: supported a ban on motor boat use on the lake;
2. Organization B: opposed a ban on motor boat use on the lake;
3. Organization C: approved a phasing out of motorboat use, and;
4. Organization D: did not express a public position on the ban, but had been monitoring the lake’s water quality for over 20 years (p. 227).

Frequent boaters found water quality to not be a salient value, and recreational choice to be a salient value. In addition, this group stated that they shared values with Organization B, but not the three other groups. People who had a self-interest in consuming water from the lake regarded water quality to be a salient value, but not recreational choice. In addition, this group stated that they shared values with organization A.

This shows that people tended to share values with the organization whose favored outcomes aligned with their self-interests regarding the boat ban (p. 229-231). Shared values were found to be the most significant predictor of trust, but this implies that trust is influenced indirectly by agreement on outcome. This may imply that favored outcomes signal values to the public. This finding adds an additional dimension to the Consumer Trust Model: people might

It is also worth noting that while organization D did not have an explicit agenda like the other organizations, this group might be interested in providing unbiased information to the public in the interest of a fair decision making process. Focus on a fair process could certainly be a value for some people.
perceive outcomes to be a reflection of values, and end up favoring an outcome that matches their self-interest.

*Values, Competence, and Care driving Trust and Risk Perception*

Allum (2007) looked at which of three dimensions of trust (care, competence, and shared values\(^\text{10}\)) best explain variation in risk perceptions. Allum’s (2007) empirical study tested public opinion of GM food risk. Participants were asked to evaluate measures of competence, care, and shared values as dimensions of trust. They were also asked to indicate their perceptions of genetic scientists working on GM foods regarding expertise, care, competence, social responsibility, and honesty (p. 938-340). The purpose was to determine whether the relationship between competence and care on risk perception is dependent on shared values. Included in the model is perception of risks and benefits as an outcome of trust, an element that the CFI model does not address.

A positive correlation between perception of competence and care is explained in this study by shared value similarity. In other words, people who view genetic scientists as competent also see them as caring. In contrast to the SVS model, this positive correlation was not explained by the extent to which people felt a sense of shared values (p. 944). The first research hypothesis, “people who think genetic scientists are responsible and honest (i.e., care) will also tend to think they are competent” (p. 938) was supported.

The second research hypothesis, “once shared values are controlled, the correlation between competence and care disappears or is reduced” (p. 938) was also supported. Shared values were found to be more important than competence and care for risk perception (and indirectly, for trust), as compared to the other two risk factors. Competence was found to be a significant factor for risk perception even in the case where shared values were controlled for by the researchers (p. 944). This means that perception of GM scientist competence affects people’s perception of GM risk regardless of whether or not they have a sense of shared values with the scientists.

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\(^{10}\) Allum (2007) utilizes definitions from Branden Johnson’s (1999) article “Exploring dimensionality in the origins of hazard-related trust”. Thus, competence is referred to as “some form of technical competence or expertise”, and, care is referred to as an organization's “commitment to goals, fairness, faith or goodwill, honesty, and openness” (p. 936). Shared values are defined by the definition put forth by Earle and Cvetovich (1995).
A negative correlation was found between shared values and risk perception. Based on this finding, Allum (2007) suggests that risk communication efforts should rely on shared value-determined trust: Promoters of GM foods will be more successful in gaining technology acceptance if they can persuade the public that organizations responsible for the technology can be trusted in safely managing the possible risks because they share the same values and concerns as them. Due to the significance of competence on risk perception, it is also important (but less so than shared values) for people to believe that the organization is knowledgeable in dealing with the risks. On the other hand, opponents of agricultural technology will be successful in stopping further progress if they are able to convince the public that the interests/values of scientists do not align with the interests of the public and that the organizations are not competent in dealing with the risks (p. 944). The Center for Food Integrity addresses this latter scenario as the outrage factor “Control”, which is defined as the extent to which government agencies address the risk in a competent manner. According to Allum’s (2007) findings, the success of an organization in addressing control depends on how trusted the organization is regarding the shared value trust dimension.

![Risk perception and dimensions of social trust](image)

**Figure 2.5 Risk perception and dimensions of social trust**
Source: Allum (2007)
In sum, Allum’s (2007) findings support that shared values are the most important trust dimension for explaining variation in risk perception, although competence still plays a significant but weaker role (p. 943). This finding aligns with the importance of shared values and competence on trust in the CFI Consumer Trust Model (2014). Allum (2007) provides additional insights, such as the role of care on trust and the finding that competence influences risk perception (and therefore trust, in this model) independently of shared values.

Attitudinal Distance and Prior Attitudes

While other studies have focused on specific aspects of the SVS model, Poortinga and Pidgeon (2006) compare the SVS model to two other trust models. The first of these other two approaches, the dimensional approach, states that trust is based on competence and care dimensions. Second, the associationist approach states that trust is based on prior attitudes (Poortinga and Pidgeon, 2006, p. 1676-1678).

The dimensional approach appears in Allum (2007) and Cvetkovich and Nakayacki (2007)’s research, but prior attitudes as a determinant of trust only appears explicitly in Poortinga and Pidgeon (2006) within this literature review.

Overall, Poortinga and Pidgeon’s (2006) showed that most of the variance in trust (for genetically modified foods) can be explained by the SVS approach, but a model of trust that integrates all three empirical approaches to trust is put forth. This proposed model suggests that SVS precedes the other trust models because “if an organization is seen as having the same understanding of a particular situation, it is evaluated more positively on other trust-relevant aspects such as competence and care (p. 1692).” It is implied that an organization that has a similar understanding of a situation as an individual, shares values with the individual.

The integration of the associationist view, which states that perceptions of value similarity are to some extent influenced by prior attitudes, with the SVS model is intuitive: Poortinga and Pidgeon (2006) mention that from the SVS perspective, value similarity serves as “an assessment of the attitudinal distance between one’s own and the other person’s attitudes” (p. 1677). Attitudinal distance was measured by comparing “people’s own attitudinal positions” to

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11 Referring to Earle and Cvetkovich’s (1995) SVS model, Poortinga and Pidgeon point out that “people base their trust judgments on whether they feel that the other person or organization has the same understanding of a specific situation. From this perspective, value similarity could be seen as an assessment of the attitudinal distance between one’s own and the other person’s attitudes.” (p.1677)
“the perceived position of the government on GM food” (p. 1685) (for an explanation of how these two factors were measured, refer to 2.3). The model posits that the smaller the resulting attitudinal distance measure, the higher the perception of shared values (p. 1692).

The role of prior attitudes in evaluating the similarity of values is important because shared values appear to be the most important predictor of trust. If the attitudinal distance is small it means that the trustee is seen to have similar values to the truster. In other words, if the organization's attitude confirms the trustees prior attitudes, perceived shared values are strong and a value similarity-based trust building communication strategy is likely to be successful. However, if the attitudinal distance is large it means that the trustee is seen to have values different from the truster. In other words, the organization’s attitude does not align with the trustee’s prior attitude, and perceived shared values are not strong. In this situation, organizations that engage in value similarity-based trust building would not be successful.

Poortinga and Pidgeon (2006) demonstrate the versatility of the SVS model by integrating it with two other models for explaining trust, the dimensional and the associationist approach. In their empirical test, the proposed model was shown to be a good fit (Poortinga and Pidgeon, 2006, p. 1694) for explaining variations in trust. As a result, the authors recommend a Phase 3 approach to risk communication (Figure 2.1) stating that building trust is more effective if an organization aims to understand the public's position on agricultural biotechnology rather than a Phase 1 or 2 approach to feed the public more factual information (p. 1695).

**Summary**

The Center for Food Integrity (2014) focuses on shared values as a tool for building trust between an organization and the public. Similarly, Earle and Cvetkovich’s (1995) SVS model was developed and has been used to explain the role of shared values in trust-building. The research discussed in this section utilizes the SVS model, and the findings overall support the CFI (2014) recommendation that shared values are the most important factor in building trust. The literature also agrees that the other CFI trust dimension, competence, also plays a role in building trust.

However, the above literature points out some potential limitations of the CFI Consumer Trust Model. Additional factors that influence trust may be examined in future research as possible additions to the CFI Consumer Trust Model including:
o Risks and benefits: For example, Siegrist, Cvetkovich and Roth (2000) expand the Consumer Trust Model to show that social trust is closely related to risk perception; Allum (2007) similarly includes perception of risks and benefits as an outcome to trust in his model;

o Favoured outcomes: Cvetkovich and Nakayacki (2007) point out the importance of favored outcomes on perceived value similarity;

o Prior attitudes: The model proposed by Poortinga and Pidgeon highlights the role of prior attitudes on shared values. However, the authors’ recommendation to try to first understand the public’s position on the technology is broadly addressed in the second recommendation by CFI (i.e. “Identify the groups you want to engage”).

While Allum (2007) and Poortinga and Pidgeon (2006) investigate the concept of care/fairness as a determinant of trust, the CFI Consumer Trust Model does not include it explicitly. However, it was proposed as a driver of perceived shared values in the CFI research but not found to be statistically significant (CFI, 2014). The following section 2.3.2 discusses the believability drivers that CFI has identified as most relevant in contributing to perception of value similarity between communicators and the public.

2.3.2 Recommendation 2: Believability Drivers Establish Trust

Believability is a key driver in creating information that is trusted. Evaluate the information you want to share against the Fundamental Message Elements and Outrage Factors in the research models and modify where necessary to align your information with the models.  
(Center for Food Integrity 2014, p. 17)

While CFI (2014) makes it is clear how Shared Values fit into the Consumer Trust Model, the role of the Believability Drivers is less clear, but stated to be important. CFI states that “in predicting Confidence, Believability is more often a stronger predictor of Messenger Confidence than…” the other factors tested (p. 14). In other words, the Believability Drivers that CFI outlines as being the most significant in the tested models contribute to establishing shared values. There are two categories of Believability Drivers: Fundamental Message Elements and Outrage Factors. The following section describes each of these in more detail.

Fundamental Message Elements
There are four Fundamental Message Elements that CFI has identified as important when communicating about controversial topics. Referring to Table 2.1, these include a unifying message, openness/transparency, accurate presentation of risks, and leveraging trusted sources. While CFI states that these four message elements were selected “based on a comprehensive review of each topic,” the details of the selection process are not documented (Center for Food Integrity, 2014, p.10). As shown in the first column of Table 2.1 below, the description given of each message element by CFI provides limited insight on how each element can be implemented. For the purpose of this research, it would be useful to know, for example, what steps an organization can take to ensure it is sending “open and transparent” messages, or how it can leverage trusted sources.

Cited in Covello and Sandman (2001), four of the rules from the EPA’s Seven Cardinal Rules of Risk Communication (Appendix 2.1) have strong similarities to the Fundamental Message Elements (Center for Food Integrity 2014). The EPA handbook was drafted by Covello and Allen (1988) for both the public and private sector to be used as a “policy guidance document” (Covello and Allen 1988; Covello and Sandman 2001). The authors state that even though the rules of risk communication appear to be “obvious”, the guidelines are still not followed in risk communication, thus, making the document useful (Covello and Allen 1988).

The three other EPA rules, “accept and involve the public as a legitimate partner”; “meet the needs of the media”; and “plan carefully and evaluate performance” do not align with CFI Message Elements, although they are mirrored in communication recommendations provided by other literature. For example, the Phase 3 risk and science communication recommendation (Figure 2.1) to accept the public as a full stakeholder in an organization mirrors rule 1 - “accept and involve the public as a legitimate partner”. In addition, Frewer, Miles, and Marsh (2002) speak about the ability of the media to generate a social amplification of risk when it comes to agricultural biotechnology, stressing the need for organizations to consider their relations with the media more carefully. Addressing this would align with rule 5 - “meet the needs of the media” - to avoid social amplification of risk (Appendix 2.1).

<table>
<thead>
<tr>
<th>Believability Drivers (Center for Food Integrity 2014)</th>
<th>EPA’s Rules of Risk Communication Guidelines (Sandman and Covello 2001)</th>
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</table>

27
<table>
<thead>
<tr>
<th>Unifying Message. A singular, compelling message that touches the deeper drivers of human behaviour (connecting on shared values)</th>
<th>Rule 2: Listen to the audience. “If people feel they are not being heard, they cannot be expected to listen. Effective Communication is a two-way activity.” Guidelines: “Recognize people’s emotions. Let people know that what they said has been understood, addressing their concerns as well as yours. Recognize the “hidden agendas,” symbolic meanings, and broader social, cultural, economic or political considerations that often underlie and complicate the task of risk communication.” (p. 10) Rule 6: Speak clearly and with compassion. “In low trust, high concern situations, empathy and caring often carry more weight than numbers and technical facts.” Guidelines: “Use clear, non-technical language. Be sensitive to local norms… strive for brevity, but respect people’s information needs and offer to provide more information... Avoid distant, abstract, unfeeling language about deaths, injuries and illnesses. Acknowledge and respond (both in words and with actions) to emotions that people express, such as anxiety, fear, anger, outrage, and helplessness… Acknowledge, and say, that any illness, injury or death is a tragedy and to be avoided.” (p. 11)</th>
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<tr>
<td>Openness/Transparency. Acknowledging both sides of the story, providing a level of depth to avoid the appearance of “holding back,” and avoiding over-simplification</td>
<td>Rule 3: Be honest, frank, and open. “Before a risk communication can be accepted, the messenger must be perceived as trustworthy and credible. Therefore, the first goal of risk communication is to establish trust and credibility.” Guidelines: “State credentials;... Make corrections if errors are made….If in doubt, lean toward sharing more information, not less — or people may think something significant is being hidden. Discuss data uncertainties, strengths and weaknesses — including the ones identified by other credible sources...” (p. 10)</td>
</tr>
<tr>
<td>Accurate Presentation of Risks: Present known risks since known risks trump unknown risks by accurately presenting safety facts.</td>
<td>Rule 3: Be honest, frank, and open. Guidelines: “... Disclose risk information as soon as possible (emphasizing appropriate reservations about reliability). Do not minimize or exaggerate the level of risk. Speculate only with great caution... Discuss data uncertainties, strengths and weaknesses — including the ones identified by other credible sources. Identify worst-case estimates as such, and cite ranges of risk estimates when appropriate.” (p. 10)</td>
</tr>
</tbody>
</table>
### Table 2.1 Matching of CFI's fundamental message elements with EPA's guidelines for risk communication

Source: Center for Food Integrity (2014); EPA (1988)

| Leverage Trusted Sources: Leveraging trusted sources | Rule 4: coordinate and collaborate with other credible sources. “Allies can be effective in helping communicate risk information. Few things make risk communication more difficult than conflicts or public disagreements with other credible sources.” Guidelines: “...Devote effort and resources to the slow, hard work of building bridges, partnerships, and alliances with other organizations. Use credible and authoritative intermediaries. Consult with others to determine who is best able to answer questions about risk. Try to issue communications jointly with other trustworthy sources such as credible university scientists, physicians, citizen advisory groups, trusted local officials, and national or local opinion leaders.” (p. 10) |

The first Message Element “*unifying message*” aligns with EPA rule “*listen to the audience*” and “*speak clearly and with compassion*” A unifying message, is “a singular, compelling message that touches the deeper drivers of human behaviour.” In other words, it is meant to be a message beyond just the technical information. This element could be combined with the rule “listen to the audience” and “speak clearly and with compassion” because a true unifying message cannot be sent unless you listen to the audience first and recognize their feelings, concerns, and attitudes about a topic.

The second Message Element, CFI Message Element “*openness/transparency*” aligns with EPA rule “*be frank, honest, and open*”. Openness and transparency requires an organization to disclose all relevant information and to be unbiased. When it comes to risk communication, this means being transparent about any uncertainties as opposed to withholding such information. This is similar to the EPA rule “be frank, honest, and open” by having accountability for statements made, over-sharing information instead of disclosing when in doubt, and generally discussing public concerns in a transparent and accountable manner.

The third CFI Message Element “*accurate presentation of risks*” aligns with EPA rule “*be honest, frank, and open*” To accurately present risk data requires being open and transparent regarding risk data. This can be done by acknowledging and addressing any known risks rather than denying them. Accurately presenting risk data involves sharing information in a time-
relevant manner, not holding back on sharing uncertainties in data, and providing sufficient risk estimates.

The fourth CFI Message Element “leverage trusted sources” aligns with EPA rule “coordinate and collaborate with other credible sources.” Leveraging trusted sources is similar to the EPA rule “coordinate and collaborate with other credible sources” in order to demonstrate consistency with other experts. This can be done by building relationships with other experts in the field in a way that the public can recognize.

Due to these similarities between the Message Element descriptions and EPA rules and guidelines, and citation of Covello and Sandman’s research in the CFI report, it is assumed that the four Fundamental Message Elements tested by CFI are drawn from, and therefore can be further defined by, the EPA’s Seven Cardinal Rules of Risk Communication. Aligning the Fundamental Message Elements with the EPA guidelines provides more clarity on what application of the Fundamental Message Elements might look like for agricultural organizations. The EPA guidelines provide guidance on how to implement each Message Element in communication.

Outrage Factors

The Outrage Factors outlined by CFI also come from previous work by Covello and Sandman (2001). In their paper, Risk Communication: Evolution and Revolution, it is stated that one of the obstacles to effective risk communication is psychological and social factors that influence how people process risk information. Seven psychological and social factors are put forth, with one of them being outrage factors.

12 Other obstacles mentioned that are of less importance to this research project are: uncertainty of data and gaps in knowledge, distrust between stakeholders, selective reporting by the news media, and psychological and social factors that influence how people process risk information. Although all of these are important for effective risk communication, the last one, psychological and social factors, is particularly important for this research project.

13 Other social and psychological obstacles to risk communication include: mental shortcuts that cause people to “make biased judgments, or use only a small amount of information in making decisions about risk”; apathy, meaning that some people do not have the motivation or interest to properly learn about a topic; overconfidence and unrealistic optimism, causing people to dismiss risk information that is presented to them; the fact that some topics being simply too difficult and/or technical for the public to understand; public demand for scientific certainty, which is due to general aversion towards uncertainty even though risk estimates are not perfect forecasts of the future; and, “reluctance on the part of people to
Outrage factors are factors that influence the way in which people respond to and judge risk information. Research on outrage factors began in the 1960’s, and the resulting body of literature concluded that the correlation between actual physical risk in a situation and the amount of worry it generates in people is often very low (Covello and Sandman, 2001, p. 4). In other words, the public sometimes perceives risk levels to be very different than risk specialists. Outrage factors help to explain why such a phenomenon occurs (p. 4). Twenty outrage factors are described in Covello and Sandman (2001), and CFI cites seven of these as being relevant for the topic of controversial food issues. Table 2.2 compares the definitions that CFI gives to their chosen Outrage Factors with the definitions that are found in Covello and Sandman (2001).

<table>
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<tr>
<th><strong>Center for Food Integrity Description</strong></th>
<th><strong>Covello and Sandman Description</strong></th>
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<tr>
<td>Voluntary vs. Imposed: People tolerate more risk if it has been voluntarily entered into rather than forced upon them (the difference between being pushed out of an airplane with a parachute against your will as opposed to choosing to skydive).</td>
<td>Voluntariness: Risks from activities considered to be involuntary or imposed (e.g., exposure to chemicals or radiation from a waste or industrial facility) are judged to be greater, and are therefore less readily accepted, than risks from activities that are seen to be voluntary (e.g., smoking, sunbathing, or mountain climbing).</td>
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<tr>
<td>Control vs. No Control: The extent to which government agencies address the risk in a competent manner. People feel alienated and frightened when they believe that government agencies are not doing a good job of regulating potential hazards (if I choose to go skydiving, then I hope the skydiving company is being well-regulated).</td>
<td>Controllability: Risks from activities viewed as under the control of others (e.g., releases of toxic chemicals by industrial facilities) are judged to be greater, and are less readily accepted, than those from activities that appear to be under the control of the individual (e.g., driving an automobile or riding a bicycle).</td>
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change strongly held beliefs, and their willingness to ignore evidence that contradicts them”, otherwise known as having a confirmation bias;
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<th>Familiar vs. Exotic: It is difficult to feel threatened by something that is familiar - your basement recreation room (in the case of radon) or the car (in the case of seat belts). But things perceived as strange and unfamiliar can raise the concern just on that fact alone (skydiving for the first time).</th>
<th>Familiarity: Risks from activities viewed as unfamiliar (such as leaks from chemicals, or radiation from waste disposal sites) are judged to be greater than risks from activities viewed as familiar (such as household work).</th>
</tr>
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<tr>
<td>Not Memorable vs. Memorable: Events that elicit much public discussion and news media coverage can seem more risky. For example, a plane crash that results in multiple fatalities is rare but very memorable when compared to the thousands that die each year in car crashes. (Talk radio, 24-hour news and some bloggers work to make issues more memorable and tend to polarize debate to secure listeners, viewers, and readers.)</td>
<td>Media Attention: Risks from activities that receive considerable media coverage (e.g., accidents and leaks at nuclear power plants) are judged to be greater than risks from activities that receive little (e.g., on-the-job accidents).</td>
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<td>Commonplace vs. Dreaded: Certain diseases, contaminants or forces understandably are dreaded, and more so if they are not commonplace. Examples would include rare cancers and radioactive waste, or more recently, Ebola compared to influenza.</td>
<td>Dread: Risks from activities that evoke fear, terror, or anxiety (e.g., exposure to cancer causing; AIDS) are judged to be greater than risks from activities that do not arouse such feelings or emotions (e.g., common colds and household accidents).</td>
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<td>Fair vs. Unfair: People who have to endure greater risks than others are naturally outraged, especially if it appears the decisions that create the risk are based on politics instead of science. For example, neighbours of an industrial plant may feel unfairly burdened by noise or traffic. The entire community benefits from the economic activity, but immediate neighbours have to deal with the challenges of the plant.</td>
<td>Fairness: Risks from activities believed to be unfair or to involve unfair processes (e.g., inequalities related to the siting of industrial facilities or landfills) are judged to be greater than risks from fair activities (e.g., vaccinations).</td>
</tr>
<tr>
<td>Morally Acceptable vs. Unacceptable: Certain actions are unacceptable to most people regardless of the calculated risk (e.g., deliberate contamination/pollution of groundwater used for drinking and deliberate abuse of animals). It is not</td>
<td>Ethical/Moral Nature: Risks from activities believed to be ethically objectionable or morally wrong (e.g., foisting pollution on an economically distressed community) are judged to be greater than risks from ethically neutral activities (e.g., side effects)</td>
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unusual for this outrage factor to be the trump card in decision making because moral outrage elicits a strong emotional response.

