PERCEPTIONS OF GENETICALLY MODIFIED ORGANISMS AND

CORRESPONDING FOOD LABELS AMONG UNDERGRADUATE

STUDENTS AT BINGHAMTON UNIVERSITY

BY

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Abstract

In January 2020, the United States implemented a federal bioengineered labeling standard for food products that contain genetically modified organisms (GMOs). This Bioengineered Label indicates which products are made with bioengineered foods/GMOs, while the pre-existing Non-GMO Verified Label indicates which products are free of bioengineered foods/GMOs. Having multiple labels in place, it is important to understand how people interpret and understand these labels and how they inform consumer choices. Through a survey, which gathered 153 partial and 143 total responses, sent to Binghamton University undergraduates majoring in Biology or Environmental Studies/Science, data was collected on the participant's views on GMOs, the corresponding food labels, and how these labels influence their purchasing decisions. The results found that there is a disparity in awareness of the Bioengineered Label compared to the Non-GMO Verified Label, and that individuals associate 'bioengineered' and 'genetically modified' with differing themes. In addition there is a discrepancy in how individuals say these labels influence their purchases versus how the labels actually influence purchasing decisions. As this study is revealing of both consumer attitudes and behaviors, it can be used to inform future labeling policies and educational initiatives- both of which are important for consumers to make educated purchasing decisions.

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List of Abbreviations

APHIS   Animal and Plant Health Inspection Service

BA   Bachelor of Art

BS   Bachelor of Science

EPA   Environmental Protection Agency

EU   European Union

FDA   Food and Drug Administration

GE   Genetically Engineered

GMO   Genetically modified organism

rBST   Recombinant Bovine Somatotropin

USDA   United States Department of Agriculture

Chapter 1: Introduction

Genetically modified organisms (GMOs) refer to plants or animals whose genetic

materials have been altered in ways that are not naturally occurring, either by adding,

removing, or changing their DNA sequences (European Food Safety Authority, 2013).

While both plant and animal-based food products have been genetically modified, the

majority of GMOs in the food system plants- with over 90% of US corn, soy, cotton,

canola, and sugarbeets being genetically engineered (GE) varieties. (USDA-ERS, 2019).

In the 1980s, the United States government determined that biotechnology and

genetically modified crops were essential for the success of the country's agriculture.

Policy was established that evaluated GMOs based on risk assessment, in which risk is

defined in biological and physical terms, and it evaluated the probability that new

biotechnology would harm human or environmental health (Bain & Dandachi, 2014).

On the consumer level, the use of biotechnology in food production is

controversial. Some consumers avoid food produced with biotechnology, either wanting

it banned or for these foods to be clearly labeled, while others are simply indifferent on

the matter. As a result, social movements have emerged as important functions in framing

both food and agricultural issues, mobilizing political consumers to change agricultural

practices through the market. The GMO countermovement, also known as the anti-GMO

movement, dates back to the 1970s when activists opposed to GMOs began to organize

themselves. The goal at the start of this movement was to gain a national ban on GMO

products. As the movement had been unable to gain a ban on GMO food products, the goal shifted toward a new ultimate goal of mandatory GMO labeling on a national level. The anti-GMO movement has gained significant momentum in its efforts to require mandatory labeling for GMOs in food. The Non-GMO Project established its own non-GMO label and standards. The Non-GMO Project requires on-going testing of any at-risk ingredients and for companies to adhere to 'traceability and segregation practices' to ensure products are entirely non-GMO. For a product to be verified it must meet or be below the threshold of acceptable traces of genetically modified DNA. This threshold varies based on the type of product- for seed and plant products the threshold is 0.25%, for wholesale or retail goods that are either ingested or applied topically the threshold is 0.9%, for animal feed and supplements the threshold is 5.0%, and for wholesale or retail goods that are not ingested or topically applied the threshold is 1.5% (The Non-GMO Project Standard, 2019). Companies are likely to create and label items as GMOs or non-GMOs if in doing so the private benefits outweigh the costs. Due to this, there are some proponents of biotechnology that fear mandatory labeling of GMOs will negatively influence GMO acceptance and will cause companies to stop utilizing GMOs (Caswell, 2000). Much of the argument for mandatory GMO labeling relies on the idea that consumers have the right to be able to choose whether or not to consume GMO food products, which is why understanding consumer attitudes on the subject is important (Clark, Ryan & Kerr, 2014).

