Sustainability Strategies in U.S. Agribusiness: Understanding Key Drivers, Objectives, and Actions

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Abstract

This study explores the domain of sustainability from the agribusiness perspective by establishing levels or stages of sustainability in terms of views, actions and performance measures. In addition, it analyzes factors including firm characteristics and internal and external stakeholders that influence a company's sustainability initiatives. In a sample of U.S. agribusiness managers, results indicate that strong management pressures have a positive and highly significant relationship with the level of a firm's sustainability initiatives. Other pressures including competition, government regulations, and the media have little or no effect. The size of the company also has minimal influence on a company's level of sustainability, whereas a company's primary function plays a more significant role.

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Background

In 1987 the World Commission on Environment and Development (WCED) officially defined sustainable development as the ability to meet present needs without compromising the needs of future generations. The WCED recognized that there were three interlaced principles at the core of sustainability: environmental integrity, social justice, and economic prosperity. In addition, it acknowledged that both industry and government had significant roles to play in sustainable development that included achieving food security, protecting species and natural resources, and attaining connectedness among societies (Brundtland 1987). However, the WCED provided little guidance beyond this definition for identifying future and present needs, determining appropriate technologies and resources to use, and understanding how to balance various responsibilities and demands (Carter and Rogers 2008). Today's definition of sustainability continues to remain vague as it encompasses a variety of issues over time and space and accommodates the values and goals of a diverse group of organizations and individuals (Gasparatos, El-Haram, and Horner 2007; Goldin and Winters 1995; Peterson 2009; Rigby and Caceres 2001).

Sustainability is often referred to as the 'triple bottom line' because it involves the integration of environmental and social responsibilities with economic goals to create value for the company as well as for society (Elkington 2004). The topic of sustainability has become increasingly important in the agricultural sector due to the sector's large environmental and social impacts: agriculture is the main user of land, water, and resources in many countries, and its products reach consumers around the world (Aigner, Hopkins, and Johansson 2003). The agribusiness sector, comprised of companies involved in the food production supply chain, faces a unique set of challenges and opportunities associated with sustainability that revolve around ensuring a secure food supply, addressing the environmental impacts of agriculture, practicing fair labor standards, and providing safe and healthy products (IMAP 2010; Murray 2010).

Incentives as well as pressures and challenges for agribusiness companies pursuing sustainable practices are present in both the marketplace where consumers demand agricultural goods and in the supply chain where organizations demand efficiency and communication. On the consumption side of the sustainable food system, consumers demand quality, nutrition, and environmental and social considerations (IMAP 2010). In addition, communities on a global scale demand technology, innovation, and efficiency to meet the needs of a growing population (Jansen and Vellema 2004). On the production side, upstream members of the supply chain such as input suppliers and producers bear the costs of innovation and environmental damage while downstream supply chain members such as processors and retailers often receive the economic benefits and value added from sustainability (Clift 2003; Heller and Keoleian 2003; Vorley 2001).

Studies on the sustainability of agricultural systems have explored the farmer perspective of sustainable agricultural practices (Giovannucci 2001; Jordan 2005), consumer perceptions of the food market (Kriflik and Yeatman 2005), drivers of sustainability strategies in food companies (Grolleau et al. 2007; Marcus and Anderson 2006), and the necessary components of a sustainable supply chain (Fritz and Schiefer 2008; Heller and Keoleian 2003). However, no studies have specifically categorized the sustainability programs of agribusiness firms based on their levels or stages within the domain of sustainability efforts. This study aims to fill this gap in order to enable the agribusiness sector to gauge its progress with respect to sustainability.

Corporate Sustainability Strategies

The topic of sustainability is relatively new and difficult to document, so studies analyzing how companies incorporate sustainability into their business strategies have only emerged in the last few decades. In the 1960s and 1970s environmental awareness and social responsibility were still periphery issues on corporate agendas (Walton, Handfield, and Melnyk 1998), and it was not until the late 1980s and early 1990s that "sustainable businesses" emerged recognizing society and the environment as legitimate stakeholders (Carroll 1991; Kirchoff 2000). In addition, only since the late 1990s have companies considered sustainability as an integral part of corporate strategy and a basis for technological development (Hart 1996).