Responsive vs. Unresponsive (Process): Does the agency/organization/company tell people what’s going on before the real decisions are made? Does it listen and respond to community concerns?

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<td>Responsive vs. Unresponsive (Process): Does the agency/organization/company tell people what’s going on before the real decisions are made? Does it listen and respond to community concerns?</td>
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Table 2.2 Comparison of outrage factors between CFI (2014) and Sandman and Covello (2001).


The outrage factors were matched together between the two research publications based on similarity of definition and/or similarity of factor name. Most of the CFI (2014) descriptions relate closely with Covello and Sandman (2001). For example, the descriptions of Voluntariness, Familiarity, Media Attention, Fairness, and Ethical/Moral Nature are similar enough to the corresponding CFI factors to be deemed as the same outrage factor (Table 2.2).

Dread is similar to Commonplace vs. Dreaded because both deal with the feeling of dread that comes along with a rarely occurring risk. However, the Covello and Sandman (2001) definition focuses more on the emotional response to a risk, whereas the CFI definition (2014) focuses more on whether or not the risk is familiar or not.

Control vs. No Control and Controllability are not the same concept, despite their similar names because the two differ significantly, and therefore they were not matched despite the similarity of their names. According to CFI (2014), Control vs. No Control refers to the extent to which governments/organizations regulate risk, a concept that is not mentioned in Covello and Sandman (2001). In fact, Covello and Sandman (2001) use Controllability to refer to whether choosing to engage in a risky activity is under the control of the individual or someone else, similar to CFI factor Voluntary vs. Imposed. The first is referring to trust in regulatory control, the latter to personal control over risk behaviour. Allum’s (2007) findings support the CFI (2014) finding that Control vs. No Control should be addressed in communication in order to reduce

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14 A similar CFI outrage factor would include Voluntary vs. Imposed, which predicts that people are more tolerant of risks if they voluntarily enter a risky situation versus being in a risk situation that is forced upon them. However, this was matched with the Covello and Sandman outrage factor Voluntariness because they the two are essentially similar (see Table 2.2).
potential outrage. He suggests that risk perceptions of GM food can be reduced if the public is convinced that the regulatory process is managed by “scientists and other risk managers [who] are trustworthy and share broadly the same goals and values as them” (Allum, 2007, p. 944).

Lastly, the CFI factor Responsive vs. Unresponsive, otherwise called Process in the CFI report, does not match up to any of outrage factors that Covello and Sandman talk about. Responsive vs. Unresponsive is similar to the EPA’s rule #1 and #2: “accept and involve the public as a legitimate partner”, and “listen to the public”. The guidelines for rule #1 are to involve the public early in the decision making process before final decisions are made, and the guidelines for rule #2 are to use a variety of techniques to allow any interested stakeholders to address their concerns. Being Unresponsive would mean that an organization is being secretive and not including anyone in the decision making, whereas being responsive would mean the organization is inviting community feedback and the outcomes of the decision making process would be the result of a two-way conversation with the public. The overlap here makes it clear that the outrage factors are closely related to risk communication recommendations. This corroborates that outrage factors explain why people tend to overestimate risk, and risk communication attempts to address these concerns.

**Significant Outrage Factors**

In the CFI (2014) research, 20 models were tested to see which Outrage Factors drive Message Believability. Out of the eight outrage factors tested (Table 2.2), the ones that were found to drive believability of a message were Control (significant in 17 models), Process (i.e. Responsive versus Unresponsive) (significant in 12 models), Fairness, Familiarity, and Voluntariness (all significant in one model) (p. 15).

Process, whether or not an organization is responsive to the public, can be addressed through engagement by the organization. Control, the extent to which risk is addressed in a competent manner, can also be addressed through communication if the organization makes clear to the public how effectively the industry is regulated. Familiarity can be addressed through communication by making an effort to educate the public more, but the reach of this can be very limited and time consuming. However, Voluntariness and Familiarity cannot be easily addressed through communication.
Since Control and Process are the most significant outrage factors, it is clear that organizations should take care to address these outrage factors. The organizations who are not doing this might need to undergo fundamental changes in organizational structure and values towards embracing public opinion, as suggested by Phase 3 of the risk and science communication recommendations (Table 2.1).

Social Amplification of Risk

Similar to outrage factors, Frewer, Miles, and Marsh (2002) utilize the Social Amplification of Risk framework to explain why sometimes events or things that have little actual risk tend to provoke strong public apprehension (p. 701). Frewer, Miles, and Marsh (2002) suggest that this is partly due to sudden changes in the volume and content of risk reporting about GM foods that can produce significant attitudinal changes in the public. Although this study was done in the context of media impact on risk perception, it is relevant because social amplification of risk matches with the outrage factor Media Attention (Covello and Sandman 2001) and Memorable versus Not Memorable (Center for Food Integrity 2014)(Table 2.2).

To test the extent of social amplification of risk associated with GM foods, Frewer, Miles, and Marsh (2002) looked at how public attitudes about GM foods varied during three time periods: before, during, and after peak reporting of the topic. As predicted by the social amplification of risk framework, it was found that risk perceptions were higher during the peak reporting period and reduced after media reporting subsided.

This study confirms the importance of media attention as an outrage factor in the case of GM food: When media attention to a topic is higher, people can become outraged despite the actual low risk level. This leads to a question about why Memorable vs. Not Memorable was not a contributing outrage factor toward Message Believability in the work done by CFI. One possible reason for this given by Frewer, Miles, and March (2002) is that it was found that media reporting about GM risks did not impact peoples’ trust in regulators, meaning that the social amplification of risk occurred independently of factors that influence trust (Frewer, Miles, and Marsh 2002, p. 708). Then, it is possible that media coverage does not interact with trust, but with risk perception, making it insignificant in CFI’s trust research.
Summary

To summarize, Section 2.2.3 investigated the context behind the CFI (2014) Message Elements and Outrage Factors. It was established that Believability Drivers are closely related to the risk communication guidelines developed by the EPA (Covello and Allen 1988), and that outrage factors are closely related to the outrage factors discussed by Covello and Sandman (2001).

A better understanding of how believability drivers and outrage factors can be implemented in communication is useful because message elements contribute to Believability and overall trust (Center for Food Integrity 2014). However, The Center for Food Integrity research might have areas to build on in the future, particularly regarding the role of other significant factors for building trust that have been outlined by the researchers discussed in this section. The following, Section 2.2.4, will provide a detailed assessment of the Consumer Trust Model.

2.3.3 Critical Assessment of the CFI Consumer Trust Model

This section provides a critical assessment of the CFI Consumer Trust Model with insights from the stages of risk and science communication (Figure 2.1) and the literature on building trust in controversial technologies (Section 2.2.2 and 2.2.3). In addition, the concept of confirmation bias will be introduced as a potential barrier to communication.

The following points are suggested areas of improvement for the CFI consumer trust model:

1. The Consumer Trust Model does not explicitly address the importance of institutional change.

Referring to Figure 2.1, Phase 3 of risk and science communication suggests that organizations need to have a dialogue with the public in order to address the trust deficit and reduce public outrage. Covello and Sandman (2001) suggest that organizations in this stage will eventually come to realize that being effective at listening to and engaging with the public would eventually lead to institutional change that is guided by the suggestions and concerns expressed within the public dialogue.
Similarly, Bauer, Miller and Allum (2007: p. 28) criticize the Stage 1 and 2 deficit models as having an “institutional neurosis” where the central premise is that a deficient public cannot be trusted. In turn, the public does not trust the scientific experts because they feel their concerns are not being legitimately considered. The way to rebuild trust is through public engagement and deliberation that focuses on reaching a social consensus. Bauer, Miller and Allum (2007: p. 86) provide a real-life example that showcases the actual difficulty of this process: the GM Nation public debate about GM crops and foods during 2003 in the UK resulted in a public opinion that was still skeptical of GM foods and crops, regardless of the public deliberation process. The government’s response to this attitudinal outcome was to either blame environmental groups for having too much influence in the debate, or to further engage in dialogue until the public was convinced of the merits of GM foods (Bauer, Miller, and Allum 2007, p. 86).

Both of these outcomes demonstrate that the hesitant public's concerns weren’t really being listened to, even though they were given an opportunity to be a part of the conversation. In other words, as a result of engaging with the public, the “organizations” weren’t willing to change, but public opinion was expected to. This example shows that true institutional change is difficult to achieve. Covello and Sandman (2001: p. 8-9) give several reasons that can prevent institutional change, including institutional resistance, preference for avoiding emotional approaches to solving problems, and desire for risk managers to protect their self-esteem.

CFI is partly in line with Phase 3 of science and risk communication because they suggest engaging with the public through a shared values-based communication strategy. However, the risk and science communication literature points out that this engagement needs to be taken one step further to include organizational change in order to be meaningful. As Covello and Sandman (2001) point out, organizational change in itself is difficult to achieve even if the need for it is clear. To achieve this, they state that organizations must fully commit to embrace stage four of risk communication, which occurs “when you really believe in stage three, and discover that stage three requires fundamental shifts in an organization’s values and culture” and enter stage four which “involves treating the public as a full partner” (Covello and Sandman 2001, p. 8).

It is worth noting that the Center for Food Integrity research does point out the importance of organizational change in a more subtle way. They found that the two outrage factors that are more significant for message believability were Process, whether or not an organization is responsive to the public, and Control, how effectively risk is regulated in a competent manner by
the organization. Addressing both Process and Control are ways that an organization can change its fundamental values and behaviour by being more responsive to the public (i.e. actually listening to and addressing their concerns) and by addressing the risks for which the public has concerns.

2. The Consumer Trust Model does not consider the role of preferred outcomes in predicting trust.

Cvetkovich and Nakayachi’s (2007) research suggests that the outcome that an organization prefers is important to people when they are deciding whether to trust an organization or not. Outcomes can be seen as the results of a public debate and/or political deliberation process, often in the form of a policy. It is possible for someone to have shared values with an organization, yet prefer a different outcome. For example, both parties may value a healthy and sustainable food supply. An organization might manifest this value in the form of a new GM food that is proven to use fewer natural resources. Since this food must be thoroughly tested for health and safety before it can be available for consumption, the organization sees no use for mandatory labelling of GM food. On the other hand, the public might be concerned about the unintended health consequences of a new GM food, and demand to have mandatory labelling of all GM foods. In this case, connecting based on shared values will not be successful if the two parties have a different vision for what the most desirable outcome of the shared value is. In this case, it would be necessary for both values and preferred outcomes to align.

Although Cvetkovich and Nakayachi (2007)’s study was done on an issue separate from agricultural biotechnology, the findings may be transferable. Further, Cvetkovich and Nakayachi (2007)’s finding that people tend to trust the organization whose favoured outcomes reflects their own values also points to the reality that it can be difficult to change peoples’ values. Thus, understanding that preferred outcomes are a strong and unambiguous signal of one’s position could be a useful communication tool as opposed to attempting to change attitudes. Within a society, values can differ greatly and this limits the reach of connecting with the entire public based on shared values. An organization will only be able to connect based on shared values with those who actually have similar values. This is another reason why favoured outcomes might be more important than shared values in predicting trust. In this sense, if agreement on outcomes is a driver of trust, then shared values don’t matter at all but can instead be viewed as desired end-
states. Then, agreement on outcomes is a more important indicator of trust than agreement on values.

3. The Consumer Trust Model does not explicitly address risk and benefit perception in relation to trust

Siegrist, Cvetkovich, and Roth (2000) show that a substantial amount of the variance in risk and benefit perception was correlated to social trust in the predicted directions (Siegrist, Cvetkovich, and Roth 2000, p. 358). They concluded that lay people are more likely to trust experts who are perceived to hold similar values to them, confirming the shared value relationship. Once established, trust leads people to accept the risk evaluations from these experts more easily. In other words, shared values and trust are connected to risk perception. Allum (2007) also included risk perception as an intermediate step to trust development after shared values are established.

While the CFI approach does allow organizations to listen to public worries about risks and recommends discussing risks and benefits in the believability drivers, risk perception is not included in the Consumer Trust Model. However, accepting the risk evaluations of trusted like-minded experts is similar to an organization gaining a Social License in the Consumer Trust Model. Social License is defined as “the privilege of operating with minimal formalized restrictions,” but this description is slightly incomplete because it does not identify what this “privilege” entails. In addition, CFI identifies that “accurate presentation of risks” is a crucial believability driver for communication based on shared values.

Instead, thinking about the Social License in the context of risk perception is useful and more comprehensive. Proceeding with this idea, the logic would follow similarly to Siegrist, Cvetkovich, and Roth’s (2000) finding: Once people trust an organization, they are willing to accept the risk evaluations that the organization provides. If they trust these risk evaluations that state consuming GM food is no more hazardous than consuming conventional food, then the public would perceive a very low risk and would be willing to give the organization freedom to proceed with the technology in a manner they see fit. A more complete description of the Social License, then, might be acceptance of risk as a successor to trust. In real life, people take many risks (such as driving an automobile or trusting the pilot of an airplane) because they both understand and accept the risks associated with such activities. It is due to the Social License that
exists between the organization and the public that makes people willing to accept the risk and allows such organizations to operate.

4. The Consumer Trust Model does not explicitly consider the role of prior attitudes in building trust.

Poortinga and Pidgeon (2006) integrate prior attitudes and propose their own version of the Salient Value Similarity model. In their model, a smaller perceived attitudinal distance between the truster (i.e. the public) and the trustee (i.e. an organization/the government) implies a higher perception of values similarity. Therefore, prior attitudes are a benchmark for comparing one's own attitude to an organization's attitude to determine how closely their values align. Including prior attitudes is useful since it addresses individual differences in values amongst people and sheds light on how shared values are actually formed. These are two functions of including prior attitudes that the CFI Consumer Trust Model does not address explicitly.

As mentioned, a small attitudinal distance means that the trustee is seen to have similar values to the truster. In other words, if the organization’s attitude does not align with the truster’s prior attitude, and perceived shared values are not strong, then building trust through shared values can be difficult. Attitudinal distance serves as a proxy for SVS in the sense that a smaller attitudinal distance makes shared values more likely, whereas a larger attitudinal distance would makes it more difficult to connect on shared values according to SVS. Poortinga and Pidgeon’s (2006) model proposes that:

As value similarity can be conceptualized as an assessment of the attitudinal distance between the “truster” and the “trustee,” we expect that the combination of people’s own attitudinal positions (affect) and the perceived position of the government on GM food (government position) will better predict the perceived value similarity with the government (p. 1685).

5. The Consumer Trust Model does not explicitly consider the role of confirmation bias as a potential barrier to shared values-based communication.

While previous research has investigated the roles of preferred outcomes, perceived risks and benefits and prior attitudes in the perception of value similarity and in the generation of trust,
little is known about consumers’ information search and processing about novel food and agricultural technologies. These issues can be addressed by discussing confirmation bias as a communication barrier that needs to be overcome.

Although Poortinga and Pidgeon’s (2006) attitudinal distance model is about trusting the government’s ability to regulate, and not about communication or information search behaviour, some implications about communication can be made. As mentioned above, if attitudinal distance is large, then the values of the organization do not align with personal values. In this case, Poortinga and Pidgeon (2006) suggest that skepticism rather than trust will develop toward the organization. This implies that any information that the organization shares will be viewed with caution, or avoided altogether. On the other hand, a small attitudinal distance implies that values align because attitudes are in agreement. Trust in the organization is more likely to develop in this case, making it more likely for new information to be accepted. Overall, if prior beliefs are strong and there is a large attitudinal distance between a truster and a source (i.e. an organization), the psychological tendency of confirmation bias might lead people to avoid information from that source.

The goal of the Consumer Trust Model is to help organizations communicate more effectively with the public. Although confirmation bias is stated as a barrier to informed decision making, the role of confirmation bias as a barrier to connecting on shared values is not explicitly considered by the CFI model (2014). Poortinga and Pidgeon (2006) address this problem with the concept of attitudinal distance as a predictor of shared values. This concept combined with human tendency for confirmation bias can make shared values an ineffective strategy for building trust if attitudinal distance is large.

Figure 2.6 below represents how confirmation bias might act as a barrier to the Consumer Trust Model. The Consumer Trust Model posits that Believability Drivers - more specifically the fundamental message elements and outrage factors that were identified as significant by CFI - will help to establish a sense of shared values. However, if people have a tendency for confirmation bias, then it is unlikely that any attempts at communication, even when Believability Drivers are addressed, will be successful. Once again, it is important for organizations to embrace the public as a legitimate stakeholder in order to facilitate a reduction of attitudinal distance and lower the potential for confirmation bias.
2.4 Confirmation Bias

Confirmation Bias can be defined as a tendency for people to seek out consonant information and to avoid dissonant information (Smith et al. 2008). Similarly referred to as Selective Exposure, Confirmation Bias became a known concept in the social sciences around the 1950’s when Cognitive Dissonance Theory first emerged. Cognitive Dissonance Theory proposes that people prefer to have consistency in their attitudes and their decisions such that a negative psychological state of cognitive dissonance arises when people are exposed to information or situations that are not consistent with their existing attitudes or decisions. Engaging in confirmation bias is one way to avoid cognitive dissonance.

2.4.1 Theoretical Underpinning for Confirmation Bias

Section 2.3.3 will discuss empirical research that has been done on overcoming confirmation bias. Before presenting that, it is useful to go over some of the theoretical underpinnings that have been used previously as a basis for past research. Most of the following empirical studies build off of an established theory related to confirmation bias, with the
exception of the study by Vydiswaran et al. (2015) which does not provide a concrete theoretical basis for the study.

Cognitive Dissonance Theory

As previously mentioned, confirmation bias is one of the ways to deal with cognitive dissonance, defined by Leon Festinger (1957) as the negative psychological state that arises when people are exposed to information or situations that are not consistent to their already made up attitudes or decisions. By seeking out consonant and disregarding dissonant information, people are able to reduce this negative psychological state.

Jonas et al. (2001) use Cognitive Dissonance as the theory for their study to test whether people display confirmation bias during an information search. They define a confirmation bias as “the preference for supporting as opposed to conflicting information” (p. 557), which is similar to the Smith (2008) definition.

It is worth noting that engaging in selective exposure of information is only one of the ways to reduce cognitive dissonance. In some situations it might be more appropriate to reduce dissonance by seeking out incongruent information for the purpose of refuting it (Smith et al., p. 467). For example, as suggested by Rhine (1967a, 1967b)(cited in Smith), at very high levels of cognitive dissonance it is less likely for an individual to engage in confirmation bias because in this case “they are actually more likely to seek out information that increases dissonance. The reason for this is that at very high levels of dissonance, the best form of dissonance reduction would be to change one’s attitude or decision” (Smith et al. p. 468). In other words, in cases when people might be unsure of their opinion on a topic, they are more likely to look at both sides of an argument in an attempt to form a more confident opinion thereby reducing cognitive dissonance.

However, for the case of agricultural biotechnology it is likely that individuals would engage in confirmation bias due to the controversial nature of the GM debate. In other words, there is arguably strong arguments to support either side of the debate making it less likely for people to avoid dissonance by seeking out incongruent information.

Prospect Theory
Kahneman and Tversky (1979) developed Prospect Theory to explain risk behaviour, suggesting that “losses are more averse in intensity than the pleasure resulting in equal-sized gains” (p. 313). Fischer et al. (2007) applied Prospect Theory to look at whether gain- vs. loss-decision framed problems affect the tendency for confirmation bias differently in information search behaviour.

Based off of previous studies on Prospect Theory, it was hypothesized by Fischer et al. (2007) that people in gain-decision frames are less likely to “exert themselves” than people in loss-decision frames. In other words, people in gain-decision frames “are not very diligent in their decision making and thus come easily to a tentative decision that they are confident about” making them more likely to seek out consonant “information that fits to their subjectively highly valid position.”