It has been suggested that adopting mandatory GMO labeling could signal to consumers that food produced with biotechnology is unsafe or should be avoided. Studies

have also shown that the signaling effect resulting from mandatory 'contains GMO' labels are very different from the effect seen with voluntary 'does not contain GMO' labels (Costanigro & Lusk, 2014). However, there are studies that conclude mandatory labeling that provides a simple disclosure of bioengineered foods actually leads to a reduction in the opposition to them (Kolodinsky & Lusk, 2018). Many of these studies do not uncover why labeling causes consumers to react in these ways. As such, further research has been carried out to determine how consumers view these labels. A majority of consumers view 'contains GMO' labels and 'does not contain GMO' labels as an informational cue, while few allow the labels to influence their preferences and behavior (Kolodinsky, Morris & Pazuniak, 2018). However, other studies have shown that labeling bias has a significant impact on consumer decision making. Mandatory labeling may reinforce bias against GMO foods, and that with certain bioengineered foods labeling the non-bioengineered creates a stigma effect around non-labeled versions of that product (Huffman et al., 2003; Gruère et al., 2008; Kanter et al., 2009).

In January 2020, the United States began the implementation of a federal labeling standard for GMO food products. The National Bioengineered Food Disclosure Law, which was passed by Congress in 2016, has directed the United States Department of Agriculture (USDA) to establish a national standard for bioengineered foods. This mandatory national standard will disclose all foods that are bioengineered through labeling options (text, symbol, electronic or digital links, or text messages) and a verification process. This policy defines bioengineered foods as those which contain detectable genetic material that has been modified in a way that is not found in nature or

manageable through conventional breeding techniques. This policy also sets the threshold of GMO DNA for this bioengineered label is any amount above 0.9%, the same as the EU and the Non-GMO Project (USDA, 2018). With this policy taking effect, the United States will have two informational labels on GMO foods that are independent of each other, stemming from entirely different organizations-one the US government and one a private company, one stating a product is bioengineered and the other stating that a product is not. With the federally mandated bioengineered label having begun implementation in January 2020, this research hopes to gain insight into the perception of GMO foods and the corresponding labeling. Additionally, as knowledge and attitudes differ across individuals, this research hopes to gain insight into if there is a difference in perception based on educational background- i.e. majoring in Biology or Environmental Studies/Science. These two majors are of interest as they share some of the same core coursework but diverge along the way, creating the different educational backgrounds.

1.1 Research Purpose & Questions

The goal of my research is as follows:

First, to understand the perceptions of GMOs and the corresponding food labels among undergraduates at Binghamton University. Second, to compare these perceptions and gain understanding as to if and how the individual's major being either Environmental Studies/Science or Biology relates to these perceptions. In my attempt to complete these goals I have two research questions:

1. What are the perceptions of GMOs and corresponding labels, including the voluntary Non-GMO Project Verified Label and the mandatory Bioengineered Label among undergraduate students at Binghamton University?

2. Do these perceptions differ between undergraduate students in the Biology program and the Environmental Studies/Science program? If so how?

1.2 Summary of Methodology

My methodology followed two basic steps. First, I created the survey which consisted of five types of questions:

1. Demographic questions

2. Knowledge questions

    a. Questions assessing participant knowledge on GMOs.

    b. Questions assessing participant knowledge on the Non-GMO Label.

    c. Questions assessing participant knowledge on the Bioengineered Label.

3. Attitude questions

    a. Questions assessing participant attitudes toward GMOs.

    b. Questions assessing participant attitudes toward the Non-GMO Label.

       c. Questions assessing participant attitudes toward the Bioengineered

           Label.

    4. Behavior questions

       a. Questions assessing how the Bioengineered Label would influence

           participant purchasing behaviors.

       b. Questions assessing how the Non-GMO Label would influence

           participant purchasing behaviors.

    5. Choice experiment questions

       a. Questions in which participants had to choose between products

           that either had the Bioengineered Label, Non-GMO Label, or no

           label. Products were identical in type, brand, and price.

The survey was distributed via email to the Biology and Environmental

Studies/Science undergraduate listserv through a modified version of Dillman's Tailored

Design Method- consisting of an initial invitation email, a follow-up reminder email one

week later, and a final reminder email three days later. The survey was closed and

responses were no longer accepted after 10 days.

1.3 Progression of Text

Chapter 2 is a review of literature surrounding GMOs and the discourse around

GMO perceptions and labeling. First, I define GMOs and look at how they are defined

within governments and related policies. From there, I go on to discuss social movements

that arose due to GMO creation and production and examine the impacts they have had.

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