

Food Industry Sustainable Practices—How They May Affect ESG Risk Ratings

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Abstract

This paper looks at public food companies that produce food products and seeks to find out if sustainable practices unique to the food industry correlate with a lower Environmental, Social, and Governance (ESG) risk rating, if there are any common sustainable practices, and if public food companies are more likely to overcome sustainability barriers of the food industry. An exploratory study is conducted by looking at sustainability reports of nineteen public food product companies and recording their sustainable actions for a correlation analysis and means analysis.

Keywords: food industry, sustainable practices, ESG risk ratings, research

1. Literature Review

Sustainability is a very important goal that the food industry must achieve in the future. But achieving sustainability takes on very diverse forms in this industry (De Krom & Muilwijk, 2019). Environmental sustainability can involve decreasing greenhouse gas emissions, decreasing water pollution (Van der Gaast et al., 2021), or using recyclable packaging (Bockelmann & Recker, 2022). Food companies can also achieve social sustainability by using fairtrade ingredients, providing better work conditions, and contributing to food security (Aiking & De Boer, 2004). Regulations are pushing the food industry to be more sustainable, but it is difficult for smaller companies and food entrepreneurs to transition. In their research, Van der Gaast et al. wrote about how food producers needed a separate source of income to support their transition to sustainability. In addition, many producers also

received less income after making their ingredients organic (Van der Gaast et al., 2021).

1.1 Current Sustainability Barriers in the Food Industry

Bockelmann & Recker and the Harvard Business Review have all pointed out that the food industry needs to use technology and AI to become sustainable. AI can help companies refine production processes while a better use of data can allow companies to efficiently understand how to improve their sustainability (Bockelmann & Recker, 2022) (Harvard Business Review, 2023). While employing technology and AI may help companies be more sustainable, the technology is expensive and companies may need to change their current practices or production model for the technology to function. Established companies in the food industry may be able to afford these changes but it may be too expensive for food entrepreneurs to transition

their companies to become more sustainable (Harvard Business Review, 2023).

Another barrier is keeping track of suppliers' sustainability. Many food companies need different ingredients and thus have multiple suppliers. If a company has a high demand, it may need multiple suppliers for just one ingredient. Suppliers, manufacturers, and companies of other stages are often independent of others in the food industry. Therefore, a food company may want to be more sustainable, but they cannot make sure that the supplier of ingredients, factories, and distributors are also trying to be more sustainable (Jia et al., 2023). With an expiration date and as an essential good, food is transported at a much higher frequency, causing the food industry to face a high environmental impact (Jia et al., 2023).

Finally, another barrier faced by companies when they try to become more sustainable is cost. Becoming more sustainable often requires changing ingredient suppliers. However, organic or sustainable ingredients are more expensive. Van der gaast et al. mentioned that the transition to an organic product takes two years for food entrepreneurs (Van der gaast et al., 2021).

While there has been much research on different types, methods, and barriers to sustainability in the food industry, few researchers have looked specifically at a segment of the food industry or at sustainable practices specific to the food industry. Therefore, this paper will look at public food products companies and the sustainable practices they engage in.

2. Theoretical Background

The global food system contributes 34% of the global greenhouse gas (GHG) emissions, but as a necessity in people's lives the food industry also brings negative impacts to society in many other ways (Gatzer et al., 2022). In 2019, a sum of approximately 106.27 million tons of food was wasted and food manufacturing and processing was ranked first with 40.05 million tonnes of food waste (Wunsch, 2023). But food insecurity continues to be a major problem in the present day, where approximately 1.3 billion people are food insecure globally in 2022 (Zereyesus & Cardell, 2022). Regulations have been put in place to reduce the high amount of pollution produced by the food industry and many food companies are engaging in more sustainable practices. The recent rise of using Environmental,

Social, and Governance (ESG) scores as a criteria in investment has also encouraged public food companies to become more sustainable and initiate programs to reduce their company's impact on the environment and help solve societal issues.

Nineteen public food product companies that are recognizable and well-known were chosen for this research. These companies produce many different product types and are based in different countries. However, these companies are not selected at random and only include public companies in the food product sector. Thus, this is a convenience sample and cannot represent the entire food product sector or the food industry. This research only includes public companies because these public companies are required to disclose their ESG information. Private companies often do not release detailed information about their operation and it is much harder to access their sustainable actions. As noted above in the literature review, many food companies struggle to become more sustainable because of the high cost and lack of resources. Established food companies that are well-funded are more likely to have the resources and power to engage in more sustainable practices. Thereby, established companies can give more insights into the advanced technology that the food industry may use to be more sustainable.