The existing literature on sustainability strategies can be separated into two categories: the measurement-based literature and the theoretical literature. In the measurement-based literature, researchers have focused on quantifying sustainability and analyzing the resource-based and institutional factors influencing company strategies. Studies such as Grolleau, Mzoughi, and Thomas (2007) and Henriques and Sadorsky (1996) focused on quantifying specific observable activities associated with sustainability while Bansal (2005), Arragon-Correa (1998), and Buysse and Verbeke (2003) among others attempted to measure sustainability by establishing a set of indicators and frameworks.

Studies in the measurement-based literature have found that many factors influence the sustainability strategies of companies including customers (Giovannucci 2001; Grolleau et al. 2007; Henriques and Sadorsky 1996), government (Grolleau et al. 2007; Henriques and Sadorsky 1996; Porter and van der Linde 1995), the media and competitors (Bansal 2005), shareholders and the community (Henriques and Sadorsky 1996), management (Grolleau et al. 2007), size of the company (Ambec and Lanoie 2008; Arragon-Correa 1998), and position in the supply chain (Vorley 2001). A number of quantitative techniques have been employed to determine these relationships including logit regression (Buysse and Verbeke 2003; Grolleau et al. 2007; Henriques and Sadorsky 1996; Marcus and Anderson 2006), factor analysis (Arragon-Correa 1998; Buysse and Verbeke 2003; Judge and Douglas 1998; Marcus and Anderson 2006), and cluster analysis (Arragon-Correa 1998; Arragon-Correa et al. 2008; Buysse and Verbeke 2003).

The second body of literature on sustainability strategies is the theoretical literature which attempts to characterize sustainability strategies as a series of levels or stages rather than as a set of quantifiable measurements. Levels are distinguished based on factors such as the degree of balance achieved among the three aspects of sustainability (Elkington 2004; van Marrewijck and Werre 2003), the complexity of sustainability definitions (Mirvis and Googins 2006), and the sophistication of sustainability actions taken (Markevich 2009; Willard 2002). There are five main levels of sustainability that are repeated throughout the theoretical literature: *Sustainability for Regulatory Compliance, Profit-Driven Sustainability, Innovative Sustainability, Organizational Sustainability,* and *Societal Sustainability.*

Level 1: Regulatory Compliance. The first stage of corporate sustainable development is generally characterized as 'Compliance-Driven' (van Marrewijk and Werre 2003) sustainability because such companies only pursue environmental and social actions that conform to established laws and industry standards (Markevich 2009).

Level 2: Profit-Driven. In the second stage of sustainability, companies are considered 'Profit-Driven' (van Marrewijk and Werre 2003) because they predominantly focus on economic goals and only address social and environmental aspects when actions are profitable, improve reputation and brand image, or preserve the company's license to operate (Elkington 2004; Mirvis and Googins 2006; van Marrewijk and Werre 2003). Changes at this stage typically target low-hanging fruit such as sustainability 'add-ons' to normal business operations that achieve cost reductions and increase efficiency without requiring long-term investments (Markvich 2009; Porter and van der Linde 1995).

Level 3: Innovative. In the third stage of sustainability are 'Innovative' (Mirvis and Googins 2006) companies that recognize environmental, social, and economic concerns as equally important. Companies in this stage broaden and deepen their sustainability involvement through increased efficiency and innovation, formalization of sustainability criteria and metrics, and increased communication with stakeholders (Mirvis and Googins 2006). Markevich (2009) indicated that company objectives at this stage focus on aligning the values of the company with the personal values of all its employees to develop a more flexible and productive organization.

Level 4: Organizational. The fourth stage, termed 'Whole System' (Markevich 2009) sustainability, is comprised of companies that integrate sustainability throughout the business, optimize organizational designs and business models, and view sustainability as necessary for long-term survival. Sustainability efforts extend beyond the immediate impacts of the company to coordinate efforts within the supply chain and across networks (Carter and Rogers 2008; Elkington 2004; Mirvis and Googins 2006).

Level 5: Societal. In the final and most advanced stage of sustainability, 'Transformative' (Mirvis and Googins 2006) companies address sustainability as part of their core business. They are motivated by a sense of corporate purpose to serve society, and they are able to re-define and change the nature of business and the competitive landscape by merging sustainability with the business agenda (Markevich 2009). Companies at this level model sustainability on long-term global issues that reach beyond the company and its consumers such as creating new markets and developing local economies, partnering with social and environmental organizations, and becoming spokesmen for industry (Mirvis and Googins 2006; Willard 2002).