On the other hand, people in loss-decision frames are “more careful and thus unwilling to make a quick tentative decision” making them less likely to experience decision certainty and “should finally lead them to be more careful and thus balanced in their information search” (p. 313). Since Prospect Theory states that losses are more severe than gains, it makes sense that people in loss-decision frames would be more thorough in information search than people in gain-decision frames. By testing whether the decision frame makes a difference in if the proceeding information search is biased or balanced, it makes sense to connect Prospect Theory with confirmation bias in information search behaviour.

Lay Epistemic Theory

Lay Epistemic Theory (LET) states that people “generate and test hypotheses [depending] on cognitive capability to acquire and process information as we well as their motivation for doing so” (Smith et al. 2008, p. 469). A person’s capability depends on the availability and accessibility of information; motivation is how much a person seeks “closure,” which depends on “a person’s belief of the cost-benefit trade-off of continuing to seek out information.”

According to LET, confirmation bias behaviour comes about because people are motivated to reach a specific conclusion or “closure” in order to account for their attitudes or behaviours. Smith, Leandre and Fabrigar (2008) suggest that LET might be a useful framework
for organizing past research on confirmation bias, although no documented studies have used it as a theoretical approach for understanding confirmation bias (p. 477).

2.4.2 Confirmation Bias as a Barrier to Shared Values Based Communication

Confirmation Bias and Selection of Information

Covello and Sandman (2001) list several barriers to effective risk communication, and confirmation bias is present in the category of “psychological and social factors that influence how people process information” (p. 3). They argue that people with strongly held beliefs about a particular risk are willing to ignore any evidence that is in contradiction to these beliefs (p. 4). Similarly, CFI claims that confirmation bias acts as a barrier to informed decision making when attitudes are in disagreement with “scientific consensus” (Center for Food Integrity 2014, p. 2). Earle (2004) suggests that there is a difference between building trust and distrust in the sense that trust is built based on agreement while distrust is built based on disagreement. In the case of distrust, a “disconfirmation bias” is present such that people actively reject information that does not align with currently held beliefs (Earle 2004, p.172).

Earle (2004) suggests that people actively resisting dissonant information is a more thought provoking behaviour than when people accept and seek out consonant information, such that there is a difference in psychological magnitude between agreement and disagreement. Earle’s (2004) think aloud protocol study has two significant findings. First, it was found that people base their trust judgements on similarity and agreement to the information given to them, and distrust is based on disagreement. This agreement, however, can be on the basis of shared values, or other factors such as policy outcomes, perceived issue importance, information credibility, and the legitimacy of the organization providing the information. Agreement based on any of these things can lead to trust, whereas disagreement can lead to distrust.

Secondly, it was found that levels of trust are negatively correlated to conscious thought. The idea that disagreement is more thought provoking than agreement was supported by the results. Earle points to the importance of confirmation bias by finding this interesting relationship between agreement and trust.

Earle’s (2004) study suggests that information that agrees with someone’s current beliefs can lead to trust, while information that is against one's current beliefs leads to distrust. This supports other related literature on Salient Value Similarity. Further, Earle’s (2004) findings
suggest that dissonant information might be resisted more actively than consonant information is accepted.

Applying these findings to the Consumer Trust Model makes it is clear that prior attitudes and agreement with new information, two elements of confirmation bias, are important for building trust. While it is clear that confirmation bias is considered an obstacle in related literature, we suggest that the Consumer Trust Model underestimates the role of confirmation bias in the communication process (Figure 2.6). Due to the mechanism of confirmation bias, it may be difficult to connect on shared values and build trust if people’s prior beliefs contradict with given information, as the Consumer Trust Model suggests. The current research seeks to further examine the implications of this mechanism for communication.

2.4.3 Empirical Research on Overcoming Confirmation Bias in Information Search Behaviour

Smith et al. (2008) published an article covering six decades of research on selective exposure/confirmation bias. This research was largely organized into moderators of confirmation bias. They were able to identify 5 moderator categories, including: Decisions, attitude, information characterises, individual differences, and contextual/situational factors (Smith et al. 2008, p. 482). However, there is little conclusive evidence about how generalizable moderator impacts are, and the researchers suggest there are even more new potential moderators to explore (Smith, Leandre, and Norris 2008, p. 486). The current research will look at the role of shared values based communication as a potential moderator of confirmation bias.

The relevant moderators for this research project include contextual/situational factors (presentation format), attitude (extremity, certainty, and commitment), and information characteristics (familiarity/novelty) (Smith et al. 2008, p. 482).

The role of information presentation formats

Vydiswaran et al. (2015) conducted an experiment to determine at what factors help people to acquire additional information about controversial topics in an unbiased manner. Two controversial issues were chosen for participants to engage in a learning task. The first issue was the healthfulness of flavoured milk, and the second issue was the feasibility of alternative energy sources to fossil fuels.

The experiment was setup in three phases, including the pre-study questionnaire, the study phase, and the post-study questionnaire. During the study phase, participants were in
engage in a learning task about one of the issues by entering a computer interface user-survey that was named BiasTrust. There were several interface variants that each participant could be directed to, which studied the following factors:

1. Explicit display of contrasting information: It was believed that showing alternate viewpoints side-by-side would reduce bias in information search behaviour. Two variants were used for this factor. The first one displayed one document at a time to participants, the second showed contrasting evidence beside the primary document.

2. Single document per page versus multiple documents: It was believed that people would spend more time reading a document before moving on to the next one if fewer documents are shown. A third variant was designed here where five documents instead of just one were shown on the webpage.

3. Source expertise rating: It was believed that people would decide to read or skip a document based on whether the document is from a credible/trustworthy source. Source rating was controlled in two ways. In the fourth variant, source ratings were hidden. In the fifth, source ratings were shown using one of two rating schemes.

4. Document presentation order: It was believed that grouping documents together by subtopics would influence information search behaviour. Two variants were used here: one with a random order or subtopics based on when they were retrieved, and another where the documents were sorted based on subtopic. In the second setting, all the documents in on topic were shown before moving on the next topic.

In some cases it was found that people changed their strongly held biases. The factor driving this appeared to be number of documents read and display of contrasting viewpoints: 65.7% of the people who read more than 20 documents on the contrasting viewpoint interfaces had changed their beliefs (p. 1668).

In addition to contrasting vs non-contrasting format, information can be presented in a sequential or simultaneous manner. Building off of Dissonance Theory, Jonas et al. (2001) inquire about whether a tendency for confirmation bias can be applied to situations where information is sought sequentially rather than simultaneously. Most prior research on confirmation bias was conducted in a simultaneous manner, but it is believed that real life settings are more likely to follow the sequential situation.
In a sequential setting, information is retrieved, read, and then processed before moving onto the next document. On the other hand, in the simultaneous situation participants are asked to mark which documents they would like to read from a list of all available documents and are then are given the documents.

It was found that the generalization of confirmation bias tendencies holds in sequential situations. Even when participants were engaged in a sequential information search, a significant confirmation bias was observed by a preference for attitude consistent documents. It was suggested that sequential information presentation makes the prior decision more salient, and therefore the commitment to the decision is higher, leading to a stronger confirmation bias than in a simultaneous presentation.

The role of decision framing

Fischer et al. (2007) looked at whether gain- vs. loss-decision framing makes a significant difference in tendency to engage in confirmation bias in an information search. It was hypothesized that people in loss-decision frames would be more thorough in information search than people in a gain-decision frame. Thus, people in a loss-decision frame would engage in a more balanced information search, and people in a gain-decision frame would be more likely to engage in confirmation bias.

Four experiments were conducted by Fischer et al. (2007), with varying methods. In all of the experiments, participants were assigned to either a loss or gain decision problem and asked to make a final decision after they had the opportunity to look at additional information. It was concluded that loss-framed decision problems facilitate less of a tendency for confirmation bias in information search than gain-framed decision problems. Also, people in a gain decision frame looked at less information overall (i.e. “exerted themselves” less) and had higher subjective decision certainty. This increased certainty led to increased confirmatory tendencies in their information search than for participants in the loss-frame.

The role of initial judgments on information search

Wilson et al. (2004) looked at how initial judgements (current perceptions) about the benefits and risks associated with genetically modified foods influence information search
behaviour on the issue. More specifically, how much initial judgments affected whether or not participants engaged in systematic or heuristic information gathering. Systematic processing occurs when a person makes a judgement by carefully examining, comparing and relating arguments, whereas heuristic processing occurs when people rely on simple decision rules to reach an opinions - such as agreeing with social consensus, by avoiding ongoing evidence collection and evaluation, or referencing “expert” opinion. Some of the questions that arose were: is there evidence that suggests that negative opinions about GMOs are driven by fear and risk-focus? Does information seeking behaviour vary significantly with current perceptions on the issue? Are people with polarized views more likely to exhibit a confirmation bias in information search?

The results indicated that all participant groups (polarized and balanced) were most likely to choose a neutral document as their first selection. However, people who were alert to the dangers of GMOs preferred negative documents to positive ones, whereas people alert to opportunities preferred positive documents over negative ones. This demonstrates some evidence for confirmation bias behaviour, however the overall consensus was that initial judgments are not a significant indication of how people will gather information.

3 CHAPTER THREE: Study Design

3.1 Motivation, Research Questions, Hypotheses, and Recruitment

3.1.1 Motivation for Empirical Research

Recalling the economic problem presented in Chapter 1, agricultural biotechnology is a topic that many people have very strong opinions about. As a result, it can be difficult for people to consider information that doesn’t align with their existing opinions or beliefs. This makes individuals more likely to engage in confirmation bias during information searches or information processing. A polarization of opinions, such as with agricultural biotechnology, can pose a problem for development of the regulatory process under which the technology is assessed.
There are two possible extreme outcomes of such a polarized opinion climate. The first would be an overly lenient regulatory system that favours the view that the technology should be used whenever possible. In action, this opinion could result in untested GM products making it to market and being consumed by people. The alternative outcome of a polarized opinion climate would be an overly cautious regulatory system that favours the view that biotechnology should not be used at all. In this case, beneficial GM foods with manageable risks would not make it to market. Neither of these two outcomes are desirable because they do not result in an optimal uptake of the technology while balancing health and environmental considerations.

In order to contribute to depolarizing the current debate about this topic, a better understanding is needed regarding the circumstances that might lead people to consider information that counters their currently held beliefs.

3.1.2 Selection of Confirmation Bias Moderators and Research Questions

There are two starting points for this research. The first is that Canadian consumers have an understanding of agricultural biotechnology that is “not that well formed” and lacking in “detailed knowledge.” According to Health Canada research, this has been shaped largely by controversial media coverage and anti-GM groups (Health Canada 2016, p. 7).

The second is the assumption that the psychological mechanism of confirmation bias is present when people engage in an information search about agricultural biotechnology. Since confirmation bias is one of the coping mechanisms for cognitive dissonance\(^{15}\), this is a reasonable assumption given the aforementioned current understanding of agricultural biotechnology by the average Canadian consumer.

\(^{15}\) Defined by Leon Festinger (1957) as the negative psychological state that arises when people are exposed to information or situations that are not consistent to their already made up attitudes or decisions. By seeking out consonant and disregarding dissonant information, people are able to reduce this negative psychological state.
As such, this research seeks to examine how confirmation bias tendencies may be overcome. Based on the literature review presented in Chapter 2, a conceptual framework has been developed from which research questions have been derived.

For the purpose of this study, four factors were identified that can influence the presence of confirmation bias during an information gathering task, so-called moderators of confirmation bias:

1. Content of communication
2. Presentation format
3. Individual characteristics
4. Situational context

Content of communication refers to what is actually being said in the information someone is reading. The main focus here is on content that either has or does not have a presence of shared-values based communication. This is based on the findings of consumer research by the Center for Food Integrity (2014) and other studies investigating the link between salient value similarity and trust, as outlined in Chapter 2.

Presentation format refers to how the information is visually presented. Vydiswaran et al. (2015) tested several factors to determine what helps people to gather information in an unbiased manner. Their findings suggested that explicitly showing contrasting viewpoints on subject side-by-side reduced the incidence of confirmation bias in their study, compared to the treatment that showed only one viewpoint at a time. Inspired by this technique, this study categorized article subjects by the aforementioned dominant message elements (unifying message, openness/transparency, accurate presentation of risks, control, process) and a labelling statement (Table 3.2).

Individual characteristics (such as demographics and prior attitudes) were measured with a demographic survey and two psychographic scales to assess attitudes towards science and technology, and towards natural food products.

Lastly, situational context refers to the context in which a person is looking for information. This moderator has been kept constant in the study by assigning participants the same information-gathering task across all treatments of the experimental design.
The extent of confirmation bias can be measured in a number of ways. The present study will introduce a hypothetical GM product and ask participants to make an opinion about it based on a simulated article search. Participants will be presented with 12 articles, half supportive of the new GM food and half in opposition. Participants will be invited to read as many or as few of the articles as they need to make an opinion before continuing on to an exit questionnaire. As presented in more detail below, for the purpose of this study, confirmation bias will be measured on the numbers of articles selected by the participant. The more balanced the article selection is between the two sources, the smaller the extent of confirmation bias is assumed.

Considering these four moderators of confirmation bias listed above, three research questions are addressed in this study:

1. Does exposure to shared values-based communication have an impact on the likelihood of engaging in confirmation bias tendencies during an information search?

2. Does format of information presentation have an impact on the likelihood of engaging in confirmation bias tendencies during an information search?

3. Do previous attitudes (towards science and technology and/or towards natural products) have an impact on the likelihood of engaging in confirmation bias tendencies during an information search?

3.1.3 Hypotheses

Based on the conclusions presented in the literature review in chapter 2, the above research questions can be transformed into the following directional hypotheses:

1. Being exposed to shared values based communication reduces confirmation bias tendencies during an information search.

2. Being exposed to information that is presented in a “contrasting format” (i.e. opposing views presented side-by-side) reduces confirmation bias tendencies during an information search.

3. Having less extreme prior attitudes on the subject matter of are will reduce confirmation bias tendencies during an information search.
3.1.4 Data Collection Method

An online survey with an experimental element was the chosen method of implementing the experiment. The logistical ease of administering an online survey with a large sample size was a major rationale for doing the survey online, as opposed to an in-person experiment. In addition, the researchers believe that participants would be able to successfully complete the experimental survey during their own time and in their own space.

The online survey was composed of three main stages (which are outlined in further detail below). The first is the entry survey where data is collected about demographics and attitudes. In addition, participants must successfully get through the screening questions to continue the study. The second stage is the experimental portion, where participants are randomly assigned to one of four treatment groups and are required to read provided articles. In this phase, participants are given a task description, a rationale for the choice of the genetically modified food product, and a selection of articles to read that represent the selected believability drivers. Last, the exit survey serves the purpose of collecting data regarding the research output variables. This requires participants to make an assessment of the new food product, their level of trust towards the two hypothetical organizations, and perception of shared values with the two organizations.

3.1.5 Recruitment and Qualifying Criteria

A global market research company, Lightspeed GMI, was hired to program and host the survey, recruit participants and collect data for this study. Specific instructions were given to the company by the researchers, along with all the survey content including demographic questions, two psychographic scales, exit survey questions, treatments, and articles. From this, Lightspeed GMI was able to create an online survey interface to meet the research requirements.

Aside from the ability to create a survey interface able to track participant time spent on various articles and flow through the articles and entry/exit questionnaires, another reason for commissioning a third-party research company was due to the fact that Lightspeed GMI has an extensive database of survey participants that can be efficiently recruited to participate in online surveys. The company uses a double opt-in process to build a database of consumers who have expressed an interest in taking part in online surveys. When a new survey is launched, an e-mail invitation is sent to a subset of the panellists in their database. The researchers requested a sample size of 500, and Lightspeed GMI recorded a total of 501 responses (n=501).
The first inclusion criteria for this study required participants to be at least 18 years of age. Non-adults (under the age of 18) were excluded from the survey because they generally are not expected to be responsible for household food choices. The second inclusion criteria required that participants be either a primary grocery shopper or have shared responsibility in grocery shopping in their household. Participants with expertise in biotechnology, plant science, agriculture, genomics, or other related fields were excluded from the study. The reason for this is because this research is examining communication for the average Canadian, and anyone with expertise in these fields would likely have knowledge and opinions that deviate from the average Canadian’s knowledge and opinions on the topic, thus making the results less useful.

Participants who successfully completed the survey received 35 “market points” from Lightspeed GMI. The market points system is an incentive system managed by the company. Participants who completed the screening questionnaire but did not qualify for the study (in this case, based on age, gender, and/or region) were entered into a monthly sweepstakes draw by Lightspeed GMI. Clearance from the Research Ethics Board was obtained on December 6, 2016 (REB#16OC028). Data collection was completed between December 8th, 2016 and Dec 18th, 2016.

3.2 Entry Survey

First, participants were screened in order to ensure that they:

1. are at least 18 years of age;
2. are either the primary grocery shopper in their household, or, contribute to the shared responsibility of grocery shopping in their household;
3. do not have extensive work experience or formal education specializing in agronomy, crop science, or plant biology; molecular biology and genetics; and/or biotechnology.

If participants were cleared for all three screen questions, they were able to proceed to the experiment. Demographic data about the participants was collected through a demographic survey (Appendix 3.1). This includes basic information about the participants including age, sex, occupation, number of people in the household, region of residence, marital status, ethnicity, number of years living in Canada, education, and income.
Next, prior attitudes that have been found relevant for consumers’ assessment of agricultural biotechnology in previous studies were measured using two psychographic scales. The first scale was the Confidence in Science and Technology Scale, which asks participants to indicate their level of agreement/disagreement with a series of statements regarding the ability of science and technology to solve environmental problems. The scale is a 7-point Likert scale that ranges from “Disagree Strongly” [1] to “Agree Strongly” [7](Appendix 3.2).

Milfont and Duckitt (2010) provide The Confidence in Science and Technology Scale as one of twelve psychometric scales that make up the Environmental Attitudes Inventory (EAI). The EAI was developed in order to provide a “psychometrically sound, multidimensional inventory to assess Environmental Attitudes (EA) cross-culturally” because “no previous attempt to measure EA had taken a systematic approach in which the multidimensional and hierarchical nature of EA are considered” (Milfont and Duckitt 2010, p. 80). The EAI is meant to be a “new culture-general and fully balanced tool for measuring EA” (Milfont and Duckitt 2010, p. 88). The authors gave the Confidence in Science and Technology Scale the following construct definition:

Belief that human ingenuity, especially science and technology, can and will solve all environmental current problems and avert or repair future damage or harm to the environment, versus belief that human ingenuity, especially science and technology, cannot solve all environmental problems (Milfont and Duckitt 2010, p. 90).

This scale is useful for the purpose of this study because agricultural biotechnology is under the realm of science and technology, and agricultural biotechnology companies often claim that their products contribute to solving current environmental problems. Although this scale measures general, not specific (i.e. agricultural biotechnology) attitudes towards science and technology, it is possible to infer an attitude towards agricultural biotechnology from this scale as it falls under the general umbrella of science and technology. In addition, it would not be useful to ask agricultural biotechnology attitude specific questions as it could potentially “prime” the participants for the experimental study by potentially causing them to overthink their position.

16 In addition, this experiment was designed in such a way that the agricultural biotechnology product in question is created in order to contribute to solving the environmental problem of global food waste.
on the issue. In this case, results would be skewed because participants would not be expressing their true attitudes. This scale has been used in the past to infer attitudes towards GM foods. Grygorczyk, Turecek, and Lesschaeve (2013) used this scale to infer agricultural biotechnology attitudes. They found that consumers who had low confidence in science and technology preferred organic pest management practices and strongly disliked genetic modification.

Second, the Natural Product Interests Scale (Roininen et al. 1999) measures people's’ affinity for natural foods (Appendix 3.2). This scale was found to be strongly correlated with another scale that Roininen et al. developed - the General Health Interest scale, which measures how mindful an individual is of the healthfulness of the food they consume. The correlation between the two scales reveals that people generally do not see food additives and processing as lending to the health and safety of food (Roininen et al 1999, p. 84).

GM foods are categorized by many consumers as not natural (Magnusson and Hursti 2002, p. 23); therefore a measure of people's natural product interest will provide a reasonable reflection of how they feel about GM foods. The Natural Product Interest Scale has been used in research about GM foods in the past. Magnusson and Hursti (2002) and Lähteenmäki et al. (2002) both use the NPI scale in their research. In both cases a higher score on the NPI scale (i.e. more interest in natural foods) is associated with a more negative attitude towards GMO’s (Magnusson and Hursti 2002, p. 17-18; Lähteenmäki et al. 2002, p. 529).

The average of all answer scores for each scale was used to compute one attitude score towards science and technology, and one towards natural foods.

3.3 Article Selection Task

3.3.1 Task Assignment and Introduction of the Always Green Avocado

Once Stage 1 was complete, the participants were informed that their next task was to engage in an online information search about a novel food. The task given is the following:

Imagine that you went to the grocery store and saw the "Always Green Avocado" in the produce isle. When you came back home you decided you wanted to look into it some more.