ESG risk ratings look at potential ESG issues of a company. Starting at zero, the ESG risk rating has five levels—negligible, low, medium, high, and severe—categorized by intervals of ten. A risk rating of zero to ten is a negligible risk while a rating of 40+ is a severe risk. The ESG risk ratings of the selected companies are all updated at different dates and because this rating is a forecast of future risk this research will only be looking at the most recent sustainability report published prior to the ESG risk rating update.

This paper seeks to explore four propositions:

P1—Increased sustainability by public food product companies is positively related to the company's adoption of advanced technologies such as AI. As mentioned above in the literature review, utilizing advanced technologies is essential for the food industry to become more sustainable. However, smaller companies lack the funds to purchase, develop, or use advanced technologies (Harvard Business Review, 2023). Therefore, because the chosen food product

companies in this research are all well established and have a large market capitalization, these companies should be able to afford advanced technology. Chosen companies that use advanced technology should also have a lower ESG risk rating than companies that do not use advanced technology.

P2–The ability of public food product companies to better track sustainable practices across their entire value chain will be positively related to lower ESG risk rating.

Because the food industry has a very long and complex value chain, smaller companies often can not keep track of the sustainability of their suppliers and manufacturers. In addition, they also do not have control over the sustainable practices of their value chain (Jia et al., 2023). Public food product companies have much more power and resources to keep track of their value chain than smaller food product companies. Because of their large product production and demand, public companies should also have a higher level of control over the sustainable practices engaged by their suppliers and manufacturers. Therefore, public companies should have a better ability to monitor sustainable actions of their entire value chain and decrease unsustainable actions.

P3–The decision of public food product companies to engage in more types of sustainable practices unique to the food industry will be positively related to a lower ESG risk rating. Sustainable practices in the food industry take on very diverse forms (De krom & Muilwijk, 2019). The ESG risk rating is an overall analysis of environmental, social, and governance sustainability of a company. Therefore, sustainable practices unique to the food industry should also be taken into account during ESG risk rating evaluations and have an impact on the company's risk rating.

3. Methods

This paper collected data on the sustainable practices of nineteen food product companies. Only public companies are chosen because it is easier to access the sustainable practices of public companies. The nineteen companies are a convenience sample and not selected at random. However, the selected companies are some of the top food product companies based on market capitalization and leaders of the food product industry. Therefore, the actions of the nineteen companies may provide interesting

insight and forecast for the future of sustainability in the food industry.

All information on the sustainable actions and goals of the selected nineteen public food product companies is retained through their sustainability reports. These reports are accessed either from published reports or sustainability webpages of the companies' websites. This paper looks at ESG reports instead of annual reports because annual reports are mostly focused on financials, future plans, achievements, etc. Information related to ESG is included but often as a short summary that depicts the main ESG achievements and risks. Meanwhile, the ESG report offers a more in-depth and detailed description of all the sustainable practices and goals of the company. Because the ESG risk rating is a forecast of a company's future risks, only the most recent ESG report published prior to the ESG risk rating will be evaluated. ESG reports published after the update date of the ESG risk ratings are not taken into account in this paper because the reports were not evaluated in the ratings. ESG risk ratings are retrieved from Sustainalytics.

The sustainability reports are then compared against thirteen sustainability criteria. The thirteen criteria were largely based on sustainability levers used by McKinsey & Company to evaluate food retailers (Gatzer et al., 2022). Additional criteria are included based on common actions found in the sustainability reports.

These criteria are categorical variables where companies that engage in a certain practice will have a data input of "1" and those who do not engage in certain practices will have a data input of "0". The thirteen criteria are: ensures food safety, eliminates or reduces food waste, reduces biodiversity impact (e.g., reduces deforestation), collaborates with food banks or pantries, secures food access and affordability, strengthens animal welfare, creates product transparency or traceability for consumers (e.g., displays detailed nutritional information or allows customers to know where ingredients are sourced), uses ingredients produced through regenerative agriculture, increases resource efficiency (e.g., reduces use of water), provides healthier product variation (e.g., low-sugar, plant-based, more nutritious), uses sustainably produced ingredients, advanced technology used for sustainability (e.g., Artificial Intelligence), and has a system that tracks

sustainable practices of the entire value chain. These independent variables are evaluated against the dependent variable: ESG risk ratings. Controlled variables include market capitalization, employee number, home country, and product type.