The five levels of sustainability presented in the theoretical literature provide a framework for evaluating where a company's views, actions, and performance measures are on the sustainability spectrum. Conversely, the measurement-based literature utilizes quantitative methods for establishing relationships between strategy, company characteristics, and influences. A combination of the qualitative and quantitative methods used in the literature is necessary to fully analyze the sustainability strategies in agribusiness.

Methodology

This study combines the analytical methods employed in the measurement-based literature with the sustainability framework described in the theoretical literature to better understand the domain of sustainability from the agribusiness perspective and to examine the factors influencing company strategies. The focus of the study is to establish levels of sustainability in agribusiness

companies in terms of sustainability views, actions, and performance measures as suggested by Epstein and Roy (2001). By defining a company's sustainability strategy in terms of these three dimensions, companies can be categorized into levels of sustainability based on how they view sustainability and on the scope and maturity of their initiatives.

Data Collection

Limited secondary data exists to satisfy this objective, thus, primary data collection was necessary. The survey for this study was designed in a similar fashion to other academic surveys conducted in the green business and sustainability literatures (Arragon-Correa, 1998; Bansal, 2005; Marcus & Anderson, 2006). Questions were formulated based on a review of the existing literature on the sustainability strategies of companies to align the survey with theory.

The survey listed a series of statements with Likert scale responses concerning the sustainability views, actions, and performance measures of companies. There were 16 statements on sustainability views with response choices *of Strongly Agree, Somewhat Agree, Somewhat Disagree, Strongly Disagree*, and *Do Not Know* for each view. There were 12 statements on sustainability actions and eight statements on performance *measures with responses of Using, Developing, Considering, Not Applicable,* and *Do Not Know* for each action and measure. Responses to these questions on sustainability views, actions, and performance measures were used to determine how many levels of sustainability were present in the sample and how respondents were grouped according to these levels. Additionally, it was possible to identify any relationship between the level of a company's sustainability views and its actions and performance measures.

The survey also collected responses on the presence of internal influences (including shareholders/owners, management, and employees), external influences (including customers, suppliers, competitors, government, community, and the media), and certain company characteristics (including revenue level, position in the supply chain, and primary function). This data was used to determine whether these factors impact a company's level of sustainability.

The survey instrument was pretested with graduate students and agribusiness professionals in January 2010. The final survey was then administered in person to agribusiness professionals in February and March 2010. Both an oral and written overview of the survey and its purpose were given to participants, and responses were guaranteed to be voluntary and anonymous. To encourage participation and provide some benefit to respondents, a summary of responses was delivered at the conclusion of the survey.

Sample Selection

Participants at three management seminars held at Purdue University in West Lafayette, IN and administered by the Center for Food and Agricultural Business were given the opportunity to participate in the sustainability survey. The three groups were the Agricultural Retailers Association Management Academy (ARA), American Seed Trade Association Management Academy (ASTA), and the Midwest Food and Agribusiness Executive Seminar (MFAES). These groups were chosen as the sample population because participants in the seminars were agribusiness professionals training for leadership roles within their respective companies. According to Ar-

ragon-Correa (1998), individuals in high level or executive positions tend to be the ones most familiar with company strategy and practices. In addition, making direct contact with respondents allowed for discussions which provided context for the results. Although the chosen seminars were a sample of convenience rather than a random sample, companies and individuals present were random in the sense that attendance was voluntary and open to agribusiness professionals in leadership roles.

A total of 165 agribusiness professionals representing U.S. firms participated in one of the three seminars included in the study. The number of participants to complete the survey totaled 114 for a response rate of 69.1%. Response rates were similar for all three programs. Surveyed agribusiness professionals represented companies that were diverse in terms of size, function, and legal organization. The annual revenue of companies ranged from less than $100 million to more than $10 billion. All levels of the supply chain were represented including input supply, production, grain handling, food processing, retail, and other services, although input and production companies had the largest representation. Over half of the respondents were employed by privately held companies while one third by publicly traded companies and the rest by cooperatives. Respondents were primarily in positions of executive management, other levels of management, or sales, marketing, and communications.