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17 defined as foods that are organic, not processed, and do not contain additives
Now, imagine that you do an online search (for example, on Google or Yahoo) and that the search results that come up are the articles that will appear on the following screen. Feel free to read as many or as few articles as you need to form an opinion on the product, just as you would in a real information search. You must read at least one article.

Once you feel you've gathered enough information about this new avocado and have decided if you would be interested in trying it, or if you could recommend trying it to a friend, you can click the arrow on the bottom right hand corner of the screen. You will then be asked to answer a few follow-up questions in the final part of the survey.

Click on the arrow below to begin exploring articles about the "Always Green Avocado".

This task was designed to be as realistic as possible. When a new food is introduced into the food system, people might engage in an online search to determine whether or not they want to buy and/or consume the product. The participants were told to read as much or as little information as they felt they needed in order to mimic a real life information search. In other words, the experimental task above was meant to encourage the participants to conduct a “search” about a new product as they would in real life. However, in order to ensure results were collected the participants were required to read at least one article.

A possible drawback of this design is that asking participants to “form an opinion” might indicate to them that they should look at both sides. Therefore the extent of confirmation bias could be understated in this experiment compared to a real-life situation. Chapter 2, Section 2.3.3 discusses the role of situational factors as a moderator of confirmation bias.

In order the avoid deception, participants were told that the Always Green Avocado and the two organizations that discuss it within the experiment were fictitious. However, they were also asked to think of them as real-world concepts in order to make the experimental task more realistic. In addition, participants were informed that the Always Green Avocado was produced with genetic engineering. Before moving on to the experimental portion, participants were given the following description of the hypothetical new food product:
The Always Green Avocado was developed by the Always Green Company in response to consumer demand for an extended ripeness period for avocados. The Always Green Avocado stays ripe and green for 8-12 days even when sliced in half, as compared to a conventional ripeness period of 3-5 days.

The Always Green Avocado was developed by silencing the gene that is responsible for producing the browning enzyme in avocados. Although the product will still spoil over time due to bacteria or mould like any regular avocado, the spoilage due to over-ripening is delayed in this avocado even after cutting. According to Health Canada, this type of breeding process is described as genetic engineering, which is also referred to as genetic modification (GM) or agricultural biotechnology.

3.3.2 Experimental Design and Treatments

There are four treatments in this study based on two dichotomous factors (Table 3.1). Participants were assigned to one of the four treatments at random. The first factor is exposure to shared values-based communication, and the second factor is exposure to a contrasting viewpoint format.

<table>
<thead>
<tr>
<th>Factor level 2a: Contrasting format</th>
<th>Factor level 1a: Shared Values communication</th>
<th>Factor level 1b: No Shared Values communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment 3: SVC_C</td>
<td>Treatment 4: XSVCC_C</td>
<td></td>
</tr>
<tr>
<td>Factor level 2b: Non-contrasting format</td>
<td>Treatment 1: SVC_XC</td>
<td>Treatment 2: XSVCC_XC</td>
</tr>
</tbody>
</table>

Table 3.1 Experimental design and treatment groups
Legend:
SVC_C: shared values communication with contrasting format
SVC_XC: shared values communication with non-contrasting format
XSVCC_C: no shared values communication with contrasting format
XSVCC_XC: no shared values communication with non-contrasting format (i.e. control group)
The first level of factor one was exposure to shared values-based communication (Table 3.1, factor 1a), and the second was not being exposed to shared values-based communication (Table 3.1, factor 1b). The way that factor 1a was administered was through the presence of sentences within each article that communicate a sense of shared values. This was accomplished by using sentences such as “We care deeply about using science-based principles for assuring health and environmental safety.”, “It is important to us that consumers receive accurate information about the food supply so that they can make informed choices.”, and, “We are fully committed to empowering consumers to give them a voice in the regulatory process for genetically modified foods and to help them protect themselves against corporate interests.”

For factor one, level b, shared values sentences were not present and the participants instead received only the parts of the articles that did not communicate shared values. In order to maintain the same word count within each article, shared values statements were replaced with neutral “filler statements” that did not add or take away any content from the articles.

Factor 2, the presentation format of the articles also had two levels. Level a) displays the articles in a contrasting manner (Table. 3.1, factor 2a). For this treatment, articles from the Always Green Company were displayed side-by-side with the corresponding topic article from Food Monitor Canada. For factor 2, level b), the articles appeared as a single column list similar to what a Google search result would look like so that the articles were presented to the participant in a non-contrasting format in a randomized order.

Treatment 2 was considered to be the control group because participants in this group were not exposed to shared values based communication, nor were they exposed to the contrasting presentation format. Finally, all articles were presented in a randomized order for each participant to avoid ordering effects. As mentioned above, the contrasting treatment had been randomized in a way that preserved a side-by-side topic match between the two organizations. For example, the article addressing the message element “control”, by Food Monitor Canada was shown beside the article addressing the message element “control”, by Always Green Company (see Table 3.2 below in section 3.3.4).

3.3.3 **Fictitious Case: Always Green Company & Food Monitor Canada**

Descriptions of two fictitious organizations were developed by the researchers with the objective to keep the experiment as realistic as possible. After researching various real-life GM companies and anti-GM organization, the Always Green Company and Food Monitor Canada
were developed based on the language, tone, and content of real-life websites. Each organization is portrayed through a series of articles that address the message elements that CFI finds to be most important in shared-values communication. These are: unifying message, process, transparency and openness, control, and accurate risk presentation (Table 3.2). In addition, a genetically modified avocado was specifically chosen as the crop of interest by the researchers because it is a fruit that is not grown in Canada. Therefore, it is unlikely that a product such as this is already being considered for development in Canada, and makes it unlikely that the participants will believe the research is a market research attempt. Furthermore, due to the nature of avocados, it was possible to give the hypothetical product a GM trait of non-browning, similarly to other newly commercialized GM foods with consumer benefits (Innate Potato™ and Arctic Apple™), adding to the realism.

There are two main reasons why fictitious instead of real organizations were used. First, it allows us to have complete control over the message content in the articles. Controlling the content allowed crafting messages from two fictitious sources that both address message elements, outrage factors and shared values topics that are not necessarily consistently addressed by real-life organizations. This helps to maintain control over the variables of interest, shared values communication and message elements. Second, copyright issues impeded using information from existing websites in our study. Overall, creating fictitious organizations and content based on the real world allowed for control over the variables of interest while bypassing complicated steps that would be necessary for using copyrighted information from real websites.

It was aimed to fabricate two organizations that were realistic enough to be reflective of existing organizations but not real in the sense that they could be linked to any specific existing organization. The Always Green Company is the creator of the product that is used in this study, the Always Green Avocado. It is a hypothetical non-browning avocado developed by the company in an attempt to help reduce food waste and enhance convenience for consumers. As a reflection of the real life climate surrounding agricultural biotechnology, Food Monitor Canada was created as an “opponent” of the Always Green Company, their avocado, and other similar novel food products.

The experiment was set up in this manner, with one “proponent” of agricultural biotechnology (The Always Green Company) and one “opponent” (Food Monitor Canada) so that the degree of confirmation bias that is present in an information search could be tested in
accordance to the outlined research questions. In addition, this design allowed the factors of interest, shared values-based communication and presentation format, to be tested for their impact on confirmation bias behaviour.

Even though the two organizations were designed to hold opposing opinions on the technology, a conscious effort was made not to make any of the articles too polarized by using neutral language to the extent possible. Extremist views were avoided because this would have caused an effect similar to media sensationalism and appealed to high emotion introducing an additional potential source of bias (Marks and Kalaitzandonakes 2001)(see Appendix 3.3).

3.3.4 Message Elements and Articles

The positions of the Always Green Company and Food Monitor Canada were communicated through a series of articles that were developed to represent key message elements for believability of messages, as identified by the CFI research (CFI 2014). Like the companies, the fictitious articles were inspired by the real-life opinion climate that was observed on various websites. This research project investigated whether this method of building trust through message elements is effective at overcoming barriers to communication, specifically confirmation bias. The articles each addressed one of the message elements that CFI identifies as being important for building trust with the public:

1. Mission Statement/Unifying Message
2. Process
3. Control
4. Openness and Transparency
5. Accurate Presentation of Risks
6. Statement of position on GMO labelling

Refer to Appendix 3.3 for the full articles that were developed for each corresponding message element. Participants were presented with 12 articles to select from: one for each of the five message elements from each of the two organizations, in addition to an “About Us” article

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18 This is not a message element addressed by the Center for Food Integrity (2014) research. However, the researchers felt that it was important to include an article that discusses the current climate surrounding labelling opinions as it is a popular topic in the current debate. It is difficult to speak about agricultural biotechnology without addressing this topic. In addition, will be useful for future research projects that use the same dataset.
outlining the organization (Table 3.2). In total, the researchers composed 24 articles: 12 pertained to the shared values treatment and a second 12 pertained to the no shared values treatment. An overview of the article topics is provided in Table 3.2 below.

<table>
<thead>
<tr>
<th>Message element addressed</th>
<th>Information Source:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Always Green Company</td>
</tr>
<tr>
<td>Unifying Message</td>
<td>Always Green Company: About Us</td>
</tr>
<tr>
<td>Process</td>
<td>A Continuous Process: How We Respond to Consumers’ and Farmers’ Needs</td>
</tr>
<tr>
<td>Openness and Transparency</td>
<td>Transparency and Our Limitations: We Need to Talk About the Things We Can’t Talk About</td>
</tr>
<tr>
<td>Control</td>
<td>How Novel Foods are Controlled and Regulated in Canada</td>
</tr>
<tr>
<td>Accurate Presentation of Risks</td>
<td>No Risks Found to be Associated with Eating the Always Green Avocado</td>
</tr>
<tr>
<td>Labelling Statement</td>
<td>Always Green Company’s Position on Labelling</td>
</tr>
</tbody>
</table>

Table 3.2 Summary of article titles and associated message elements from fictitious organization

Note: The titles of the articles are same for the shared values and no shared values communication treatments. This is because the content of the articles does not change with the inclusion or exclusion of shared values statements.

3.3.5 The Information Search

Once participants were randomly assigned to one of four treatment groups, they had a total of 12 articles to choose from. The interface resembled the appearance of an online information search result (Figure 3.1). Once the participant clicked on an article, a pop-up window appeared with the contents of the article. For data collection purposes, only one article could be viewed at a time. The online survey interface was set up to track what articles each
participant opened, along with the time spent reading each article they opened (in seconds). Once participants read as many articles as they felt necessary for the purpose of the experiment, they were able to click through to the final stage of the study.

**Search results for "always green avocado"**

<table>
<thead>
<tr>
<th>Always Green Company: About us</th>
<th>Food Monitor Canada: About us</th>
</tr>
</thead>
<tbody>
<tr>
<td>Author: Always Green Company</td>
<td>Author: Food Monitor Canada</td>
</tr>
<tr>
<td>Always Green Company is a Canadian agricultural biotechnology start-up that is funded by a group of private investors. We are...</td>
<td>Food Monitor Canada is a non-profit organization. Our mission is to inform the Canadian public about healthy food choices that...</td>
</tr>
</tbody>
</table>

**Transparency and Our Limitations:**

**We Can't Talk About the Things We Need to Talk About**

<table>
<thead>
<tr>
<th>Author: Always Green Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Members of the public who are interested in our enterprise can find plenty of information on our website. We have...</td>
</tr>
</tbody>
</table>

**A Continuous Process:**

**How We Respond to Consumers' and Farmers' Needs**

<table>
<thead>
<tr>
<th>Author: Always Green Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>We developed the Always Green Avocado in response to in-depth market research in the USA and Canada. Although demand for...</td>
</tr>
</tbody>
</table>

**Companies that Produce GM Foods Do Not Care about Consumers' and Farmers' Needs**

<table>
<thead>
<tr>
<th>Author: Food Monitor Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td>Companies that use genetic modification (sometimes also referred to as agricultural biotechnology) for food production have a track record of...</td>
</tr>
</tbody>
</table>

**No Transparency: The Information that they're Hiding From You**

<table>
<thead>
<tr>
<th>Author: Food Monitor Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is clear that profits are the most important driver motivating the development of genetically modified crops such as the...</td>
</tr>
</tbody>
</table>

Figure 3.1 An example of how articles appeared to participants

Note: This is an example of treatment 4 (no shared values communication with contrasting format). Treatment 3 appeared identical except that the articles content contained shared values communication. See Appendix 3.4 for an example of how all the non-contrasting treatments (treatment 1 and 2) appeared to the participants.

### 3.4 Exit Survey

Once the information search (Stage 2) was completed the participants answered questions that pertained to the output variables. There were three sets of questions in this part of the experiment.

The first set of questions was regarding the participants’ opinion about the Always Green Avocado in order to elicit a response on whether they would personally try the avocado.
Participants were asked to imagine that the avocado was introduced into the Canadian market. Then, they were to evaluate their level of agreement with a set of opposing opinion statements (Figure 3.2): 

![Figure 3.2](image.png)

Figure 3.2 First set of exit questions, as they appeared in the experiment, regarding opinion about the Always Green Avocado

Note: Wording was changed for item 2: “It would surely increase food waste” read as “It would surely not reduce food waste” in the final survey.

The second set of questions was regarding their trust in Always Green Company and Food Monitor Canada. It is important to measure overall trust in Always Green Company and Food Monitor Canada because the Center for Food Integrity model predicts that trust can be built by using values-based communication. Having a measure of trust will help to determine if values-based communication or presentation format does in fact influence trust in this scenario. In this section, participants were asked their level of agreement with two statements for each organization: whether they would trust the organization to provide accurate information, and whether they would like to receive more information from each organization if it were real. These questions were used as trust measures (Appendix 3.5)

The third set of questions was regarding perception of value similarity with Always Green Company and Food Monitor Canada. This is particularly useful in determining whether shared values communication makes a difference in perception of value similarity, as predicted by CFI. In this section, participants were asked their level of agreement about whether each organization seemed like a caring organization, and if they feel that the values exhibited by each organization reflected their own personal values (Appendix 3.5).

Chapter 4 presents the results of this experiment to evaluate the hypotheses that were formulated by the researchers.
4 CHAPTER FOUR: Results and Discussion

4.1 Description of the Sample

4.1.1 Demographics descriptive Statistics

The total sample size was 501 Canadian residents. Of these, slightly more than half were male (54%) and slightly less than half were female (46%) (Table 4.1). The sample deviated slightly from the Canadian population. According to Statistics Canada, the 2011 census reports that 49% of the Canadian population is male, and 51% is female (Statistics Canada 2016).

Quotas were set for age so that the sample would have a relatively equal proportion of adults aged 18 to 35 years old, 36 to 50 years old, and above the age of 50 years old (Table 4.2).
Although this distribution is not representative of the Canadian population, it was decided that it is important for this research to include a sufficiently large sample of Millennials (18 to 35 years old), as this age group will increasingly become the decision makers in the future of GMOs in terms of purchasing power, communication around the technology, R&D and regulation as they enter the workforce. Realizing this age group’s influence, the Center for Food Integrity identifies Millennials as a target group for research (Center for Food Integrity 2014, p. 15). Also, these requirements make it easier to make comparisons of people’s views about GMOs across generations. As such, this age group is over-represented in this study, as Statistics Canada reports that 22.1% of Canadians are 18-34 years old\(^\text{19}\) (Statistics Canada 2016). The second eldest age group, 36 to 50, is also over-represented in this study, as 21.4% of all Canadians are 35 to 49 years old. Statistics Canada reports that 21.07% are 50 to 64 years old and 14.8% are 65 years old and above. These age groups are representative in this study (Statistics Canada 2016).

The largest proportion of participants (38.35%) reported an annual household income of $40,000 - $79,999, followed by the second largest proportion being the lowest income level of less than $40,000 (29.12%). The remaining third of the sample (32.53%) reported an annual household income of $80,000 or more, with 12.65% of this group reporting an income of over $119,999 (Table 4.3).

Quotas were set for regions of Canada to align with the population distribution according to the 2011 Canadian population census. Most participants were residents of Ontario (36.73%) or Quebec (21.96%). The remainder of participants resided in the Prairie provinces (Alberta, Manitoba, Saskatchewan) (18.36%), British Columbia (12.97%), or the Atlantic provinces (New Brunswick, Newfoundland, Nova Scotia, Prince Edward Island) (9.98%) (Table 4.4). Participants from the Northern territories (Northwest Territories, Nunavut, Yukon Territory) were excluded as they comprise less than 1% of the Canadian population and with a total sample size of 500 in the study, there would be an insufficient number of participants from the Northern regions to create a statistically valid segment or to influence the overall result.

<table>
<thead>
<tr>
<th>Count</th>
<th>271</th>
<th>230</th>
<th>501</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>54%</td>
<td>46%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 4.1 Gender distribution

<table>
<thead>
<tr>
<th>18 to 35</th>
<th>36 to 50</th>
<th>51 to 65</th>
<th>&gt; 65</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>166</td>
<td>168</td>
<td>102</td>
<td>65</td>
</tr>
<tr>
<td>Percentage</td>
<td>33.13%</td>
<td>33.53%</td>
<td>20.36%</td>
<td>12.97%</td>
</tr>
</tbody>
</table>

Table 4.2 Age distribution

<table>
<thead>
<tr>
<th>&lt; $40,000</th>
<th>$40,000 - $79,999</th>
<th>$80,000 - $119,999</th>
<th>&gt; $119,999</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>145</td>
<td>191</td>
<td>99</td>
<td>63</td>
</tr>
<tr>
<td>Percentage</td>
<td>29.12%</td>
<td>38.35%</td>
<td>19.88%</td>
<td>12.65%</td>
</tr>
</tbody>
</table>

Table 4.3 Income distribution

<table>
<thead>
<tr>
<th>Atlantic</th>
<th>BC</th>
<th>Ontario</th>
<th>Prairies</th>
<th>Quebec</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>50</td>
<td>65</td>
<td>184</td>
<td>92</td>
<td>110</td>
</tr>
<tr>
<td>Percentage</td>
<td>9.98%</td>
<td>12.97%</td>
<td>36.73%</td>
<td>18.36%</td>
<td>21.96%</td>
</tr>
</tbody>
</table>

Table 4.4 Region of residence distribution

4.1.2 Attitude Scales Descriptive Statistics

The following section reports the average scores of the individual items of the two scales that were used for measuring prior attitudes. The two scales used that are relevant for participants’ attitudes towards agricultural biotechnology are the Confidence in Science and Technology scale and the Natural Product Interest scale.

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Most environmental problems can be solved by applying more and better technology.</td>
<td>4.3</td>
<td>4</td>
<td>1.4</td>
</tr>
<tr>
<td>2. Science and technology will eventually solve our problems with pollution, overpopulation, and diminishing resources.</td>
<td>4.1</td>
<td>4</td>
<td>1.4</td>
</tr>
<tr>
<td>3. Science and technology do as much environmental harm as good.</td>
<td>3.6</td>
<td>4</td>
<td>1.4</td>
</tr>
<tr>
<td>4. Modern science will NOT be able to solve our environmental problems.</td>
<td>3.9</td>
<td>4</td>
<td>1.5</td>
</tr>
<tr>
<td>5. We cannot keep counting on science and technology to solve our environmental problems.</td>
<td>3.4</td>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>6. Humans will eventually learn how to solve all environmental problems.</td>
<td>3.9</td>
<td>4</td>
<td>1.5</td>
</tr>
<tr>
<td>7. The belief that advances in science and technology can solve our environmental problems is completely wrong and misguided.</td>
<td>4.1</td>
<td>4</td>
<td>1.5</td>
</tr>
</tbody>
</table>
8. Humans will eventually learn enough about how nature works to be able to control it.  
9. It can be risky to switch to new food technologies too quickly.  
10. Science and technology cannot solve the grave threats to our environment.  
11. Modern science will solve our environmental problems.

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humans will eventually learn enough about how nature works to be able to control it</td>
<td>3.7</td>
<td>1.6</td>
<td>4</td>
</tr>
<tr>
<td>It can be risky to switch to new food technologies too quickly</td>
<td>3.0</td>
<td>1.2</td>
<td>3</td>
</tr>
<tr>
<td>Science and technology cannot solve the grave threats to our environment</td>
<td>3.8</td>
<td>1.5</td>
<td>4</td>
</tr>
<tr>
<td>Modern science will solve our environmental problems</td>
<td>4.1</td>
<td>1.3</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>3.81</td>
<td>3.81</td>
<td>1.4</td>
</tr>
</tbody>
</table>

Table 4.5 Descriptive statistics for Confidence in Science and Technology scale for each item and total

Overall, there is not much variation in the measures of central tendency across items in the Confidence in Science and Technology Scale. The mean scores ranged from 2.99 to 4.32, and the median across items was the middle attitude score of 4 (“neither agree nor disagree”) except for items 4 and 9, which had a median of 3 (“disagree somewhat”). This indicates that there is a balance of scores around the median, or that most items have a central tendency towards the middle of the 7-point Likert scale (Table 4.5).