Data analyses are performed using IBM SPSS Statistics version 29. A point-biserial correlation analysis is performed because the dependent

variables in this study are dichotomous. The second analysis is a means analysis using ANOVA–analysis of variance. The mean analysis would compare the mean ESG risk ratings of companies who engage in a certain sustainable practice with the mean ESG risk ratings of companies who did not engage in the sustainable practice.

4. Findings

Table 1. (a) ESG risk ratings and food industry specific sustainable practices engaged by sample companies (left)

Company name	Market capitalization (billions) ¹	Employee number ²	Home Country	ESG risk rating ³	Product type	Ensures food safety	Eliminates or reduces food waste
Nestlé	310.994	275000	Switzerland	27.3	multi-product	⁴ ✓	✓
PepsiCo	248.26	315000	USA	22.1	beverage & snacks		
Campbell Soup Company	12.734	14700	USA	23.5	multi-product	✓	✓
Coca-Cola Company	252.714	82500	USA	21.6	beverage		
Conagra Brands Inc.	13.653	18600	USA	30.8	multi-product	✓	✓
General Mills	37.928	32500	USA	21.1	multi-product	✓	✓
Kellogg's	20.171	30000	USA	28.4	convenience food	✓	✓
Kraft Heinz Company	40.767	36000	USA	33.7	multi-product	✓	✓
Danone	36.682	96166	Spain	19.7	multi-product	✓	✓
Constellation Brands	47.697	10700	USA	24.7	alcohol		✓
Tate & lyle	3.49	4591	UK	24.9	sweetener		
Lindt and Sprungli	30.943	14466	Switzerland	23.8	confectionary	✓	✓
Keurig Dr	46.291	28000	USA	23.2	beverage	✓	✓

¹ Market capitalization data retrieved from Yahoo Finance: Yahoo Finance. (n.d.). [Market Capitalization Data]. Yahoo Finance. Retrieved September 13, 2023, from <https://finance.yahoo.com>.

² Employee number retrieved from company website.

³ ESG risk rating retrieved from Sustainalytics: Sustainalytics Data. "Company ESG Risk Ratings." Retrieved August 31, 2023 from <https://www.sustainalytics.com>.

⁴ "✓" check mark indicates that the company is engaging in this sustainable practice. Blank box indicates that the company is not engaging in this sustainable practice.

Pepper							
Barry Callebaut	9.131	13418	Switzerland	14.5	confectionary		
Mondelez International	96.984	91000	USA	22	confectionary	✓	✓
Meiji Holdings	7.135	17336	Japan	24.1	multi-product		
The Hershey Company	42.879	19865	USA	26.1	confectionary	✓	
Tyson foods	18.788	12400	USA	35.9	protein		✓
Carlsberg	19.858	39000	Denmark	22	alcohol	✓	✓

Table 1. (a) ESG risk ratings and food industry specific sustainable practices engaged by sample companies (right)

Company name	Reduce biodiversity impact	Collaborates with food banks or food pantries	Secures food access and affordability	Strengthens animal welfare	Creates product transparency or traceability for consumers
Nestlé	✓		✓	✓	✓
PepsiCo	✓		✓	✓	
Campbell Soup Company		✓	✓	✓	✓
Coca-Cola Company	✓				
Conagra Brands Inc.	✓	✓		✓	✓
General Mills	✓	✓	✓	✓	✓
Kellogg's	✓	✓		✓	
Kraft Heinz Company				✓	✓
Danone	✓		✓		
Constellation Brands	✓				
Tate & lyle		✓	✓		
Lindt and Sprungli	✓			✓	✓
Keurig Dr Pepper					✓

Barry Callebaut	✓				✓
Mondelez International	✓			✓	
Meiji Holdings	✓		✓	✓	✓
The Hershey Company	✓	✓	✓		✓
Tyson foods		✓	✓	✓	✓
Carlsberg	✓				

Table 1. (b) ESG risk ratings and food industry specific sustainable practices engaged by sample companies (left)