Empirical Analysis

Similar to previous studies on the environmental strategies of companies, analysis of the survey data involved a combination of principal component analysis, cluster analysis, and logit regression analysis (Arragon-Correa 1998; Arragon-Correa et al. 2008; Buysse and Verbeke 2003; Judge and Douglas 1998; Marcus and Anderson 2006). The sets of questions on sustainability views and actions from the survey were first subject to principal component analysis by creating standardized scores for the Likert scale responses to each question. This was done to group highly correlated variables into factors for data reduction purposes and to systematically determine the number of sustainability levels present in the data. Next, cluster analysis on the established factors grouped respondents according to their scores for each sustainability level. A two step process of Ward's hierarchical clustering algorithm and the K-means iterative partitioning process was used (Punj and Stewart 1983). Finally, logit regression analysis identified significant relationships between a company's sustainability cluster and characteristics including internal and external influences, firm size, position in the supply chain, and primary function. Other control variables included whether a company was public, private, or a cooperative, the respondent's position in the company, and which leadership program the respondent attended.

Unlike the analysis for sustainability views and actions, analysis of sustainability performance measures was performed using cross tabulations. Responses of "do not know" were common for this set of questions, and they were recorded as missing values rather than as scores on the Likert scale because they did not follow the logical sequence of the responses. Only 76 observations were available after adjusting for "do not know" responses, which were not enough observations for principal component analysis or cluster analysis (Hatcher 1994; Nargundkar and Olzer 1998) Instead, chi-square test statistics were calculated to determine the probability of association between how a respondent answered each question on performance measures and the company characteristics described previously.

Sustainability Views

Table 1 defines the 16 sustainability views included in the study and shows the factor loadings from the principal component analysis for each view using varimax rotation. Principal component analysis for the set of statements on sustainability views resulted in three significant factors (with eigenvalues greater than one) that explained 57.2% of the total variance. Fifteen of the variables had high loadings (greater than or equal to 0.50, shown in bold) for at least one factor.

Table 1. Factor Loadings of Sustainability Views

View of Sustainability	Factor 1: Organizational and Societal (Levels 4 and 5)	Factor 2: Profit-Driven and Innovative (Levels 2 and 3)	Factor 3: Compliant (Level 1)
Complying with laws and standard	-.04	.15	**.83**
Responding to external pressures	.40	.35	.41
A way to strengthen image	.30	**.55**	.34
A strategy for cost savings	-.08	**.69**	.21
A function of management beliefs	.37	**.62**	.04
A source of competitive advantage	.20	**.67**	.35
A way to impact employee satisfaction	.35	**.57**	.41
An opportunity for new revenue	.12	**.71**	.01
A function of aligning values	.32	**.62**	.08
Dedication to long-run development	**.52**	**.52**	-.23
A method of risk management	**.50**	.38	-.03
A value integrated into the business	**.65**	.42	.01
Collaboration with other groups	**.74**	.19	-.08
Addressing hunger and societal welfare	**.68**	.03	.42
Reducing impact on the environment to preserve it for the future	**.81**	-.01	.16
An integral part of the core business	**.74**	.35	.18
Eigenvalue	6.380	1.620	1.150
Alpha	.836	.834	

Total N = 109 observations

The first factor was comprised of variables associated with Levels 4 and 5 in the literature, namely views related to Organizational and Societal Sustainability. The second factor was comprised of Level 2 and 3 statements related to Profit-Driven and Innovative Sustainability. The third factor included the statement on regulatory compliance which was associated with Level 1, but this factor was dropped from the analysis because it was only explained by one variable (Hatcher 1994). The individual statement about responding to external pressures was not included in the subsequent cluster analysis because it did not have any high factor loadings, and the statement on long-run business development was also removed because it had high loadings for more than one factor. The Cronbach's alpha coefficients for internal consistency and reliability were high for both factors (0.836 and 0.834 respectively). The alpha coefficient can take on values from 0 to 1 with a threshold of 0.70 as an acceptable value (Hatcher 1994), indicating that variables with high factor loadings in this analysis were highly correlated within factors.