The standard deviations for each of the 11 items in the Confidence in Science and Technology Scale ranged from 1.209 to 1.551. The least amount of variation across participants was observed for item 9 (“It can be risky to switch to new food technologies too quickly.”) where most people selected “disagree somewhat” with this statement. The most amount of variation amongst participants was observed for item 8 (“Humans will eventually learn enough about how nature works to be able to control it.”) where most participants indicated that they either “disagree somewhat” or “neither agree nor disagree”.

<table>
<thead>
<tr>
<th>Average participant attitude score across all items</th>
<th>Number of participants</th>
<th>Percentage of Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 3.4 (skeptical)</td>
<td>134</td>
<td>26.8%</td>
</tr>
<tr>
<td>3.41 to 4.5 (indifferent)</td>
<td>276</td>
<td>55.1%</td>
</tr>
<tr>
<td>4.51 to 7 (confident)</td>
<td>91</td>
<td>18.2%</td>
</tr>
</tbody>
</table>

Table 4.6 Average participant scores for the Confidence in Science and Technology scale, sorted into confidence ranges

Table 4.6 refers to average attitude scores across participants for all items for the Confidence in Science and Technology Scale. Being in the range of an attitude score of less than or equal to 3.4 5 indicates skepticism or distrust in science and technology for solving the
world’s environmental problems; being in the range of an attitude score of 3.41 to 4.5 indicates a neutral/indifferent attitude to science and technology for solving the world’s problems; and, being in the range of an attitude score above 4 implies having confidence in the role of science and technology in solving the world’s environmental problems.

Results indicate that about half of the participants (55.09%) have a neutral/indifferent opinion about science and technology’s role in solving environmental problems. This could mean that they are simply not engaged in the topic, or perhaps they do not have an opinion on the topic. More participants are skeptical about the role of science and technology (26.75%) than those who are confident (18.16%)

The next scale that was used was the Natural Product Interest scale, which measured general interest in natural foods and aversion to additives in food. Tables 4.7 and 4.8 report the descriptive statistics for this scale.

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I try to eat foods that do not contain additives.</td>
<td>4.9</td>
<td>5</td>
<td>1.4</td>
</tr>
<tr>
<td>2. I do not care about additives in my daily diet.</td>
<td>4.8</td>
<td>5</td>
<td>1.5</td>
</tr>
<tr>
<td>3. I do not eat processed foods, because I do not know what they contain.</td>
<td>4.1</td>
<td>4</td>
<td>1.5</td>
</tr>
<tr>
<td>4. I would like to eat only organically grown vegetables.</td>
<td>4.3</td>
<td>4</td>
<td>1.6</td>
</tr>
<tr>
<td>5. In my opinion, artificially flavoured foods are not harmful for my health.</td>
<td>4.8</td>
<td>5</td>
<td>1.4</td>
</tr>
<tr>
<td>6. In my opinion, organically grown foods are not better for my health than those grown conventionally.</td>
<td>4.0</td>
<td>4</td>
<td>1.6</td>
</tr>
<tr>
<td>Total</td>
<td>4.5</td>
<td>4.5</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Table 4.7 Descriptive statistics for the Natural Food Interest scale for each item and total sample

Similarly to the Confidence in Science and Technology scale, there was limited variation in the measures of central tendency across items in the Natural Product Interest Scale. The mean scores ranged from 4.1 to 5.0. The median across items was 4 for items 3, 4, and 6, and 5 for items 1, 2, and 5.
The standard deviations for each of the 6 items in the Natural Food Product Interest Scale ranged from 1.4 to 1.6. The least amount of variation across participants was observed for item 1 (“I try to eat foods that do not contain additives.”) where most people indicated that they “agree somewhat” with this statement. The most amount of variation amongst participants was observed for item 4 (“I would like to eat only organically grown vegetables.”) where most people veered towards “neither agree nor disagree” with this statement.

<table>
<thead>
<tr>
<th>Average participant attitude score across all items</th>
<th>Number of participants</th>
<th>Percentage of sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 3.4 (no or little interest)</td>
<td>68</td>
<td>13.6%</td>
</tr>
<tr>
<td>3.41 to 4.5 (indifferent)</td>
<td>227</td>
<td>45.3%</td>
</tr>
<tr>
<td>4.51 to 7 (moderate or high interest)</td>
<td>206</td>
<td>41.1%</td>
</tr>
</tbody>
</table>

Table 4.8 Average participant score for the Natural Food Interest scale, sorted into interest ranges

Table 4.8 refers to average attitude scores across participants for all items for the Natural Product Interest Scale. Being in the range of an attitude score of less than or equal to 3.4 indicates little or no interest in natural foods; Being in the range of an attitude score of 3.41 to 4.5 indicates an attitude that is neutral/indifferent about natural foods; Being in the range of an attitude score more than 4.5 indicates a moderate or high interest in natural foods. Most participants were either indifferent (45.3%) about natural food products, or displayed a moderate or high interest in natural foods (41.1%). The remaining 13.6% showed no or little interest in natural foods.

4.1.3 Article Selection Descriptive Statistics

The following section reports the descriptive statistics regarding article selection. This includes measures of how much time was spent on all articles, the total number of articles selected (out of 12 possible choices), and the resulting average time spent on each article.

<table>
<thead>
<tr>
<th></th>
<th>Total time spent on all articles (seconds)</th>
<th>Total # of articles selected</th>
<th>Average time spent per article (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>89.1</td>
<td>2.8</td>
<td>30.7</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>173.6</td>
<td>2.4</td>
<td>56.7</td>
</tr>
<tr>
<td>Minimum</td>
<td>1.5</td>
<td>1.0</td>
<td>1.1</td>
</tr>
<tr>
<td>Maximum</td>
<td>2078.1</td>
<td>12.0</td>
<td>1039.0</td>
</tr>
</tbody>
</table>
Table 4.9 Descriptive statistics for time spent on articles, for the total sample

Table 4.10 below reports article selection data within each of the four treatment groups.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Average # of articles selected</th>
<th>Average time spent on articles (in seconds)</th>
<th>Average time spent per article (in seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment 1</td>
<td>2.7</td>
<td>76.0</td>
<td>27.9</td>
</tr>
<tr>
<td>Treatment 2</td>
<td>3.2</td>
<td>111.4</td>
<td>35.2</td>
</tr>
<tr>
<td>Treatment 3</td>
<td>2.7</td>
<td>98.9</td>
<td>36.8</td>
</tr>
<tr>
<td>Treatment 4</td>
<td>2.4</td>
<td>70.2</td>
<td>29.0</td>
</tr>
<tr>
<td>Total</td>
<td>2.8</td>
<td>89.1</td>
<td>30.7</td>
</tr>
</tbody>
</table>

Table 4.10 Number of articles selected and time (in seconds) spent on article selection per treatment and for total sample

Legend:

Treatment 1: No contrasting format with shared values based communication
Treatment 2: No contrasting format without shared values based communication
Treatment 3: Contrasting format with shared values based communication
Treatment 4: Contrasting format without shared values based communication

Referring to table 4.10, people in treatment 4 on average selected the least number of articles (2.4 articles), and people in treatment 2 on average selected the most number of articles (3.2 articles).

Overall, people in the non-contrasting format treatments (treatments 1 and 2) selected more articles on average (2.7 and 3.2 articles) than people in the contrasting formats treatments (treatments 3 and 4) selected on average (2.4 and 2.7 articles). This makes sense, as it is expected that the format of presentation might impact the number of articles selected since the format is notable when people are selecting articles to read. There is no such noticeable pattern when it comes to exposure to shared values based communication, and this makes sense since this treatment is not noticeable when people are choosing which articles to select.

When it comes to time spent on articles, people in treatment 2 on average spent the longest time on the articles (111.4 seconds in total; 35.2 seconds per article on average), and people in treatment 4 spent on average the least amount of time on the articles (70.2 seconds in total; 29.0 seconds per article on average).
People in treatment 2 on average both spent the most amount of time on the articles, and selected the most number of articles (111.4 seconds; 3.2 articles). Likewise, people in treatment 4 on average spent the least amount of time on the articles and selected the least number of articles (70.2 seconds; 2.4 articles). This makes sense, as it is expected that overall time spent increases with the number of articles selected.

4.1.4 Exit Survey Descriptive Statistics

The following section reports the descriptive statistics for all 12 exit questions that participants were required to answer after the article selection component. There were three categories of exit questions, each with four separate statements for which participants had to state their level of agreement on a 7-point Likert scale.

The first set of questions measured participant opinion of the Always Green Avocado. The second set of questions measured perceived trust in Always Green Company and Food Monitor Canada. The last set of questions measured perception of shared values with Always Green Company and Food Monitor Canada.

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safe to eat</td>
<td>3.5</td>
<td>4</td>
<td>1.633</td>
</tr>
<tr>
<td>Reduce food waste</td>
<td>3.7</td>
<td>4</td>
<td>1.645</td>
</tr>
<tr>
<td>Recommend</td>
<td>4.4</td>
<td>4</td>
<td>1.784</td>
</tr>
<tr>
<td># of Buyers</td>
<td>3.8</td>
<td>4</td>
<td>1.475</td>
</tr>
</tbody>
</table>

Table 4.11 Summary statistics for exit questions regarding opinion on the Always Green Avocado

Legend:
“Safe to eat” refers to the opposing statements: “it would be safe to eat”(1) and “it would not be safe to eat” (7)
“Reduce food waste” refers to the opposing statements: “it would surely reduce food waste” (1) and “it would surely not reduce food waste” (7)
“Recommend” refers to the opposing statements: “I would recommend to try it”(1) and “I would not recommend to try it” (7)
“# of Buyers” refers to the opposing statements: “Many people would buy it” (1) and “Few people would buy it” (7)
Participants had to choose a value between 1-7, where a value of 1 indicated “disagree strongly”, a value of 7 indicated “agree strongly”.

Table 4.11 reports descriptive statistics for the four exit questions regarding people’s opinion about the Always Green Avocado. Participants were required to choose a scale number
between 1 and 7, where each scale endpoint indicated agreement with a statement and it’s opposite statement. For example, “safe to eat” referred to safety perception. Selecting scale endpoint 1 for this question means agreeing with the statement “It would be safe to eat,” and selecting scale endpoint 7 means agreeing with the statement “It would not be safe to eat.”

Results of the mean for each trust item is very close, ranging from 3.5 to 4.4. This could means two things. First, it could indicate an overall neutral perception of the Always Green Avocado. Alternatively, this could also mean that participants answered with distinct opinions whose scores average out to be neutral. The standard deviation suggests the latter is more likely.

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>I trust FMC</td>
<td>4.6</td>
<td>5</td>
<td>1.386</td>
</tr>
<tr>
<td>I trust AGC</td>
<td>3.8</td>
<td>4</td>
<td>1.479</td>
</tr>
<tr>
<td>More from AGC</td>
<td>4.5</td>
<td>5</td>
<td>1.543</td>
</tr>
<tr>
<td>More from FMC</td>
<td>4.9</td>
<td>5</td>
<td>1.453</td>
</tr>
</tbody>
</table>

Table 4.12 Summary statistics for exit questions regarding trust in Always Green Company and Food Monitor Canada

Legend:
“I trust FMC” refers to the statement “I would trust Food Monitor Canada to provide accurate information.”
“I trust AGC” refers to the statement “I would trust Always Green Company to provide accurate information
“More from AGC” refers to the statement “If the product were real, I would like to receive more information from Always Green Company”
“More from FMC” refers to the statement “If the product were real, I would like to receive more information from Food Monitor Canada”
Participants had to choose a value between 1-7, where a value of 1 indicated “Disagree strongly”, a value of 7 indicated “Agree strongly”.

Table 4.12 reports descriptive statistics for the four exit questions regarding people’s opinion about the trust in Always Green Company and Food Monitor Canada. Participants were required to state their level of agreement on a 7-point Likert scale with statements regarding perception of trust in the two organizations.

On average, people trusted Food Monitor Canada (4.6) more than they trusted Always Green Company (3.8). In addition, people were slightly more interested in receiving further information for Food Monitor Canada (4.9) than Always Green Company (4.5).
<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGC shares my values</td>
<td>3.9</td>
<td>4</td>
<td>1.361</td>
</tr>
<tr>
<td>FMC shares my values</td>
<td>4.4</td>
<td>4</td>
<td>1.265</td>
</tr>
<tr>
<td>AGC seems caring</td>
<td>4.1</td>
<td>4</td>
<td>1.341</td>
</tr>
<tr>
<td>FMC seems caring</td>
<td>4.6</td>
<td>5</td>
<td>1.244</td>
</tr>
</tbody>
</table>

Table 4.13 Summary statistics for exit questions regarding perception of shared values with Always Green Company and Food Monitor Canada

Legend:

“AGC shares my values” refers to the statement “The values exhibited by Always Green Company reflect my own personal values.”
“FMC shares my values” refers to the statement “The values exhibited by Food Monitor Canada reflect my own personal values.”
“AGC seems caring” refers to the statement “Always Green Company seems like a caring organization.”
“FMC seems caring” refers to the statement “Food Monitor Canada seems like a caring organization.”
Participants had to choose a value between 1-7, where a value of 1 indicated “disagree strongly”, a value of 7 indicated “agree strongly”.

Table 4.13 reports descriptive statistics for the four exit questions regarding people’s perception of shared values and care with Always Green Company and Food Monitor Canada. Participants were required to state their level of agreement on a 7-point Likert scale with statements regarding perception of shared values and care in the two organizations.

On average, people felt that Food Monitor Canada shared their values more and seemed more caring than Always Green Company.

### 4.1.5 Exit Survey Descriptive Statistics

The following section reports on the exit questions within each of the 4 treatment groups.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Treatment 1</th>
<th>Treatment 2</th>
<th>Treatment 3</th>
<th>Treatment 4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safe</td>
<td>3.88</td>
<td>4.05</td>
<td>3.87</td>
<td>3.94</td>
<td>3.94</td>
</tr>
<tr>
<td></td>
<td>(1.644)</td>
<td>(1.539)</td>
<td>(1.750)</td>
<td>(1.607)</td>
<td>(1.633)</td>
</tr>
<tr>
<td>Food waste</td>
<td>3.47</td>
<td>3.90</td>
<td>3.67</td>
<td>3.79</td>
<td>3.71</td>
</tr>
<tr>
<td></td>
<td>(1.673)</td>
<td>(1.633)</td>
<td>(1.625)</td>
<td>(1.636)</td>
<td>(1.645)</td>
</tr>
<tr>
<td>Recommend</td>
<td>4.17</td>
<td>4.43</td>
<td>4.46</td>
<td>4.32</td>
<td>4.35</td>
</tr>
<tr>
<td></td>
<td>(1.839)</td>
<td>(1.672)</td>
<td>(1.869)</td>
<td>(1.756)</td>
<td>(1.784)</td>
</tr>
<tr>
<td># of buyers</td>
<td>3.61</td>
<td>3.89</td>
<td>3.78</td>
<td>3.79</td>
<td>3.77</td>
</tr>
<tr>
<td></td>
<td>(1.301)</td>
<td>(1.546)</td>
<td>(1.641)</td>
<td>(1.530)</td>
<td>(1.475)</td>
</tr>
</tbody>
</table>

Table 4.14 Results for exit questions regarding opinion on the Always Green Avocado

Legend:
“Safe to eat” refers to the opposing statements: “it would be safe to eat” (1) and “it would not be safe to eat” (7)
“Reduce food waste” refers to the opposing statements: “it would surely reduce food waste” (1) and “it would surely not reduce food waste” (7)
“Recommend” refers to the opposing statements: “I would recommend to try it” (1) and “I would not recommend to try it” (7)
“No of Buyers” refers to the opposing statements: “Many people would buy it” (1) and “Few people would buy it” (7)
Treatment 1: No contrasting format with shared values based communication
Treatment 2: No contrasting format without shared values based communication
Treatment 3: Contrasting format with shared values based communication
Treatment 4: Contrasting format without shared values based communication

Table 4.14 reports the means and standard deviations for exit questions regarding people’s opinion on the Always Green Avocado per treatment and for the entire sample. In general, there is very little deviation in treatment means from the total sample mean for all four questions. This suggests that treatment placement does not impact participants’ opinion on the product. No treatment mean sticks out as substantially different from the total sample, suggesting that it is unlikely that the treatments impact influence of evaluating the product. Treatment 2 has the highest mean score for all questions except for question 3, indicating a more skeptical view of the Always Green Avocado. Otherwise, there is no apparent pattern between the treatments.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Treatment 1</th>
<th>Treatment 2</th>
<th>Treatment 3</th>
<th>Treatment 4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>I trust FMC</td>
<td>4.68</td>
<td>4.72</td>
<td>4.52</td>
<td>4.61</td>
<td>4.63</td>
</tr>
<tr>
<td>(1.377)</td>
<td>(1.215)</td>
<td>(1.604)</td>
<td>(1.326)</td>
<td>(1.386)</td>
<td></td>
</tr>
<tr>
<td>I trust AGC</td>
<td>3.86</td>
<td>3.69</td>
<td>3.82</td>
<td>3.97</td>
<td>3.83</td>
</tr>
<tr>
<td>(1.522)</td>
<td>(1.505)</td>
<td>(1.478)</td>
<td>(1.414)</td>
<td>(1.479)</td>
<td></td>
</tr>
<tr>
<td>More from AGC</td>
<td>4.70</td>
<td>4.46</td>
<td>4.64</td>
<td>4.47</td>
<td>4.57</td>
</tr>
<tr>
<td>(1.576)</td>
<td>(1.548)</td>
<td>(1.516)</td>
<td>(1.537)</td>
<td>(1.543)</td>
<td></td>
</tr>
<tr>
<td>More from FMC</td>
<td>5.14</td>
<td>4.84</td>
<td>4.87</td>
<td>4.83</td>
<td>4.92</td>
</tr>
</tbody>
</table>
Table 4.15 Results for exit questions regarding trust in Always Green Company and Food Monitor Canada

Legend:

“I trust FMC” refers to the statement “I would trust Food Monitor Canada to provide accurate information.”
“I trust AGC” refers to the statement “I would trust Always Green Company to provide accurate information
“More from AGC” refers to the statement “If the product were real, I would like to receive more information from Always Green Company”
“More from FMC” refers to the statement “If the product were real, I would like to receive more information from Food Monitor Canada”
Participants had to choose a value between 1-7, where a value of 1 indicated “Disagree strongly”, a value of 7 indicated “Agree strongly”.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Treatment 1</th>
<th>Treatment 2</th>
<th>Treatment 3</th>
<th>Treatment 4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGC shares values</td>
<td>4.14 (1.410)</td>
<td>3.74 (1.357)</td>
<td>3.90 (1.313)</td>
<td>3.90 (1.347)</td>
<td>3.92 (1.361)</td>
</tr>
<tr>
<td>FMC shares values</td>
<td>4.56 (1.304)</td>
<td>4.44 (1.201)</td>
<td>4.32 (1.365)</td>
<td>4.35 (1.182)</td>
<td>4.42 (1.265)</td>
</tr>
<tr>
<td>AGC seems caring</td>
<td>4.41 (1.296)</td>
<td>3.90 (1.349)</td>
<td>4.09 (1.326)</td>
<td>4.01 (1.353)</td>
<td>4.10 (1.341)</td>
</tr>
<tr>
<td>FMC seems caring</td>
<td>4.82 (1.221)</td>
<td>4.59 (1.137)</td>
<td>4.66 (1.333)</td>
<td>4.42 (1.261)</td>
<td>4.62 (1.244)</td>
</tr>
</tbody>
</table>

Table 4.15 reports the means and standard deviations for exit questions regarding people’s trustworthiness towards Always Green Company and Food Monitor Canada. A similar pattern is seen as with Table 4.14: in general, there is very little deviation in treatment means from the total sample mean for all four questions. This suggests that treatment placement does not impact participants’ evaluation of trustworthiness in the organizations.

People in treatment 1 scored on average higher for question 4 (more from FMC) with a mean score of 5.14. This is notable as it is the only average mean that is above 5 on the 7-point Likert scales. Otherwise, no treatment mean stands out as substantially different from the total sample, suggesting that it is unlikely that the treatments impact influence of evaluating peoples’s trustworthiness of the organizations.
Table 4.16 Results for exit questions regarding perception of shared values with Always Green Company and Food Monitor Canada

Legend:

“AGC shares my values” refers to the statement “The values exhibited by Always Green Company reflect my own personal values.
“FMC shares my values” refers to the statement “The values exhibited by Food Monitor Canada reflect my own personal values.”
“AGC seems caring” refers to the statement “Always Green Company seems like a caring organization.”
“FMC seems caring” refers to the statement “Food Monitor Canada seems like a caring organization.”

Participants had to choose a value between 1-7, where a value of 1 indicated “Disagree strongly”, a value of 7 indicated “Agree strongly”.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No contrasting format with shared values based communication</td>
</tr>
<tr>
<td>2</td>
<td>No contrasting format without shared values based communication</td>
</tr>
<tr>
<td>3</td>
<td>Contrasting format with shared values based communication</td>
</tr>
<tr>
<td>4</td>
<td>Contrasting format without shared values based communication</td>
</tr>
</tbody>
</table>

Table 4.16 reports the means and standard deviations for exit questions regarding people’s perception of shared values and caring towards Always Green Company and Food Monitor Canada. A similar pattern is seen as with Table 4.14 and 4.15: in general, there is very little deviation in treatment means from the total sample mean for all four questions. This suggests that treatment placement does not impact participants’ evaluation of organizations.