Company name	Market Capitalization (billions)	Employee number	Home Country	ESG risk rating	Product type	Uses ingredients produced through regenerative agriculture
Nestlé	310.994	275000	Switzerland	27.3	multi-product	✓
PepsiCo	248.26	315000	USA	22.1	beverage & snacks	✓
Campbell Soup Company	12.734	14700	USA	23.5	multi-product	✓
Coca-Cola Company	252.714	82500	USA	21.6	beverage	
Conagra Brands Inc.	13.653	18600	USA	30.8	multi-product	✓
General Mills	37.928	32500	USA	21.1	multi-product	✓
Kellogg's	20.171	30000	USA	28.4	convenience food	
Kraft Heinz Company	40.767	36000	USA	33.7	multi-product	✓
Danone	36.682	96166	Spain	19.7	multi-product	✓
Constellation Brands	47.697	10700	USA	24.7	alcohol	
Tate & lyle	3.49	4591	UK	24.9	sweetener	
Lindt and Sprungli	30.943	14466	Switzerland	23.8	confectionary	
Keurig Dr Pepper	46.291	28000	USA	23.2	beverage	✓
Barry	9.131	13418	Switzerland	14.5	confectionary	

Callebaut						
Mondelez International	96.984	91000	USA	22	confectionary	✓
Meiji Holdings	7.135	17336	Japan	24.1	multi-product	
The Hershey Company	42.879	19865	USA	26.1	confectionary	✓
Tyson foods	18.788	12400	USA	35.9	protein	
Carlsberg	19.858	39000	Denmark	22	alcohol	✓

Table 1. (b) ESG risk ratings and food industry specific sustainable practices engaged by sample companies (right)

Company name	Increases resource efficiency	Provides healthier product variation	Uses sustainably produced ingredients	Uses advanced technology for sustainability	Has a system that tracks sustainable practices of the entire value chain
Nestlé	✓	✓	✓	✓	✓
PepsiCo	✓	✓	✓	✓	✓
Campbell Soup Company	✓	✓	✓		✓
Coca-Cola Company	✓	✓	✓		✓
Conagra Brands Inc.	✓	✓	✓		✓
General Mills	✓	✓	✓	✓	✓
Kellogg's	✓		✓		
Kraft Heinz Company	✓		✓		
Danone	✓	✓	✓		✓
Constellation Brands	✓				
Tate & lyle	✓	✓	✓		
Lindt and Sprungli	✓		✓		✓
Keurig Dr Pepper	✓	✓	✓		✓
Barry Callebaut			✓		✓
Mondelez	✓	✓	✓		✓

International					
Meiji Holdings			✓		
The Hershey Company	✓	✓	✓		✓
Tyson foods	✓	✓	✓		✓
Carlsberg	✓		✓	✓	✓

Table 2. Point-biserial correlation analysis of all variables used in this research