Cluster analysis on the two retained factors from the principal component analysis established two clusters of companies for sustainability views based on three goodness-of-fit measures: the Pseudo F, Cubic Clustering Criterion, and R-square values (Nargundkar and Olzer 1998; Punj and Stewart, 1983). The clusters are summarized in Table 2. Cluster 1, labeled "Broad Sustainability," was comprised of companies with high mean values of 3.28 and 3.21 for Factors 1 and 2, respectively. On the Likert scale, a score of 3 corresponded to "somewhat agree" while a 4 corresponded to "strongly agree." Therefore, companies in this cluster agreed with the majority of both types of sustainability views: organizational/societal as well as profit-driven/innovative. Cluster 2, labeled "Narrow Sustainability," was made up of companies with lower mean values of 2.5 and 2.42 for Factors 1 and 2, respectively. On the Likert scale, a score of 2 corresponded to "somewhat disagree" while a score of 3 corresponded to "somewhat agree." Consequently, this cluster was fairly neutral with respect to both types of sustainability views. If respondents agreed with some sustainability views, they disagreed with others so that their overall positions in terms of organizational/societal sustainability and profit-driven/innovative sustainability were neutral. Over half of the respondents were in the "Broad Sustainability" cluster while the remainder was in the "Narrow Sustainability" cluster.

Table 2. Cluster Means for Views of Sustainability

Cluster	Factor 1: Organizational and Societal Sustainability	Factor 2: Profit-Driven and Innovative Sustainability
1. Broad Sustainability (n=64)	3.28	3.31
2. Narrow Sustainability (n=45)	2.50	2.42

A logit regression model was used to test the significance of a number of characteristics hypothesized to explain the probability of a company being associated with either the Broad or Narrow Sustainability cluster. Table 3 shows a summary of the regression results. Reported marginal effects are interpreted as the discrete change in the expected value of the dependent variable as the explanatory variable changes from zero to one or from Narrow to Broad Sustainability (Greene 2000).

Results showed that significant explanatory characteristics for the clusters on sustainability views were management pressures, input and production positions in the supply chain, retail and wholesale as the primary firm functions, revenue between $1 and $10 billion, and being a member of the ARA sample group. Management pressure had the highest magnitude effect. The presence of strong or very strong management pressure was associated with a positive and highly significant coefficient indicating that companies with pressure from management were 70.9% more likely to be in the Broad Sustainability cluster, or at a higher level of sustainability, than companies without similar pressures. Companies in the input and production sectors of the supply chain were also 47.8% and 27.3% more likely to be in the Broad Sustainability cluster, respectively, than companies that were not in the same supply chain position. In terms of primary company functions, companies that focused on retail or wholesale were less likely to be in the Broad Sustainability cluster. To clarify, retailers and wholesalers can be at any position in the supply chain including inputs, production, food processing, and food retail.

Table 3. Logit Regression Results on Clusters of Sustainability Views

	Variable	Marginal Effect	
Internal Pressures	Shareholders/Owners	0.011 (0.187)	
	Management	0.709 (0.097)	***
	Employees	0.194 (0.159)	
External Pressures	Customers	0.107 (0.165)	
	Suppliers	0.211 (0.169)	
	Competitors	0.105 (0.155)	
	Government Regulators	-0.215 (0.173)	
	Community	0.105 (0.155)	
	Media	0.187 (0.166)	
Position in the Supply Chain	Inputs	0.478 (0.197)	**
	Production	0.273 (0.155)	*
Primary Function	Production	-0.210 (0.189)	
	Retail	-0.518 (0.155)	***
	Wholesale	-0.363 (0.162)	**
Type of Company	Publicly Traded	0.265 (0.231)	
	Cooperative Retailer	-0.065 (0.290)	
Annual Revenue	$100-499 million	-0.021 (0.205)	
	$500-999 million	0.083 (0.309)	
	$1-10 billion	0.336 (0.180)	*
	Over $10 billion	0.282 (0.232)	
Group	ARA	0.348 (0.173)	**
	ASTA	0.106 (0.226)	
Job Title	Executive Management	-0.038 (0.265)	
	Management	0.043 (0.284)	
	Sales, Marketing, or Communications	0.101 (0.260)	
Log Likelihood		-41.718	***

Total N = 109 observations.
Notes: *p < 0.10   **p<0.05   ***p<0.01 (Wald test using Chi-square distribution).
Marginal effects are computed at the sample means. Standard deviations are in parentheses.

Being a member of the ARA sample was associated with a positive significant coefficient, implying that respondents in this group were more likely to be in the Broad Sustainability cluster than respondents of the MFAES group which served as the base group. The ARA sample was primarily comprised of input and production companies whose main functions were retail and wholesale. While this appears to be counterintuitive to the previous results, the ARA variable may be significant because the MFAES group was exposed to more information before filling out the survey. The MFAES group read a case study on sustainability and strategy prior to attending the program, so these respondents may have had a more uniform understanding of sustainability and of the questions asked in the survey.