Treatment 1 (No contrasting format with shared values based communication) consistently scores the highest for all four questions. Treatment 3 (contrasting format with shared values based communication) scores the second highest for all questions except for question 2 (FMC shares my values). This suggests that shared values based communication might have a significant impact on peoples’ perception of shared values and care of the organizations.

4.2 Hypothesis Testing

4.2.1 Introduction

The following section reports the results for the ANCOVA analysis that was done to test the research hypotheses. Since no differences between treatment groups were found in summary statistics analyses (section 4.1), it is likely that differences are due to the experimental treatments (i.e. shared values and presentation format) and/or prior attitudes. In addition, an inter-item
correlation test for attitudes was done to see if there were any differences in attitudes between treatment groups. No significant differences were found; therefore any differences found in the ANCOVA are likely the result of treatment effects.

4.2.2 Imbalance Indicators

The imbalance score measures the relative balance/imbalance between articles selected by Food Monitor Canada versus articles selected by Always Green Company. This is useful for measuring the extent of confirmation bias for the hypothesis testing that follows in section 4.2.3. A measure of imbalance was calculated based on two measures: number of articles selected from each source and time spent on articles from each source. Four variables resulted: article difference, article balance, time difference, and time balance.

Article difference was calculated by taking the difference between the total number of AGC articles read and the total number of FMC articles read:

$$\text{Article difference} = (\text{number of AGC articles selected}) - (\text{number of FMC articles selected})$$

A negative article difference score value indicates more FMC articles were selected than AGC articles, and a bias towards FMC. A positive value indicates more AGC articles were selected than FMC articles, and a bias towards AGC.

Article balance was calculated by taking the difference between the total number of AGC articles read and the total number of FMC articles read, and dividing this by the total number of all articles selected:

$$\text{Article imbalance} = (\text{number of AGC articles selected}) - (\text{number of FMC articles selected}) / (\text{number of AGC articles} + \text{number of FMC articles})$$

A negative article balance score indicates a bias towards FMC, whereas a positive article balance score indicates AGC.

Time difference was calculated by taking the difference between the total time spent reading AGC articles and the total amount of time spent reading FMC articles.
\[
Time \ difference = (\text{time spent on AGC articles}) - (\text{time spent on FMC articles})
\]

A negative time difference score value indicates more time spent reading FMC articles, and a bias towards FMC. A positive value indicates more time spent reading AGC articles, and a bias towards AGC.

Time balance was calculated by taking the difference between the total time spent on AGC articles and the total time spent on FMC articles, and dividing this by the total number of all articles selected:

\[
Time \ imbalance = \frac{(\text{time spent on AGC articles}) - (\text{time spent on FMC articles selected})}{(\text{time spent on AGC articles} + \text{time spent on FMC articles})}
\]

A negative time balance score indicates a bias towards FMC, whereas a positive time balance score indicates AGC.

The article/time imbalance score is an index, ranging from -1 to 1 and it indicates the strength and direction of the imbalance. A value of -1 means that all articles read were from FMC, and a value of 1 means that all articles read were from AGC. Values in-between indicate the difference as a proportion of all articles read, and as a value gets closer to zero it indicates increasing balance.

The measure of difference (i.e. article difference and time difference) and an indexed measure of difference (i.e. article imbalance and time imbalance) are both included regardless of both providing similar information. However, the indexed measure allows for a comparison in relation to the total number of articles/total time spent, whereas difference is arbitrary. To give an extreme example, two different individuals could have an article difference score equal to 1. However, the first individual reads only one article, and the second individual reads 6 articles from one organization and 5 from the other, it is clear that the second individual has a more balanced view (because they read articles from both organizations) than the first individual (who only was exposed to one organization). Though their article difference score would be the same (1) and wouldn’t capture this effect, their article imbalance scores would. The first individual
would have an imbalance score of $1/1=1$, indicating perfect imbalance. The second individual would have a score of $1/11=0.09$, indicating that they’re closer to having no imbalance. Therefore, it was important to include an index in addition to the simple difference measures.

<table>
<thead>
<tr>
<th>Imbalance Indicator</th>
<th>Treatment 1</th>
<th>Treatment 2</th>
<th>Treatment 3</th>
<th>Treatment 4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Article difference</td>
<td>-0.54</td>
<td>-0.30</td>
<td>-0.10</td>
<td>-0.15</td>
<td>-0.27</td>
</tr>
<tr>
<td></td>
<td>(1.267)</td>
<td>(1.251)</td>
<td>(1.214)</td>
<td>(1.220)</td>
<td>(1.247)</td>
</tr>
<tr>
<td>Article balance</td>
<td>-0.25</td>
<td>-0.11</td>
<td>-0.02</td>
<td>-0.02</td>
<td>-0.10</td>
</tr>
<tr>
<td></td>
<td>(0.729)</td>
<td>(0.699)</td>
<td>(0.762)</td>
<td>(0.770)</td>
<td>(0.744)</td>
</tr>
<tr>
<td>Time difference</td>
<td>-21.80</td>
<td>-19.07</td>
<td>-7.53</td>
<td>3.60</td>
<td>-11.17</td>
</tr>
<tr>
<td></td>
<td>(60.215)</td>
<td>(78.348)</td>
<td>(98.447)</td>
<td>(52.368)</td>
<td>(74.919)</td>
</tr>
<tr>
<td>Time balance</td>
<td>-0.29</td>
<td>-0.12</td>
<td>-0.02</td>
<td>0.01</td>
<td>-0.10</td>
</tr>
<tr>
<td></td>
<td>(0.749)</td>
<td>(0.723)</td>
<td>(0.783)</td>
<td>(0.796)</td>
<td>(0.770)</td>
</tr>
</tbody>
</table>

Table 4.17 Mean balance scores (std. dev) for treatment groups and total sample
Legend:
Article difference refers to the difference between AGC articles read and FMC articles read
Article balance refers to the difference between time spent on AGC articles and time spent on FMC articles divided by the total number of articles selected
Time difference refers to the difference between time spent on AGC articles and time spent on FMC articles
Time balance refers to the difference between time spent on AGC articles and time spent on FMC articles divided by the total time spent on all articles

Treatment 1: No contrasting format with shared values based communication
Treatment 2: No contrasting format without shared values based communication
Treatment 3: Contrasting format with shared values based communication
Treatment 4: Contrasting format without shared values based communication

Table 4.17 reports the results for the imbalance indicators for the four treatments and the entire sample. Article difference in all cases is biased towards FMC, as indicated by the negative results. Treatment 1 had the highest difference, with people on average selecting 0.54 more FMC articles than AGC articles. Treatment 3 had the lowest difference, with people on average selecting 0.10 more FMC articles than AGC articles. Overall, the entire sample on average selected 0.27 more FMC articles than AGC articles.

All treatment groups except for treatment 4 spent more time on FMC articles than on AGC articles, on average. The largest difference is seen in treatment 1, where people spent 21.8 seconds longer on FMC articles than on AGC articles, on average. People in treatment 4 spent
3.60 seconds more on AGC articles than on FMC articles, on average. Treatment 4 also exhibited the lowest difference out of the four treatments regarding time spent.

Regarding the imbalance indicators a clear pattern emerges: treatment 3 and 4 (contrasting format) are consistently more balanced (closer to a value of 0) than treatments 1 and 2 (non-contrasting format). In addition, treatment 1 consistently has the biggest imbalance across all imbalance indicators. Specifically, people in treatment 3 on average read more FMC articles than AGC articles, and spent more time reading FMC articles than AGC articles. The difference between FMC and AGC articles read by participants is equivalent to 25% of total articles read, in favour of FMC over AGC. The difference between time spent of FMC articles and time spent on AGC articles is equivalent to 29% of total time spent on all articles, in favour of FMC over AGC.

4.2.3 Testing hypotheses 1, 2, and 3: Shared Values and Contrasting Presentation Format with Attitude Scales

For the hypothesis testing, the original imbalance indicators were transformed into absolute measures. This was done because the hypotheses to be tested are concerned with only the extent of confirmation bias (i.e. what factors cause the imbalance indicators to get closer to zero) and not the direction in which it is going (i.e. what factors cause the imbalance indicators to be more negative or positive). The four new variables that were thus created from the imbalance indicators are:

1. Absolute article difference
The absolute difference between AGC and FMC articles that were opened (original variable could take positive and negative values). A value of zero indicates that the same number of articles was read from each organization. A higher value (max = 6) means more articles were selected from one organization than the other. This indicates a bias towards one of the organizations, although the absolute measure does not specify which organization is being favoured.

2. Absolute imbalance of articles selected
The absolute value of imbalance of AGC and FMC articles that were opened. This was measured by taking the absolute values of the difference in articles opened divided by total number of
articles opened. It can range from 0 to 1, where a value of 1 indicates perfect imbalance (i.e. a person only read articles from one company) and a 0 indicated perfect balance (i.e. a person read the same number of articles from each company). As a value approaches closer to 0, imbalance decreases.

3. **Absolute difference in time spent on articles**
   The absolute difference between time (in seconds) AGC and FMC articles were open (original variable could take positive and negative values). A value of zero indicates that the same amount of time was spent reading articles from each organization. A higher value means more time was spent reading articles from one organization than the other. This indicates a bias towards one of the organizations, although the absolute measure does not specify which organization is being favoured.

4. **Absolute imbalance of time spent on articles**
   The absolute value of balance of time (in seconds) that AGC and FMC articles were open. This was measured by taking the absolute values of the difference in time spent on articles divided by total time spent on articles. It can range from 0 to 1, where a value of 1 indicates perfect imbalance (i.e. a person spent all their time reading articles from one company) and a 0 indicated perfect balance (i.e. a person spent the same amount of time reading articles from each company). As a value approaches closer to 0, imbalance decreases.

In addition, a data transformation was applied to the two attitude scales for the purpose of hypothesis testing. Instead of ranging from 1 to 7, each value was transformed to a scale that indicates only intensity of attitude and not direction. A neutral score of 4 was converted into a value of 1; semi-neutral scores of 5 and 3 were converted into a value of 2; semi-extreme scores of 2 and 6 were converted into a value of 3; and, extreme scores of 1 and 7 were transformed into a value of 4. With this adjusted attitude scale, a higher value indicates a more intense attitude. Similarity to the imbalance scores, this was done because the hypothesis testing to be done is concerned with the intensity of attitudes (i.e. going from neutral to extreme in either direction), but not the direction of the attitude (i.e. pro- versus contra-). To summarize, the two attitude variables used for hypothesis testing are:
1. Adjusted Confidence in Science and Technology scale: Average score of Confidence in Science and Technology attitude scale adjusted to show absolute difference from midpoint, ranging from 1 to 4.
2. Adjusted Natural Product Interest scale: Average score of natural product preference scale adjusted to show absolute difference from midpoint, ranging from 1 to 4.

The working hypotheses presented in Chapter 3 (section 3.1.3) can thus be operationalized as follows:

1. Being exposed to shared values-based communication reduces confirmation bias tendencies during an information search:

   \[ H_0: IMB_{SV} \geq IMB_{NSV} \]
   \[ H_A: IMB_{SV} < IMB_{NSV} \]

   where IMB_{SV} is the absolute imbalance indicator for the treatment groups exposed to shared values (treatments 1 and 3), and IMB_{NSV} is the absolute imbalance indicator for the treatment groups not exposed to shared values (treatments 2 and 4).

2. Being exposed to information that is presented in a “contrasting format” (i.e. opposing views presented side-by-side) reduces confirmation bias tendencies during an information search.

   \[ H_0: IMB_{CON} \geq IMB_{NCON} \]
   \[ H_A: IMB_{CON} < IMB_{NCON} \]

   where IMB_{CON} is the absolute imbalance indicator for the treatment groups exposed to contrasting format (treatments 3 and 4), and IMB_{NCON} is the absolute imbalance indicator for the treatment groups not exposed contrasting format (treatments 1 and 2).

3. Having more extreme prior attitudes will increase the extent of confirmation bias:

   \[ H_0: \text{Prior attitudes are not or negatively correlated with the} \]
   \[ \text{imbalance indicators} \]
   \[ H_A: \text{Prior attitudes are positively correlated with the imbalance scores} \]

Hypothesis 1 through 3 were tested simultaneously by applying a two-way 2x2 ANCOVA (analysis of covariance). The two independent variables, or experimental factors, were exposure
to shared values (0 is no exposure to shared values; 1 if exposure to shared values) and contrasting format (0 if non-contrasting; 1 if contrasting). The two adjusted attitude scales were added as independent variables with metric scales, or: as covariates. The dependent variables are the four absolute imbalance indicators. For each of them, a separate ANCOVA was conducted for which the results are presented in the same order as they were presented in the previous section.

**Results for Absolute Difference in Articles Opened**

The first ANCOVA analysis was done using absolute difference in articles opened as the dependent variable. The reported adjusted $R^2$ is 0.016, therefore only about 1.6% of the variance in absolute difference in articles opened is explained by exposure to shared values based communication, presentation format, and the two attitude scales. There are likely other variables that have not been included that contribute to balance of articles opened.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute difference in articles opened</td>
<td>1.02</td>
</tr>
<tr>
<td>Adjusted Confidence in Science and Technology Scale</td>
<td>1.66</td>
</tr>
<tr>
<td>Adjusted Natural Product Interest Scale</td>
<td>1.89</td>
</tr>
</tbody>
</table>

Table 4.18 Average (std. dev) for absolute article difference and attitude scales (n=501)

Table 4.18 shows that the mean for the two attitude scales is at the lower end of the adjusted scales, where the value of 1 indicates a neutral attitude. This is expected, as it mirrors the results for the unadjusted attitude scales. In addition, the absolute difference in articles opened is on average 1.02 articles, indicating that on average people had an imbalanced information search of about 1 article in favour of either AGC or FMC. Recalling from Table 4.9 that people on average read about 3 articles, this difference of 1 article is quite substantial and more pronounced than if people on average read a larger amount of articles.
Although the adjusted $R^2$ is low, the model is significant at the 5% significance level with a 1.7% error probability (Table 4.19). Therefore, the null hypothesis that the included variables do not significantly impact the absolute difference in articles opened is rejected. More specifically, at least one of the included variables contributes significantly to explaining the variance in this imbalance indicator.

Looking at specific factors, the Type III SS analysis shows that both the Natural Product Interest Scale ($F = 7.807, p = 0.005$) and the Confidence in Science and Technology Scale ($F = 4.042, p = 0.045$) have a strong impact on explaining the model. However, exposure to shared values ($F = 0.418, p = 0.518$) and presentation format ($F = 2.443, p = 0.119$) do not have a very strong impact on the model.

Table 4.19 ANCOVA results for absolute difference in articles opened

Table 4.20 Type III Sum of Squares analysis for absolute difference in articles opened

Table 4.21 Model parameters for absolute difference in articles opened
When attitudes are taken into consideration, there is no impact of the two experimental factors, while the two attitude scales have a significant impact. More specifically, having a more extreme attitude regarding the role of science and technology in solving the world’s problems leads to a reduction in the difference between the number of AGC and FMC articles opened. An increase in 1 scale point towards either extreme attitude reduces the article difference by 0.12 articles. This indicates that more extreme attitudes in this scale are associated with decreasing confirmation bias tendencies during information search. This is the opposite of what is expected, since it would be more intuitive that a more extreme view (i.e. increase in adjusted attitude scale) would lead to more imbalanced information search and therefore an increase in absolute article difference.

When it comes to the Natural Product Interest Scale, having a more polarized attitude in either direction leads to an increase in the absolute difference in articles opened. An increase in 1 scale point towards either extreme increases the difference between the number of AGC and FMC articles opened by 0.13 articles. This indicates that more extreme attitudes in this scale are associated with increasing confirmation bias tendencies during information search. This is consistent with confirmation bias theory.

Overall, the model for absolute article difference is significant but has low explanatory power. The two experimental factors do not contribute to the explanatory power of the current model, while the two prior attitudes do have a significant impact on the model. Therefore, the null hypothesis cannot be rejected for hypotheses 1 and 2, and the null hypothesis is rejected for hypothesis 3 for both attitude scales.

Results for Absolute Imbalance for Articles Opened

The second ANCOVA analysis was done using absolute imbalance for articles opened as the dependent variable. The reported adjusted $R^2$ is 0.008, therefore only about 0.8% of the variance in absolute imbalance for articles opened is explained by exposure to shared values based communication, presentation format, and the two attitude scales. There are likely other variables that have not been included that contribute to balance of articles opened.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total</th>
</tr>
</thead>
</table>

86
Absolute imbalance for articles opened 0.614 (0.432)
Adjusting Confidence in Science and Technology Scale 1.66 (0.601)
Adjusting Natural Product Interest Scale 1.88 (0.762)

Table 4.22 Mean (std. dev) for absolute imbalance for articles opened and attitude scales (n=501)

Table 4.22 shows that the mean for the two attitude scales is at the lower end of the adjusted scales, where the value of 1 indicates a neutral attitude. This is expected, as it mirrors the results for the unadjusted attitude scales. In addition, the absolute imbalance for articles opened is on average 0.614, indicating that on average, out of all the articles selected people select about 6% more articles from one organization over the other.

<table>
<thead>
<tr>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
<th>Pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>1.466</td>
<td>0.367</td>
<td>1.982</td>
</tr>
<tr>
<td>Error</td>
<td>91.731</td>
<td>0.185</td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>93.198</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.23 ANCOVA results for absolute imbalance for articles opened

Overall, the model is not significant at the 5% significance level (p = 0.096). Therefore, the null hypothesis that the included variables do not significantly impact the absolute imbalance for articles opened cannot be rejected. More specifically, the included variables jointly do not contribute significantly to explaining this imbalance indicator.

<table>
<thead>
<tr>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
<th>Pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adj. Confidence in Science and Technology</td>
<td>0.591</td>
<td>0.591</td>
<td>3.196</td>
</tr>
<tr>
<td>Adj. Natural Product Interest</td>
<td>0.286</td>
<td>0.286</td>
<td>1.549</td>
</tr>
<tr>
<td>Contrasting</td>
<td>0.061</td>
<td>0.061</td>
<td>0.331</td>
</tr>
<tr>
<td>Shared Values</td>
<td>0.134</td>
<td>0.134</td>
<td>0.724</td>
</tr>
</tbody>
</table>

Table 4.24 Type III Sum of Squares analysis for absolute imbalance in articles opened

Looking at specific factors, the Type III SS analysis shows that both the Natural Product Interest Scale (F = 3.196, p = 0.074) and the Confidence in Science and Technology Scale (F = 1.549, p


When attitudes are taken into consideration, there is still no impact of the two experimental factors or the attitude scales. Overall, the specified model for absolute imbalance for articles opened has low explanatory power and does not produce any significant results. Therefore, the null hypothesis for hypotheses 1, 2, and 3 cannot be rejected for this imbalance indicator.

**Results for Absolute Difference in Time Spent Reading Articles**

The third ANCOVA analysis was done using absolute difference in time spent on articles opened as the dependent variable. The reported adjusted $R^2$ is 0.01, therefore only about 1% of the variance in absolute difference in time spent reading articles is explained by exposure to shared values based communication, presentation format, and the two attitude scales. There are likely other variables that have not been included that contribute to time imbalance.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute difference in time spent on articles (seconds)</td>
<td>37.1 ( (66.036) )</td>
</tr>
<tr>
<td>Adjusted Confidence in Science and Technology Scale</td>
<td>1.66 ( (0.601) )</td>
</tr>
<tr>
<td>Adjusted Natural Product Interest Scale</td>
<td>1.88 ( (0.762) )</td>
</tr>
</tbody>
</table>
Table 4.26 Summary statistics (mean and standard deviation) for absolute difference in time spent reading articles and attitude scales (n=501)

Table 4.26 shows that the mean for the two attitude scales is at the lower end of the adjusted scales, where the value of 1 indicates a neutral attitude. This is expected, as it mirrors the results for the unadjusted attitude scales. The absolute difference in time spent on articles is on average 37.1 seconds, indicating that on average people spent 37 seconds longer on either AGC or FMC articles.

<table>
<thead>
<tr>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
<th>Pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>38356.255</td>
<td>9589.064</td>
<td>2.220</td>
</tr>
<tr>
<td>Error</td>
<td>2142041.36</td>
<td>4318.632</td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>2180397.62</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.27 ANCOVA results for absolute difference in time spent on articles

Table 4.27 reports that overall the model for absolute difference in time spent on articles is not statistically significant at the 5% confidence level. Hence, the included independent variables jointly do not contribute significantly to explaining the variance in this particular imbalance score.