		Correlations																	
		VAR00005	VAR00002	VAR00003	VAR00004	VAR00006	VAR00007	VAR00008	VAR00009	VAR00010	VAR00011	VAR00012	VAR00013	VAR00014	VAR00015	VAR00016	VAR00017	VAR00019	VAR00020
VAR00005	Pearson Correlation	1																	
	N	19																	
VAR00002	Pearson Correlation	-.081	1																
	Sig. (2-tailed)	.741																	
	N	19	19																
VAR00003	Pearson Correlation	-.107	.864**	1															
	Sig. (2-tailed)	.664	<.001																
	N	19	19	19															
VAR00004	Pearson Correlation	-.075	-.314	-.202	1														
	Sig. (2-tailed)	.760	.191	.406															
	N	19	19	19	19														
VAR00006	Pearson Correlation	-.029	-.258	-.338	-.083	1													
	Sig. (2-tailed)	.907	.286	.158	.734														
	N	19	19	19	19	19													
VAR00007	Pearson Correlation	.116	-.131	-.041	-.123	-.248	1												
	Sig. (2-tailed)	.636	.592	.867	.617	.306													
	N	19	19	19	19	19	19												
VAR00008	Pearson Correlation	.350	-.192	-.115	-.160	-.158	.655**	1											
	Sig. (2-tailed)	.142	.431	.640	.513	.519	.002												
	N	19	19	19	19	19	19	19											
VAR00009	Pearson Correlation	-.437	.289	.291	-.015	-.015	.039	-.149	1										
	Sig. (2-tailed)	.061	.230	.226	.952	.952	.874	.543											
	N	19	19	19	19	19	19	19	19										
VAR00010	Pearson Correlation	.401	-.395	-.375	-.050	.078	.131	.049	-.287	1									
	Sig. (2-tailed)	.089	.094	.114	.839	.750	.593	.841	.234										
	N	19	19	19	19	19	19	19	19	19									
VAR00011	Pearson Correlation	.051	.121	.300	.140	-.231	-.150	-.263	-.151	.368	1								
	Sig. (2-tailed)	.835	.621	.212	.567	.342	.541	.277	.537	.121									
	N	19	19	19	19	19	19	19	19	19	19								
VAR00012	Pearson Correlation	.462*	.103	.243	-.257	-.294	.233	.338	-.025	.209	.169	1							
	Sig. (2-tailed)	.047	.676	.317	.288	.221	.338	.157	.918	.390	.490								
	N	19	19	19	19	19	19	19	19	19	19	19							
VAR00013	Pearson Correlation	.270	-.211	-.232	-.341	-.129	.233	.109	-.268	.209	.169	.352	1						
	Sig. (2-tailed)	.264	.386	.340	.153	.600	.338	.658	.268	.390	.490	.139							
	N	19	19	19	19	19	19	19	19	19	19	19	19						
VAR00014	Pearson Correlation	-.006	.183	.375	-.004	-.460*	.675**	.338	-.025	-.012	.169	.136	.136	1					
	Sig. (2-tailed)	.982	.452	.113	.986	.047	.002	.157	.918	.962	.490	.578	.578						
	N	19	19	19	19	19	19	19	19	19	19	19	19	19					
VAR00015	Pearson Correlation	.384	.227	.182	-.171	-.035	.449	.505*	-.205	.262	-.018	.055	-.293	.402	1				
	Sig. (2-tailed)	.105	.349	.455	.483	.887	.054	.027	.400	.279	.941	.824	.224	.088					
	N	19	19	19	19	19	19	19	19	19	19	19	19	19	19				
VAR00016	Pearson Correlation	.039	.363	.338	-.209	-.163	.095	-.049	-.209	.357	.506*	.012	.012	.454	.449	1			
	Sig. (2-tailed)	.873	.126	.157	.391	.505	.698	.841	.391	.133	.027	.962	.962	.051	.054				
	N	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19			
VAR00017	Pearson Correlation	.000	.053	.138	.069	-.116	.309	-.160	-.141	.180	.224	.276	.276	-.081	.309	1			
	Sig. (2-tailed)	.999	.828	.572	.780	.637	.199	.513	.565	.461	.357	.252	.252	.742	.199				
	N	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19			
VAR00019	Pearson Correlation	-.169	.489*	.641**	.156	-.299	.127	.073	.309	-.127	.286	.179	-.083	.440	.177	.127	1		
	Sig. (2-tailed)	.490	.033	.003	.524	.214	.605	.766	.199	.605	.236	.464	.737	.059	.468	.605			
	N	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19		
VAR00020	Pearson Correlation	-.303	.293	.287	-.298	.078	.287	.108	.186	-.039	.088	-.025	.217	.459*	.184	.535*	.394	.309	1
	Sig. (2-tailed)	.207	.224	.233	.215	.750	.234	.659	.447	.874	.720	.918	.373	.048	.450	.018	.095	.199	
	N	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19

*, Correlation is significant at the 0.05 level (2-tailed).

**, Correlation is significant at the 0.01 level (2-tailed).

Table 3. (a) Means analysis of VAR00005 (ESG risk rating) and VAR00009 (Reduces Biodiversity Impact).

Report

VAR00009	Mean	N	Std. Deviation
.00	28.2400	5	6.07273
1.00	23.4429	14	4.03460
Total	24.7053	19	4.96605

ANOVA Table

	Sum of Squares	df	Mean Square	F	Sig.
VAR00005 * Between Groups (Combined)	84.783	1	84.783	4.013	.061

VAR00009	Within Groups	359.126	17	21.125		
	Total	443.909	18			

Table 3. (b) Means analysis of VAR00005 (ESG risk rating) and VAR00010 (Collaborates with food banks or pantries)

Report

VAR00005

VAR00010	Mean	N	Std. Deviation
.00	23.2250	12	4.52330
1.00	27.2429	7	4.95777
Total	24.7053	19	4.96605

ANOVA Table

			Sum of Squares	df	Mean Square	F	Sig.
VAR00005	*Between Groups	(Combined)	71.370	1	71.370	3.257	.089
VAR00010	Within Groups		372.540	17	21.914		
	Total		443.909	18			

Table 3. (c) Means analysis of VAR00005 (ESG risk rating) and VAR00012 (Strengthens animal welfare)

Report

VAR00005

VAR00012	Mean	N	Std. Deviation
.00	22.0875	8	3.69534
1.00	26.6091	11	5.03616
Total	24.7053	19	4.96605

ANOVA Table

			Sum of Squares	df	Mean Square	F	Sig.
VAR00005	*Between Groups	(Combined)	94.692	1	94.692	4.610	.047
VAR00012	Within Groups		349.218	17	20.542		
	Total		443.909	18			

This research, because it is exploratory in nature, considers a result to be significant if the significance level is less than 0.10.