Sustainability Actions

Table 4 defines the 12 sustainability actions included in the study and shows the factor loadings from the principal component analysis for each statement using varimax rotation. Principal component analysis for the statements on sustainability actions resulted in two factors that explained 59.9% of the total variance, and all twelve of the variables had high loadings for at least one factor. The first factor included statements expected to be associated with Levels 2, 3, and 4 in the literature and was labeled as "Internal Sustainability" because actions in this factor had a

direct impact on internal operations. The second factor primarily included Level 5 statements and was labeled as "Outward Sustainability" because actions involved extending sustainability beyond the company in ways that impacted more than internal operations. The individual statement on revising the business model was dropped from the analysis because it had a high loading for both factors. Alpha coefficients were high for both factors (0.854 and 0.864 respectively) indicating that variables with high factor loadings were highly correlated within factors.

Table 4. Factor Loadings of Sustainability Actions

Sustainability Action	Factor 1: Internal Sustainability (Levels 2, 3, and 4)	Factor 2: Outward Sustainability (Level 5)
Sustainable product features	**.61**	.18
Sustainable processes	**.82**	.01
Marketing/public relations campaigns	**.55**	.38
A task force or employee position	**.53**	.49
Environmental management system	**.74**	.34
Substantially re-developed products and processes	**.65**	.39
Sustainable supply chain management	**.60**	.48
Revised business model	**.52**	**.54**
Formal business partnerships	.36	**.78**
Multi-organizational alliances	.40	**.66**
Initiatives that address human welfare	.28	**.80**
New markets created for poor and under-served communities	.05	**.83**
Eigenvalue	6.075	1.117
Alpha	.854	.864

Total N = 92 observations

Cluster analysis on the two factors for sustainability actions established three clusters of companies: "Active," "Planning," and "Inactive." Table 5 presents a summary of the three clusters. The Active Sustainability cluster was comprised of companies with high mean values of 3.47 and 3.51 for Factors 1 and 2, respectively. Participants in this group represented companies that were, on average, using or developing sustainability actions that represented both Internal and Outward sustainability. The Planning cluster was made up of companies with mean scores of 2.72 and 2.33 for Factors 1 and 2 respectively, implying that companies in this group were in the process of becoming sustainable. The score for Internal Sustainability actions was higher indicating that companies considering or developing sustainability strategies typically began with lower level actions before developing broader programs. Finally, the Inactive cluster included companies with low means indicating that they were not considering or using most of the sustainability actions represented in the survey.

Table 5. Cluster Means for Sustainability Actions

Cluster	Factor 1: Internal Sustainability	Factor 2: Outward Sustainability
1. Active Sustainability (n=26)	3.47	3.51
2. Planning (n=37)	2.72	2.33
3. Inactive (n=29)	1.89	1.22

The three clusters were fairly evenly populated, with the largest number of companies in the Planning cluster and the fewest number in the Active cluster. This is consistent with the literature which suggests that while many companies claim to be sustainable, they have not yet formulated initiatives to turn views into actions (Berns et al. 2009; Markevich 2009).

A multinomial logit model was used to test the significance of a number of variables in explaining a company's association with the Active, Planning, and Inactive clusters for sustainability actions. Table 6 presents a summary of the regression results where the marginal effects are interpreted by analyzing each cluster or dependent variable separately.

The only significant explanatory variables for describing the Inactive cluster were strong influence from shareholders or owners and the job title of Sales, Marketing, or Communications. Companies with strong or very strong influences from owners were 25.7% more likely to be a member of the lowest cluster for sustainability actions. This may be because owners usually want to see payoffs in the short run while many sustainability strategies aim to create value in the long run (Esty and Winston 2009). Respondents with a job title of Sales, Marketing, or Communications were 46.4% less likely to represent a company associated with the Inactive cluster. It is top management that typically provides the momentum for, and has the most knowledge of, the sustainability strategies of the company (Grolleau et al. 2007). As such, people in positions such as Sales, Marketing, or Communications may have personal perceptions of sustainability that are different from the senior management, and thus, the company's, perceptions of sustainability.