<table>
<thead>
<tr>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
<th>Pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adj. Confidence in Science and Technology</td>
<td>8623.744</td>
<td>8623.744</td>
<td>1.997</td>
</tr>
<tr>
<td>Adj. Natural Product Interest</td>
<td>36341.701</td>
<td>36341.701</td>
<td>8.415</td>
</tr>
<tr>
<td>Contrasting</td>
<td>570.272</td>
<td>570.272</td>
<td>0.132</td>
</tr>
<tr>
<td>Shared Values</td>
<td>163.050</td>
<td>163.050</td>
<td>0.038</td>
</tr>
</tbody>
</table>

Table 4.28 Type III Sum of Squares analysis for absolute difference in time spent on articles

Table 4.28 reports the Type III SS analysis. The Natural Product Interest Scale ($F = 8.415, p = 0.004$) is significantly associated with the absolute difference in time spent on articles, while the Confidence in Science and Technology Scale ($F = 1.997, p = 0.158$) has no significant impact on the imbalance score. Similarly, exposure to shared values ($F = 0.038, p = 0.846$) and exposure to contrasting format ($F = 0.132, p = 0.716$) do not have an impact on the imbalance score.
When attitudes are taken into consideration, there is no impact of the two experimental factors or the adjusted Confidence in Science and Technology scale.

The Natural Product Interest Scale has a significant impact. Having a more extreme attitude in either direction in this scale leads to an increase in absolute difference in time spent on articles. An increase in 1 scale point towards either extreme was estimated to increase the time that people on average spend more on reading the articles from one organisation is 12 seconds.

Overall, the model for absolute difference in time spent on articles is not significant but there is an impact of natural product interest. The two experimental factors do not contribute to the explanatory power of the current model. Therefore, the null hypothesis for hypotheses 1 and 2 cannot be rejected, while the null hypothesis for hypothesis 3 is rejected for the Natural Product Interest scale but not the Confidence in Science and Technology scale.

Results for Absolute Imbalance for Time Spent Reading Articles

The final ANCOVA analysis was done using absolute imbalance for time spent on articles as the dependent variable. The reported adjusted $R^2$ is 0.008, therefore only about 0.8% of the variance in absolute time imbalance is explained by exposure to shared values based communication, presentation format, and the two attitude scales. There are likely other variables that have not been included that contribute to time imbalance.
Adjusted Confidence in Science and Technology Scale 1.66 (0.601)
Adjusted Natural Product Interest Scale 1.88 (0.762)

Table 4.30 Mean (std. dev) for absolute imbalance for time spent on articles and attitude scales (n=501)

Table 4.26 shows that the mean for the two attitude scales is at the lower end of the adjusted scales, where the value of 1 indicates a neutral attitude. This is expected, as it mirrors the results for the unadjusted attitude scales. The absolute difference in time spent on articles is on average 0.678, indicating that on average people spent 67.8% more of total time on gathering information on either AGC or FMC articles than the other.

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
<th>Pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>1.162</td>
<td>0.291</td>
<td>2.044</td>
<td>0.087</td>
</tr>
<tr>
<td>Error</td>
<td>70.519</td>
<td>0.142</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>71.682</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4.31 ANCOVA results for absolute imbalance for time spent on articles

Table 4.31 reports that the overall model for absolute imbalance for time spent on articles is not statistically significant. Similarly, Table 4.32 and Table 4.33 indicate that there is no significant impact of any input variables on the absolute imbalance for time spent reading articles.

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F</th>
<th>Pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adj. Confidence in Science and Technology</td>
<td>0.317</td>
<td>0.317</td>
<td>2.302</td>
<td>0.136</td>
</tr>
<tr>
<td>Adj. Natural Product Interest</td>
<td>0.368</td>
<td>0.368</td>
<td>2.587</td>
<td>0.108</td>
</tr>
<tr>
<td>Contrasting</td>
<td>0.069</td>
<td>0.069</td>
<td>0.485</td>
<td>0.486</td>
</tr>
<tr>
<td>Shared Values</td>
<td>0.087</td>
<td>0.087</td>
<td>0.610</td>
<td>0.435</td>
</tr>
</tbody>
</table>

Table 4.32 Type III Sum of Squares analysis for absolute imbalance for time spent on articles

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>Std. Error</th>
<th>t</th>
<th>Pr &gt;</th>
<th>t</th>
<th>Upper bound</th>
<th>Lower bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.821</td>
<td>0.057</td>
<td>14.309</td>
<td>&lt; 0.0001</td>
<td>0.708</td>
<td>0.934</td>
<td></td>
</tr>
<tr>
<td>Adj. Confidence in Science and Tech.</td>
<td>-0.044</td>
<td>0.029</td>
<td>-1.493</td>
<td>0.136</td>
<td>-0.102</td>
<td>0.014</td>
<td></td>
</tr>
<tr>
<td>Adj. Natural</td>
<td>-0.037</td>
<td>0.023</td>
<td>-1.608</td>
<td>0.108</td>
<td>-0.083</td>
<td>0.008</td>
<td></td>
</tr>
</tbody>
</table>
Therefore, the null hypothesis for hypotheses 1, 2, and 3 cannot be rejected regarding absolute imbalance for time spent on articles.

4.3 Discussion and Recommendations

The starting point of this thesis was a comprehensive review of public understanding of science and risk communication literature as it relates to building trust. An outcome of this was a critical assessment of the CFI Consumer Trust Model consisting of five points. Two of these included:

1. The Consumer Trust Model does not explicitly consider the role of prior attitudes in building trust, and;
2. The Consumer Trust Model does not explicitly consider the role of confirmation bias as a potential barrier to shared values-based communication.

Based on these two critiques, this research project sought to answer the question of whether shared values-based communication and presentation format (as moderators of confirmation bias), and/or prior attitudes play a role in confirmation bias tendencies during an information search. An experimental design including these factors was carried out. The researchers developed four imbalance indicators for the purpose of measuring the extent of confirmation bias.

       Overall, results show that there is no significant impact of shared values or contrasting format on the imbalance indicators. In the case of absolute difference in articles selected, the attitude scales contribute to “balance” of search behaviour. More specifically, as people move towards having more extreme attitudes in natural food product interest, they are likely to show a higher absolute imbalance in article selection. This attitude indicates that extreme opinions about natural food products might increase confirmation bias tendencies when learning about agricultural biotechnology. A possible explanation for this effect could be that natural food
products is a sensitive topic that people feel strongly about, and this makes them more unbalanced (more biased) during information search.

Additionally, as people move towards having more extreme attitudes in their confidence in the role of science and technology in solving the world’s problems, results show that they are likely to show a lower absolute imbalance time spent reading articles. Although the overall model is not significant, this attitude indicates that extreme opinions about the role of science and technology might decrease confirmation bias tendencies when learning about agricultural biotechnology. This is counter-intuitive: it would be expected that more extreme attitudes would be reflected in a more unbalanced (more biased) information search. A possible reason for this is that people who have strong confidence or strong distrust in science and technology might be more prone to collecting information more thoroughly compared to people who are more neutral.

5 CHAPTER FIVE: Recommendations for Further Research

5.1 Limitations and Recommendations for Future Research

As far as the researchers are aware, this is the first attempt made to measure and quantify confirmation bias by the extent of it during an information search. While the imbalance indicators are intuitively informative, there might be an alternative way to measure confirmation bias that has not been thought of. Future researchers working with the current dataset may find an alternative way to measure confirmation bias that might offer more comprehensive results.

Shared values are a major aspect of both this thesis and the experimental design. Another limitation of this research project is that shared values were communicated a very specific way
for the purpose of this project. In the experiment, shared values were communicated through a written message in such a way that portrayed a general belief in favour of the wellbeing of humanity with the reader. In addition, shared values may need to be built over time, whereas they are communication in a single short time period in the experiment.

Going forward, there is plenty of information within the dataset that has not been utilized for the purpose of this project that may offer additional insights for future research. An example is article titles selected by participants as they relate to message elements seen as important for communicating shared values. Future research might look at how message elements impact the exit question results.

In the same light, the exit questions were not included in this research project as a variable of interest, but this might offer insights for future research. For example, it can be tested whether prior attitudes align with exit question opinions, or, how imbalance during the information search impacts exit question results.

Finally, due to the significant role of prior attitudes it would be a good idea to investigate the role of prior attitudes more. However, although there was no significant impact of shared values and presentation format found in this research project, there might still be an impact that has been unexamined. Since the literature review states that importance of shared values on building trust, it would be interesting to examine the relationship between exposure to shared values based communication and exit question responses.
APPENDIX

2.1 The Environmental Protection Agency’s Seven Cardinal Rules of Risk Communication

Source: Adapted by Dr. Vincent T. Covello from the 1988 EPA Seven Cardinal Rules of Risk Communication

**Rule 1. Accept and involve the public as a legitimate partner.** Two basic tenets of risk communication in a democracy are generally understood and accepted. First, people and communities have a right to participate in decisions that affect their lives, their property, and the things they value. Second, the goal of risk communication should not be to diffuse public concerns or avoid action. The goal should be to produce an informed public that is involved, interested, reasonable, thoughtful, solution-oriented, and collaborative.

Guidelines: Demonstrate respect for the public by involving the community early, before important decisions are made. Clarify that decisions about risks will be based not only on the magnitude of the risk but on factors of concern to the public. Involve all parties that have an interest or a stake in the particular risk in question. Adhere to highest moral and ethical standards: recognize that people hold you accountable.

**Rule 2. Listen to the audience.** People are often more concerned about issues such as trust, credibility, control, benefits, competence, voluntariness, fairness, empathy, caring, courtesy, and compassion than about mortality statistics and the details of quantitative risk assessment. If people feel or perceive that they are not being heard, they cannot be expected to listen. Effective risk communication is a two-way activity.

Guidelines: Do not make assumptions about what people know, think or want done about risks. Take the time to find out what people are thinking: use techniques such as interviews, facilitated discussion groups, advisory groups, toll-free numbers, and surveys. Let all parties that have an
interest or a stake in the issue be heard. Identify with your audience and try to put yourself in their
place. Recognize people's emotions. Let people know that what they said has been understood,
addressing their concerns as well as yours. Recognize the "hidden agendas," symbolic meanings,
and broader social, cultural, economic or political considerations that often underlie and
complicate the task of risk communication.

**Rule 3. Be honest, frank, and open.** Before a risk communication can be accepted, the messenger must
be perceived as trustworthy and credible. Therefore, the first goal of risk communication is to establish
trust and credibility. Trust and credibility judgments are resistant to change once made. Short-term
judgments of trust and credibility are based largely on verbal and nonverbal communications. Long term
judgments of trust and credibility are based largely on actions and performance. In communicating risk
information, trust and credibility are a spokesperson's most precious assets. Trust and credibility are
difficult to obtain. Once lost they are almost impossible to regain.

Guidelines: State credentials; but do not ask or expect to be trusted by the public. If an answer is
unknown or uncertain, express willingness to get back to the questioner with answers. Make
corrections if errors are made. Disclose risk information as soon as possible (emphasizing
appropriate reservations about reliability). Do not minimize or exaggerate the level of risk.
Speculate only with great caution. If in doubt, lean toward sharing more information, not less - or
people may think something significant is being hidden. Discuss data uncertainties, strengths and
weaknesses - including the ones identified by other credible sources. Identify worst-case
estimates as such, and cite ranges of risk estimates when appropriate.

**Rule 4. Coordinate and collaborate with other credible sources.** Allies can be effective in helping
communicate risk information. Few things make risk communication more difficult than conflicts or
public disagreements with other credible sources.

Guidelines: Take time to coordinate all inter-organizational and intra-organizational
communications. Devote effort and resources to the slow, hard work of building bridges,
partnerships, and alliances with other organizations. Use credible and authoritative
intermediaries. Consult with others to determine who is best able to answer questions about risk.
Try to issue communications jointly with other trustworthy sources such as credible university
scientists, physicians, citizen advisory groups, trusted local officials, and national or local opinion
leaders.

**Rule 5. Meet the needs of the media.** Media are a prime transmitter of information on risks. They play a
critical role in setting agendas and in determining outcomes. The media are generally more interested in
politics than in risk; more interested in simplicity than in complexity; and more interested in wrongdoing,
blame and danger than in safety.

Guidelines: Be open with and accessible to reporters. Respect their deadlines. Provide
information tailored to the needs of each type of media, such as sound bites, graphics and other
visual aids for television. Agree with the reporter in advance about the specific topic of the
interview; stick to the topic in the interview. Prepare a limited number of positive key messages
in advance and repeat the messages several times during the interview. Provide background
material on complex risk issues. Do not speculate. Say only those things that you are willing to
have repeated: everything you say in an interview is on the record. Keep interviews short. Follow
up on stories with praise or criticism, as warranted. Try to establish long-term relationships of trust
with specific editors and reporters.
Rule 6. Speak clearly and with compassion. Technical language and jargon are useful as professional shorthand. But they are barriers to successful communication with the public. In low trust, high concern situations, empathy and caring often carry more weight than numbers and technical facts.

Guidelines: Use clear, nontechnical language. Be sensitive to local norms, such as speech and dress. Strive for brevity, but respect people's information needs and offer to provide more information. Use graphics and other pictorial material to clarify messages. Personalize risk data: use stories, examples, and anecdotes that make technical data come alive. Avoid distant, abstract, unfeeling language about deaths, injuries and illnesses. Acknowledge and respond (both in words and with actions) to emotions that people express, such as anxiety, fear, anger, outrage, and helplessness. Acknowledge and respond to the distinctions that the public views as important in evaluating risks. Use risk comparisons to help put risks in perspective; but avoid comparisons that ignore distinctions that people consider important. Always try to include a discussion of actions that are under way or can be taken. Promise only that which can be delivered, and follow through. Acknowledge, and say, that any illness injury or death is a tragedy and to be avoided.

Rule 7. Plan carefully and evaluate performance. Different goals, audiences, and media require different risk communication strategies. Risk communication will be successful only if carefully planned and evaluated.

Guidelines: Begin with clear, explicit objectives - such as providing information to the public, providing reassurance, encouraging protective action and behavior change, stimulating emergency response, or involving stakeholders in dialogue and joint problem solving. Evaluate technical information about risks and know its strengths and weaknesses. Identify important stakeholders and subgroups within the audience. Aim communications at specific stakeholders and subgroups in the audience. Recruit spokespersons with effective presentation and human interaction skills. Train staff - including technical staff - in communication skills: recognize and reward outstanding performance. Pretest messages. Carefully evaluate efforts and learn from mistakes.

2.2 Sapp et al.’s measures to evaluate fiduciary responsibility and competence

Source: Sapp et al., 2009

Competence Questions:
“Please tell us how competent these groups are at [the area]. Do they have the knowledge and skills to do a good job? Give a rating of 0 if you think they have no competence [in the area] and a rating of 10 if you think they are completely competent [in the area]. You can use any number between 0 and 10 to express your opinion.”

Fiduciary Responsibility Questions:
“Do they have the same values as you do so you know they will do the right thing?”

Trust Questions:
“Please tell us how much trust you have in the following groups [regarding the area]”

Support Questions:
“Please tell us how much you are willing to support the recommendations made by the following groups [regarding the area].”
Concern Questions:
“Please tell us how concerned you are about the following [area of] the food system

2.3 Poortinga & Pidgeon’s measurement of attitude and perceived government position
Source: Poortinga and Pidgeon, 2006

Study 1: Data was taken for a large scale survey where 1547 people responses. Five environmental or technological risk cases were the focus of the survey (ie. climate change, radiation from mobile phones, radioactive waste, GM food, and human genetic testing). Of these, 296 people responded to the GM food case, and this subsample was used in Poortinga and Pidgeon’s study.

Affect questions:
1) On the whole, how would you describe your feelings on GM foods?
1 (very bad thing) to 5 (very good thing)

Perceived government position questions:
n/a; attitudinal distance was not a concept in Study 1.

Study 2: A separate dataset was used here, which was adjusted from the first survey in order to test the causal trust model proposed by Poortinga and Pidgeon more thoroughly. There were 396 respondents.

Affect questions:
1. “How do you feel about GM food?”
   1 (very negatively) to 5 (very positively)
2. “To what extent is GM food a good thing or a bad thing?”
   1 (very bad thing) to 5 (very good thing)

Perceived government position questions:
1. “The government is in favour of GM food.”
2. “The government does not want to promote GM food.”

Study 3: This survey was aimed towards public attitudes towards GM food, their awareness and understanding of the issue, and the perceived value of a future public debate focused on the commercialization of GM food.

Affect questions:
1) “On the whole, how would you describe your feelings on GM foods?”
   1 (very bad thing) to 5 (very good thing)
2) “In general, how do you feel about GM food?”
   1 (very negatively) to 5 (very positively)

Perceived government position questions:
1) “The government wants to promote GM food.”
2) “The government is not in favour of GM food.”

3.1 Demographic Variables

1- Please indicate your gender.
   • Female
• Male
• Other

2- Please indicate your age.
• Less than 18
• 18 to 35
• 36 to 50
• 51 to 65
• Greater than 65

3- Please indicate the highest level of education you have achieved to date:
• High School Diploma or less
• College Certificate/Diploma or Associate’s Degree
• Bachelor’s Degree
• Graduate/Professional Degree

4- Please indicate your household's total annual income (before taxes):
• Less than $40,000
• $40,000 – $79,999
• $80,000 – $119,999
• $120,000 or more

5- How many people live in your household that are 18 years of age or older (including yourself)?
• 1
• 2
• 3 or more

6- How many people live in your household that are less than 18 years of age?
• 0
• 1
• 2
• 3 or more

7- Please enter the first three characters of your postal code/zipcode.

8- Please select your region of residence
• British Columbia
• Central (ON, QC)
• Atlantic (NB, NL, NS, PE)
• North (NT, NU, YT)
• Prairies (AB, MB, SK)
9- What is your marital status?
- Never Married
- Living with partner/common law
- Married
- Divorced/Separated/Widowed

10- Which of the following best describes YOUR ethnic heritage?
- Aboriginal
- American - United States
- Australasian
- Canadian
- Caribbean
- Central or South American
- Chinese
- East or South East Asian
- Eastern European
- Middle Eastern or North African
- South Asian
- Sub-Saharan African
- Western European

11- Were you born in Canada?
- Yes
- No

(If the response to question 11 is NO then ask the following)
11a- Please indicate how long you have lived in Canada:
- 5 years or less
- 6 to 10 years
- 11 to 15 years
- 16 years or more

3.2 Attitude Scales

Both scales use a 7-point Likert scale, which ranges from “Totally Disagree” (1) to “Totally Agree” (7)

Scale 1: Confidence in Science and Technology Scale

1. Most environmental problems can be solved by applying more and better technology.
2. Science and technology will eventually solve our problems with pollution, overpopulation, and
3. Science and technology do as much environmental harm as good. (R)
4. Modern science will NOT be able to solve our environmental problems. (R)
5. We cannot keep counting on science and technology to solve our environmental problems. (R)
6. Humans will eventually learn how to solve all environmental problems.
7. The belief that advances in science and technology can solve our environmental problems is completely wrong and misguided. (R)
8. Humans will eventually learn enough about how nature works to be able to control it.
9. It can be risky to switch to new food technologies too quickly. (R)
10. Science and technology cannot solve the grave threats to our environment.
11. Modern science will solve our environmental problems.

**Scale 2: Natural Product Interest Scale**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I try to eat foods that do not contain additives.</td>
</tr>
<tr>
<td>2.</td>
<td>I do not care about additives in my daily diet.</td>
</tr>
<tr>
<td>3.</td>
<td>I do not eat processed foods, because I do not know what they contain.</td>
</tr>
<tr>
<td>4.</td>
<td>I would like to eat only organically grown vegetables.</td>
</tr>
<tr>
<td>5.</td>
<td>In my opinion, artificially flavoured foods are not harmful for my health.</td>
</tr>
<tr>
<td>6.</td>
<td>In my opinion, organically grown foods are not better for my health than those grown conventionally.</td>
</tr>
</tbody>
</table>

**3.3 Articles**

*Articles with shared values*

**AGC 1V**

**Always Green Company: About Us**

Author: Always Green Company

Always Green Company is a Canadian biotechnology start-up funded by
private investors. We are committed to using this technology for sustainable food production that benefits consumers, our planet, and future generations. In our vision, real progress towards a sustainable world is made when we embrace novel technologies that help reduce food waste without compromising taste, health, and safety. All of us are passionate about achieving these goals, and we invite you to share your feedback with us along the way. We believe that the best way forward is together and we are committed to working together with all stakeholders in the development of our avocados.

**AGC 2V**

**A Continuous Process: How We Respond to Consumers’ and Farmers’ Needs**

**Author: Always Green Company**

We developed the Always Green Avocado in response to in-depth market research in the USA and Canada. Consumers expressed concerns that the fruit’s quick browning and short duration of optimal ripeness increases food waste. We empathize with this concern about the environmental impact of food waste. The Always Green Avocado addresses the issue with an extended ripeness period in which it does not brown.

We acknowledge that the complexity of agricultural biotechnology can evoke differing opinions on its use and we believe in peoples’ right to choose which food they prefer to eat. We value openness and have made it a priority to engage with consumers and listen to their feedback. We are working together with avocado farmers throughout North America to develop best practices to ensure a healthy diversity of varieties is maintained and consumers can continue to have their choice of avocados produced using different production methods. However, we are convinced that consumers will benefit from the longer ripeness period and the reduced waste associated with the Always Green Avocado.