Looking at Table 2, VAR00019 (Uses advanced technology for sustainability) and VAR00005 (ESG risk rating) has a significance level of 0.49, so VAR00019 and VAR00005 does not experience

a significant correlation. Thus, the data analysis does not support **P1** and the adoption of advanced technology does not correlate with a lower ESG risk rating.

P2 is also not supported by the data analysis in Table 2 as VAR00020 (Has system that tracks sustainable practices of the entire value chain)

and VAR00005 has a significance level of 0.207. The two variables do not experience a significant correlation and the company's ability to track sustainable practices of their value chain does not lead to a lower ESG risk rating.

P3 is supported by Table 3 (a) where companies that reduce biodiversity impact have a mean ESG risk rating of 23.4429 while companies that do not reduce their biodiversity impact have a mean ESG risk rating of 28.2400. This shows that companies not reducing their biodiversity impact have a much higher ESG risk. However, most of the other sustainable practices do not display a significant correlation with the ESG risk rating.

5. Discussion

Even though most of the propositions were not supported, the data analysis did reveal some interesting information about the relationship between different variables.

In Table 2, the significance level of correlation between VAR00005 and VAR00012 (Strengthens animal welfare) is 0.047, showing a significant correlation between the two variables. However, the Pearson correlation is 0.462, which indicates a positive relationship between the two variables. According to the data analysis, companies that engage in the sustainable practice of "strengthening animal welfare" actually have a higher ESG risk rating than those that do not engage in this sustainable practice. A similar result was received with the means analysis in Table 3 (c) where companies that did not engage in strengthening animal welfare had a mean ESG risk rating of 22.0875 while companies that did engage in this practice had a mean ESG risk rating of 26.6091. I have four possible explanations for this observation:

- 1) ESG is a relatively new concept and many companies are still at a starting phase for their sustainable practices and programs. Companies trying to strengthen their animal welfare may have an incomplete animal welfare program that has many underlying risks and needs major improvements, causing the ESG risk to increase.
- 2) People have a much stronger sense of feelings for animals than for plants. Animals may have a heavier moral impact and be weighted heavier in the ESG risk ratings. Companies that do not use animal products will not be evaluated against this criteria while companies that do use animal

products will be subjected to a stricter criteria, causing their ESG risk ratings to be higher.

- 3) Most of the companies selected in this research do not have animals or animal products as one of their primary ingredients or products. In fact, most of the selected companies in this research produce products that are largely based on agriculture or plants. Therefore, a bias could exist in this data analysis as not all types of companies are represented.
- 4) It is possible that companies are greenwashing, which is when they say they are engaging in certain sustainable practices but are not actually doing a lot. As this research only records down "yes" or "no," the data analysis can not analyze the extent of each company's animal welfare practices. The public's attention on ESG has also increased in recent years. Therefore, it is possible that companies wrote that they are trying to strengthen their animal welfare but are not making any drastic improvements or changes.

Another interesting observation is that even with a list of well-established and well-funded companies, only four companies (Nestlé, Pepsico, General Mills, and Carlsberg) are using advanced technology to increase their sustainability. Furthermore, Nestlé's and Pepsico's market capitalization are some of the highest in the companies selected in this research. Even for well-established companies, a large barrier exists for them to make their value chain compatible with advanced technology. It is also possible that although the companies included in this research do not lack the money or funds to develop or purchase advanced technology, their production processes are also much more well-established and harder to make changes. Meanwhile, smaller companies may lack the funds but they may have a higher flexibility when it comes to transitioning their production lines to use advanced technology.

6. Limitations and Possibility of Future Research

This research contains many limitations as it is an exploratory research and the companies selected are a convenience sample. In addition, all of the companies are public food product companies, most companies are based in the USA, and not all types of food product are

included. In order for this research to be more representative of all food product companies, future research needs to include food product companies with a wider range of size, region, and company. In addition, the research will need to include a higher number of companies as nineteen companies can not produce enough data.

For future research, there are many interesting subjects that should be explored more:

- 1) How can the extent of a food industry specific sustainable practice can affect ESG risk ratings?
- 2) Why do companies that engage in strengthening animal welfare have a higher ESG risk?

What are the similarities and differences faced by SMEs and well-established public companies in the food product industry when trying to utilize advanced technology?

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