The significant explanatory variables for describing the Planning cluster were customer, supplier, and media influences, retail as a primary function, and ARA group membership. Companies fell into this middle cluster because they responded to the questions on sustainability actions in one of two ways: either they were developing or considering most of the actions, or they were using some of the actions but not others. Companies with strong sustainability influences from customers and the media were more likely to be in the Planning cluster, indicating that these stakeholders may be enticing companies to develop actions. Companies with strong supplier influences were less likely to be in the Planning cluster suggesting that suppliers, more so than other stakeholders, may demand practices that address a broader range of topics. Additionally, companies with retail as the primary function were more likely to be associated with the Planning cluster, and companies in the ARA group were less likely to be in this cluster.

The significant explanatory variables for the Active cluster were management pressures, retail as a primary function, and Sales, Marketing, or Communications as a job title. Companies with strong management pressures were 17.7% more likely to be in the Active cluster. Although

Table 6. Multinomial Logit Regression Results on Clusters of Sustainability Actions

Variable		Marginal Effects					
		Inactive		*Planning*		*Active*	
Internal Pressures	Owners	0.257 (0.149)	*	-0.052 (0.215)		-0.205 (0.198)	
	Mgmt.	-0.261 (0.232)		0.084 (0.231)		0.177 (0.107)	*
	Employees	0.151 (0.168)		-0.087 (0.181)		-0.064 (0.149)	
External Pressures	Customers	-0.118 (0.155)		0.300 (0.162)	*	-0.181 (0.163)	
	Suppliers	0.260 (0.229)		-0.400 (0.181)	**	0.139 (0.230)	
	Competitors	-0.094 (0.153)		0.081 (0.192)		0.014 (0.168)	
	Government	-0.233 (0.179)		0.180 (0.178)		0.054 (0.143)	
	Community	-0.095 (0.167)		-0.166 (0.199)		0.261 (0.218)	
	Media	-0.160 (0.169)		0.353 (0.182)	*	-0.194 (0.122)	
Supply Chain Position	Inputs	0.075 (0.198)		-0.199 (0.208)		0.124 (0.128)	
	Production	-0.102 (0.181)		0.097 (0.201)		0.005 (0.184)	
Primary	Production	0.052 (0.184)		0.048 (0.203)		-0.100 (0.140)	
	Wholesale	-0.056 (0.163)		-0.021 (0.191)		0.077 (0.184)	
Type of Company	Public	-0.210 (0.216)		-0.196 (0.307)		0.406 (0.362)	
	Cooperative	-0.080 (0.243)		0.243 (0.258)		-0.163 (0.112)	
Annual Revenue	$100-499m	-0.158 (0.172)		-0.217 (0.241)		0.375 (0.311)	
	$500-999m	-0.112 (0.232)		0.097 (0.305)		0.015 (0.283)	
	$1-10 bil	-0.070 (0.262)		-0.051 (0.273)		-0.019 (0.234)	
	Over $10b	0.026 (0.399)		-0.298 (0.323)		0.272 (0.475)	
Group	ARA	0.168 (0.262)		-0.405 (0.225)	*	0.238 (0.283)	
	ASTA	0.204 (0.277)		-0.184 (0.265)		-0.020 (0.247)	
Job Title	Exec Mgmt.	0.047 (0.270)		0.068 (0.305)		-0.116 (0.293)	
	Mgmt.	-0.299 (0.198)		0.252 (0.287)		0.047 (0.255)	
	Sales	-0.464 (0.125)	***	-0.170 (0.274)		0.634 (0.281)	**
Log Likelihood		-61.320	***				

Total N = 92 observations.
Notes: *p < 0.10   *p < 0.05   ***p < 0.01 (two-tailed tests).
Marginal effects are computed at the sample means. Standard deviations are in parentheses.

this result aligns with the effect of management pressure in the model on sustainability views, the effect is much smaller. Companies with retail as the primary function were less likely to be in the Active Sustainability cluster. This result is also in agreement with the previous model on sustainability views which showed that companies with retail as a primary function were less likely to be associated with the Broad Sustainability group. Finally, respondents with the job title of Sales, Marketing, and Communications were more likely to represent companies that were in the Active cluster.