Our consumer engagement team is dedicated to addressing your questions, comments, and concerns - your input is highly valued and will help us make the right decisions.

**AGC 3V**

**Transparency and Our Limitations: We Need to Talk About the Things We Can’t Talk About**

**Author: Always Green Company**

Always Green Company is strongly committed to sharing information with the
public to the extent possible. We believe that honesty is the best policy and appreciate all public engagement. This is why you can find plenty of information on our website, such as details about our key team members, an overview of the technology and processes that we use, nutritional information about the Always Green Avocado, and details about the ownership of the company. We believe that transparency is beneficial for the public, our stakeholders, and our company.

However, in order to fulfill our corporate social responsibility to our investors we must keep certain data private. Our field trial locations are not revealed to the public in order to protect them from vandalism. Such acts of destruction have been committed many times by anti-biotechnology groups in Europe. Similarly, information that has been submitted to Health Canada for authorization cannot be revealed to the public because competitors would gain an unfair advantage in the market if they had access to this sensitive information.

**AGC 4V**

**How Novel Foods are Controlled and Regulated in Canada**

*Author: Always Green Company*

We care deeply about using science-based principles to ensure health and environmental safety. We went through an arduous eight step process to get approval from Health Canada for the Always Green Avocado. Scientific Assessment is the most important and most demanding of these eight steps. Government scientists evaluated our data with great scrutiny and also requested further information. Only scientific criteria are applied; profitability is not included in the assessment. Ethical and societal concerns are also not taken into consideration during the scientific assessment. Therefore, we encourage citizens to submit these concerns directly to our consumer engagement team.

Due to this stringent process, it has taken seven years and a total of $25 million to develop the Always Green Avocado. The process used by Health Canada is based on international expert consultations endorsed by the United Nations’ World Health Organization (WHO), Food and Agriculture Organization (FAO), and the Organisation for Economic Co-operation and Development (OECD). We are committed to being actively involved in the continuous improvement of this process with input from scientific experts and the public.

**AGC 5V**

**No Risks Found to Be Associated with Eating the Always Green Avocado**
Always Green Company

We care deeply about food safety and human health. If we were not convinced that our avocados are safe, we would not release them. According to Health Canada, all foods have toxic and allergenic potential and therefore screening for potential allergens and toxins is required by Health Canada for biotechnology products. Our scientists have thoroughly screened our new avocado varieties for potentially harmful substances to ensure that they are safe for public consumption. For new avocado varieties produced without biotechnology, no such screening is required.

Although the Always Green Avocado has an extended optimal ripeness period and it does not brown when cut open or crushed, it will continue to brown due to bacterial spoilage. Therefore you can easily tell when the avocado is no longer fresh and should be thrown out for food safety reasons. Our consumer engagement team is dedicated to providing honest and accurate information about potential risks when addressing your questions and concerns.

Always Green Company’s Position on Labelling

It is important to us that consumers receive accurate information about the food system so that they can make informed choices. We therefore strongly support a mandatory disclosure system for Canada similar to the one introduced in the USA in 2016. This law requires companies to disclose the use of biotechnology in their production. It is flexible and effective as it gives producers a choice between on-package symbols, on-package wording, or electronic labels that would direct consumers to more detailed information online. Our Always Green Avocado can be clearly identified by Canadian consumers and we readily provide information on its biotechnology status through our website and our public outreach efforts.

We oppose mandatory on-package labelling as is done in the European Union. First, this oversimplifies the issue, as it does not inform consumers on how exactly biotechnology was used in the production process and what benefits or risks it produced. Second, it makes it easy for anti-biotechnology groups in the EU to name and shame companies that use genetically modified ingredients to hurt their business. We believe this type of behaviour is not acceptable and does not help consumers make informed choices.

Food Monitor Canada: About Us

Author: Food Monitor Canada
Food Monitor Canada is a non-profit organization. We seek to inform the Canadian public about healthy food choices that are based on sustainable agricultural practices. We have taken a critical position on novel foods, such as genetically modified foods that may have negative unforeseen consequences. Our mandate is to provide Canadian consumers with accurate information about safety risks, and ethical and societal concerns. We are confident our efforts will give the Canadian public a real voice in the regulatory process for approving genetically modified foods. We care deeply about protecting human health and the environment, and about empowering consumers to make better food choices.

**FMC 2V**

**Companies that Produce GM Foods Do Not Care about Consumers’ and Farmers’ Needs**

*Author: Food Monitor Canada*

Everyone has a fundamental right to know how the food they eat is produced. We work hard to make your voice heard and to protect your right to know. Companies that use genetic modification for food production have a track record of secrecy and barring the public and critical scientists from involvement in risk assessment. The producer of the Always Green Avocado is no different. While they claim to work together with non-GM avocado farmers, this process acknowledges only a small portion of possible environmental and economic risks for these farmers.

Companies that promote genetic modification of food have little regard for what the public wants. As representative surveys have repeatedly shown, much of the public does not support genetic modification of food. Despite this, the Always Green Avocado producer continues to push for their product. They also claim that their avocado is beneficial because it contributes to reducing food waste. However, it would be wiser and safer to reduce food waste through consumer education. Food Monitor Canada cares about the well-being of Canadians and strives to bring you unbiased perspectives about novel foods.

**FMC 3V**

**No Transparency: The Information that they're Hiding From You**

*Author: Food Monitor Canada*

Food Monitor Canada values honesty and sustainability ahead of financial gains. It is clear that profits are the most important driver motivating the development of the Always Green Avocado. As a for-profit company, they
strive to overtake as much of the avocado market as possible to ensure large gains for their investors. Unfortunately their market dominance would come at the expense of the public and the majority of avocado growers.

Canadian consumers are our only stakeholders. We are deeply committed to serving the public by providing relevant information that would otherwise not be available. To avoid conflicts of interest we have decided to not accept any corporate sponsorship. Likewise, we do not hold back information due to any commercial or political pressures. However, this high standard does not apply to the agricultural biotechnology industry. We are concerned that important information may have been held back in order to protect corporate interests when the Always Green Avocado producers submitted their data to Health Canada for authorization. We therefore support efforts for regulations that require making risk assessment data and field trial locations public.

**FMC 4V**

**Approval Process of GM Foods Lacks Independent Testing and Disregards Public Concerns**

Author: Food Monitor Canada

We are fully committed to empowering consumers to give them a voice in the regulatory process for genetically modified foods and to help them protect themselves against corporate interests. The current authorization process of genetically modified foods does not require independent safety testing. This means that Health Canada depends only on data submitted by companies that produce genetically modified foods to assess their products. Furthermore, independent researchers are not allowed to use the Always Green Avocado for nutrition or safety research and they are not allowed access to the Always Green Avocado producer’s data for additional review. We therefore advocate for regulations that would require genetic modification companies to fund independent research.

Health Canada failed to consider the opinions of the public during the authorization process of the Always Green Avocado. Farmers, parents, members of parliament, and avocado producer associations expressed their disapproval of the genetically modified avocado only to fall on deaf ears. The reach of public participation in the authorization process is minimal. FMC is very worried about the lack of attention given to societal and ethical concerns. We find the disregard for the valid opinions of Canadian consumers unfair and frustrating.

**FMC 5V**

**The Always Green Avocado: Unknown Risks, Little Rewards**

Author: Food Monitor Canada

We strive to provide accurate risk information about the Always Green
Avocado to help Canadian consumers make informed choices. While genetically modified foods are screened for allergens and toxins during the authorization process, this process is based on current knowledge. Harmful substances that are unknown could still be present, putting consumers at risk. There is a clear lack of long-term independent testing of genetically modified foods. Anyone who values Canadians’ quality of life should not allow compromising it.

The Always Green Avocado was made through an unnatural process and this brings with it potential new risks. The non-browning feature means that consumers cannot determine when an avocado has rotted by nature’s standards, including due to bruising. Additionally, the natural browning process may be linked to the plant’s ability to fight off pests and diseases. Without it, farmers may have to use more pesticides in its production.

**FMC 6V**

**Food Monitor Canada’s Position on Labelling**

**Author:** Food Monitor Canada

Food Monitor Canada values consumer wellbeing and protection above all else. Currently in Canada, foods containing genetically modified ingredients do not require labelling. Companies can voluntarily label a food as GMO-free as long as it contains less than 5% GMO ingredients. We believe that limit is far too lenient. Due to the lack of effective labelling regulation, Canadian consumers cannot protect themselves from foods that they do not want to eat since they simply cannot identify it.

Therefore, we support efforts to influence federal and provincial governments to implement mandatory on-package labelling, as is currently the case in the European Union. Due to labelling, European consumer advocacy groups can make consumers regularly aware of the companies that use genetically modified ingredients in their products. Thanks to these efforts, European consumers can exert their right to choose foods that do not contain ingredients that they disapprove of. We care deeply about Canadians having the right to know, and we believe they deserve the same protection as European consumers.
Always Green Company: About Us
Author: Always Green Company

Always Green Company is a Canadian agricultural biotechnology start-up that is funded by a group of private investors. We are fully committed to further developing and using this technology for sustainable food production. Our mission is to produce avocados that benefit consumers, our planet, and future generations. Based on our broad expertise in novel technologies we contribute to making real progress towards a sustainable world by helping reduce food waste without compromising the taste, health, and safety of avocados. All of us at the Always Green Company are very passionate about our work, and we invite you to share your feedback and comments with us along the way.

AGC 2N

A Continuous Process: How We Respond to Consumers’ and Farmers’ Needs
Author: Always Green Company

We developed the Always Green Avocado in response to in-depth market research in the USA and Canada. Although demand for avocados has been steadily growing in both countries, many consumers reported concerns over the amount of food waste caused by the fruit’s quick browning and short duration of optimal ripeness. The Always Green Avocado addresses this issue with an extended ripeness period in which it does not brown.

We acknowledge that the complexity of agricultural biotechnology can evoke differing opinions on the use of this technology. We accept that not everyone will choose the Always Green Avocado over other avocado varieties that were produced without biotechnology. This is why we are working together with avocado farmers throughout the USA and Mexico to develop best practices so that a healthy diversity of varieties and production methods can be developed and maintained. Due to this collaboration, consumers can continue to have their choice of avocados produced using different production methods. Based on the outcome of our research, however, we are convinced that many consumers will benefit from the longer ripeness period and the reduced waste associated with the Always Green Avocado.

AGC 3N

Transparency and Our Limitations: We Need to Talk About the Things We Can’t Talk About
Members of the public who are interested in our enterprise can find plenty of information on our website. We have chosen to reveal more than the average company. We provide information regarding job-related details about key team members, as well as an overview of the technology and processes that we use. Additionally, you will be able to find nutritional information about the Always Green Avocado, and details about the ownership of the Always Green Company.

However, we must keep certain data private for a variety of reasons. Our field trial locations are not revealed to the public in order to protect them from vandalism. Such acts of destruction have been committed many times by anti-biotechnology groups in Europe. Furthermore, information that has been submitted to Health Canada as part of the authorization process requirements cannot be revealed to the public. These documents contain sensitive information that would provide insight regarding our research and development processes. Making this information available to our competitors would give them an unfair advantage in the market.

How Novel Foods are Controlled and Regulated in Canada

The Always Green Avocado was evaluated for health and environmental safety through an arduous process involving eight steps in order to get approval from Health Canada. Scientific Assessment was the most important and most demanding of the eight steps. Government scientists evaluated the data we submitted with great scrutiny and also requested additional detailed information. Only scientific criteria are applied in the scientific assessment; economic criteria, such as profitability or market potential are not included in the assessment process. Ethical and societal concerns are also not taken into consideration during the scientific assessment. However, citizens are welcome to submit these directly to our consumer engagement team.

Due to this stringent process, it has taken seven years and a total of $25 million to develop the Always Green Avocado and get it approved. The process used by Health Canada is based on international expert consultations endorsed by a number of international organisations, such as the United Nations’ World Health Organization (WHO), Food and Agriculture Organization (FAO), and the Organisation for Economic Co-operation and Development (OECD).

No Risks Found to Be Associated with Eating the Always Green
Avocado
Author: Always Green Company

According to Health Canada, all foods have toxic and allergenic potential. Therefore, screening for potential allergens and toxins is required by Health Canada for products developed with biotechnology. Without such screening, authorization could not be obtained from Health Canada.

Our scientists have thoroughly screened these new avocado varieties for potentially harmful substances to ensure that any varieties that we release are safe for the public to consume. Note that the screening process that the Always Green Avocado has gone through is not required for new avocado varieties produced without biotechnology.

Although the Always Green Avocado has an extended optimal ripeness period and it does not brown when cut open or crushed, it will continue to brown due to bacterial spoilage like any other avocado not produced by biotechnology. Therefore it is still easy to tell when the avocado is no longer fresh and should be thrown out for food safety reasons.

AGC 6N
Always Green Company’s Position on Labelling
Author: Always Green Company

We strongly support the establishment of a mandatory disclosure system in Canada that is similar to the one introduced in the USA in 2016. This law requires companies to disclose the use of biotechnology in the production of their food items. A main advantage is that it is flexible, because it gives producers a choice for the disclosure method. This could be on-package symbols, on-package wording, or electronic labels that would direct consumers to more detailed information online. Our Always Green Avocado can be clearly identified by Canadian consumers and we readily provide information on its biotechnology status through our website and our public outreach efforts.

We oppose mandatory on-package labelling as is done in the European Union for two main reasons. First, it oversimplifies the issue, as it does not inform consumers on how exactly biotechnology was used in the production process and what benefits or risks it entails. Second, it has also been used by anti-biotechnology groups in the EU as a tactic to name and shame food manufacturing companies that use ingredients produced with biotechnology without providing further context in order to hurt their business.

FMC 1N
Food Monitor Canada: About Us

Author: Food Monitor Canada

Food Monitor Canada is a non-profit organization. Our mission is to inform the Canadian public about healthy food choices that are based on agricultural production and food processing practices that are sustainable. We have taken a critical position on novel foods, such as genetically modified foods that may have negative unforeseen consequences. Our mandate is to provide Canadian consumers with accurate information about risks to health and environmental safety, as well as ethical and societal concerns. We are confident that our efforts will give the Canadian public more influence in the regulatory process for approving novel foods, such as genetically modified foods.

Companies that Produce GM Foods Do Not Care about Consumers’ and Farmers’ Needs

Author: Food Monitor Canada

Companies that use genetic modification (sometimes also referred to as agricultural biotechnology) for food production have a track record of secrecy. Time and time again these companies have barred the public and critical scientists from involvement in the risk assessment process. The producer of the Always Green Avocado is no different. While they claim to work together with avocado farmers to support the development of more sustainable production practices, they acknowledge only a small portion of the possible environmental and economic risks for these farmers.

We have seen that companies that promote genetic modification of food have little regard for what the public wants. As representative surveys have repeatedly shown, much of the public does not support the use of genetic modification in food production. Despite this, the producers of the Always Green Avocado continue to push more varieties of their genetically modified product onto the market. They also claim that their genetically modified avocado is beneficial because it contributes to reducing food waste. However, our position is that it would be wiser and safer to reduce food waste through investing in consumer education.
No Transparency: The Information that They’re Hiding From You

Author: Food Monitor Canada

It is clear that profits are the most important driver motivating the development of genetically modified crops such as the Always Green Avocado. Being a for-profit company, they strive to overtake as much of the avocado market as possible to ensure large gains for their investors. Unfortunately their market dominance would come at the expense of the public and many avocado growers, the majority of whom do not support the use of genetically modified crops in their fields.

To avoid conflicts of interest we have decided to not accept any corporate sponsorship. Similarly, we do not hold back information due to any commercial or political pressures. However, this high standard does not apply to the companies that use genetic modification in food production. In particular, we point out the possibility that important information may have been held back in order to protect corporate interests when the producers of the Always Green Avocado submitted their data to Health Canada for authorization. We therefore support efforts for regulations that require sharing of risk assessment data and information about field trial locations with the public.

FMC 4N

Approval Process of GM Foods Lacks Independent Testing and Disregards Public Concerns

Author: Food Monitor Canada

The current authorization process for genetically modified foods does not require safety testing by independent researchers who are not affiliated with the industry. This means that Health Canada depends on data submitted by companies that produce genetically modified foods to assess the products of these same companies. Furthermore, independent researchers are not allowed to use the Always Green Avocado for nutrition or safety research and they are not allowed access to the Always Green Avocado producer’s data for additional review. We therefore advocate for regulations that would require genetic modification companies to fund independent research.

Similarly, Health Canada also failed to consider the opinions of members of the general public during the authorization process for the Always Green Avocado. Farmers, parents, members of parliament and avocado producer associations all expressed their disapproval of the genetically modified avocado but their concerns were not considered in the risk assessment. Unfortunately, the reach of public participation in the authorization process is minimal. We have repeatedly criticised the lack of attention given to societal and ethical concerns as clear evidence of disregard for the valid opinions of
While the authorization process requires genetically modified foods to be screened for potential allergens and toxins prior to approval, this process is based on what is currently known. Harmful substances that are unknown could still be present, and this could put the public at risk. There is clearly a lack of long-term independent testing of genetically modified foods. Long-term testing is needed to determine the true consequences for consumers and the environment.

The Always Green Avocado was made through an unnatural process and this brings with it many new potential risks. The non-browning feature means that consumers cannot determine when an avocado has rotted by nature’s standards, including due to bruising. Additionally, the natural browning process may be linked to the plant’s ability to fight off pests and diseases. Because it has been removed, farmers may have to use more pesticides during production.

In Canada, food containing genetically modified ingredients does not have to be labelled. Current regulation allows companies to voluntarily label their food as GMO-free as long as it contains less than 5% GM ingredients. However, we think this limit is far too lenient and therefore not helpful to the public. Due to the lack of effective labelling requirements, Canadian consumers cannot protect themselves from foods that they do not want to eat. In the vast majority of cases they simply cannot determine which foods have been produced with genetic modification.

Therefore, we support efforts to influence federal and provincial governments to implement mandatory on-package labelling regulation, as is currently the case in the European Union. Due to labelling, European consumer advocacy groups can make consumers regularly aware of those companies that use genetically modified ingredients in their products. Thanks to these efforts, European consumers can exert their right to choose foods that do not contain...
ingredients that they disagree with.

3.4 Interface

Search results for "always green avocado"

No Transparency: The Information that they're Hiding From You
Author: Food Monitor Canada
Food Monitor Canada values honesty and sustainability ahead of financial gains. It is clear that profits are the most important ...

No Risks Found to Be Associated with Eating the Always Green Avocado
Author: Always Green Company
We care deeply about food safety and human health. If we were not convinced that our avocados are safe, we ...

Food Monitor Canada: About us
Author: Food Monitor Canada
Food Monitor Canada is a non-profit organization. We seek to inform the Canadian public about healthy food choices that are ...

Always Green Company: About us
Author: Always Green Company
Always Green Company is a Canadian biotechnology start-up funded by private investors. We are committed to using this technology for ...

Non-contrasting format
Contrasting format

3.5 Exit Survey

Your opinion about the Always Green Avocado

If the Always Green Avocado were introduced to the Canadian market, what would be your opinion about it? Please check the box between each pair of opposing statements that best reflects your opinion.

<table>
<thead>
<tr>
<th>Items in this particular order</th>
<th>Neutral</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>It would be safe to eat.</td>
<td>○ ○ ○ ○ ○ ○ ○</td>
</tr>
<tr>
<td>It would not be safe to eat.</td>
<td></td>
</tr>
</tbody>
</table>
It would surely reduce food waste.  ○  ○  ○  ○  ○  ○  ○  ○  It would surely increase food waste.

I would recommend to try it.  ○  ○  ○  ○  ○  ○  ○  ○  I would not recommend to try it.

Many people would buy it.  ○  ○  ○  ○  ○  ○  ○  ○  Few people would buy it.

If you want to provide additional comments, please enter them here:

Your opinion about Food Monitor Canada and Always Green Company
Please indicate to what extent you agree or disagree with the following statements on a scale from 1 “Disagree strongly” to 7 “Agree strongly”.

[Randomize order of statements]  1  2  3  4  5  6  7
I would trust Food Monitor Canada to provide accurate information.  ○  ○  ○  ○  ○  ○  ○  ○

I would trust Always Green Company to provide accurate information.  ○  ○  ○  ○  ○  ○  ○  ○

If the product were real, I would like to receive more information from Always Green Company.  ○  ○  ○  ○  ○  ○  ○  ○

If the product were real, I would like to receive more information from Food Monitor Canada.  ○  ○  ○  ○  ○  ○  ○  ○

If you want to provide additional comments, please enter them here:

Your Opinion about Food Monitor Canada and Always Green Company
Please indicate to what extent you agree or disagree with the following statements on a scale from 1 “Disagree strongly” to 7 “Agree strongly”.

116
The values exhibited by Always Green Company reflect my own personal values.

The values exhibited by Food Monitor Canada reflect my own personal values.

Always Green Company seems like a caring organization.

Food Monitor Canada seems like a caring organization.

If you want to provide additional comments, please enter them here:
REFERENCES