A final multinomial logit model tested whether sustainability views explained company actions or deliverables. The dependent variable in the model was the categorical variable for the three sustainability action clusters: Inactive, Planning, and Active. The explanatory variables were the scores for the two factors on sustainability views: Profit-Driven and Innovative Sustainability (representing Levels 2 and 3 in the literature) as well as Organizational and Societal Sustainability (representing Levels 4 and 5). Table 7 presents the marginal effects of the multinomial logit model.

For a one unit increase in the factor score for Profit-Driven and Innovative Sustainability, a company was 14.7% less likely to be in the Active Sustainability cluster. For a one unit increase in the factor score for Organizational and Societal Sustainability, a company was 41.8% less likely to be in the Inactive cluster and 53.4% more likely to be in the Active cluster. As a result, companies that agreed with views representing the lower levels of sustainability were less likely to have active sustainability strategies. Companies that agreed with views representing the higher sustainability levels were more likely to have active sustainability strategies.

Table 7. Results of the Multinomial Logit Regression on Clusters of Sustainability Actions and Factors of Sustainability Views

Levels of Sustainability Views	Clusters of Sustainability Actions					
	Inactive		*Planning*	*Active*		
Profit-Driven and Innovative Sustainability	0.157 (0.110)		-0.010 (0.112)	-0.147 (0.087)	*	
Organizational and Societal Sustainability	-0.418 (0.117)	***	-0.116 (0.123)	0.534 (0.110)	***	
Log Likelihood	-83.911	***				

Total N = 92 observations.
Notes: *p < 0.10   *p < 0.05   ***p < 0.01 (two-tailed tests).
Marginal effects are computed at the sample means. Standard deviations are in parentheses.

Sustainability Performance Measures

When analyzing the questions on sustainability performance measures, principal component analysis retained only 76 observations because of a large number of "do not know" responses, and results indicated that only one factor was present in the data. In addition, cluster analysis determined that there were too many clusters present for meaningful interpretation. As a result, cross tabulations were calculated to determine the distribution of responses to the questions with respect to company characteristics. Table 8 provides a summary of the eight performance measures tested as well as p-values for the Chi-square test statistics for the cross tabulations. The test statistic is interpreted as the probability that there is no association between how a respondent answered a given question and the company characteristic under consideration.

The characteristics that had consistently significant associations with responses to the eight questions on performance measures were company type, revenue level, and job title. In general, publicly traded companies were more likely than privately held companies or cooperatives to be associated with using and developing performance measures, possibly as a way to convey information to stakeholders. Companies with the highest revenue (over $1 billion) were more likely than small and medium-sized firms to have responses of "do not know," possibly because they have more obstacles in communicating goals across their companies. Finally, respondents with the job title of Sales, Marketing, or Communications were also more likely than other respondents to answer "do not know" to the questions on performance measures, indicating that they may not be as well-informed as employees in management positions.

Discussion of Sustainability Levels

The principal component analysis performed on sustainability views and actions in this study indicates there are similarities between the levels of sustainability in agribusiness companies and the five levels characterized in the sustainability literature. In terms of views, two levels of sustainability are identified in agribusiness companies. The first level of sustainability is a combination of Levels 2 and 3 found in the theoretical literature which focuses on profit-driven and innovative sustainability. Companies associated with this level of sustainability focus on strategies that have a direct economic impact on the company including improved reputation, brand image, efficiency, and employee productivity. The second level of sustainability corresponds to Levels 4 and 5 in the theoretical literature which focus on the broader topics of organizational and societal sustainability. Companies associated with this level of sustainability focus on efforts beyond the normal scope of operations including sustainable business organization, supply chain management, and societal welfare.

There are also two levels of sustainability identified in terms of actions. The first level of sustainability actions include Levels 2, 3, and 4 from the literature which represent actions that align with normal business operations including investment in sustainable products and processes, marketing and public relations campaigns, sustainability incorporated into employee positions, environmental management systems, and supply chain management practices. The second level of sustainability actions is similar to Level 5 in the literature which is focused on actions that extend beyond the normal scope of the company such as the formalization of alliances, addressing human welfare issues, and creating new markets.

When assigning companies to levels of sustainability using cluster analysis, companies do not strictly align with a single level of sustainability. The Broad and Narrow Sustainability groups that emerged from the cluster analysis of sustainability views are characterized as having either high or neutral factor scores for both sustainability levels. Analysis of sustainability actions produced similar results: the Active Sustainability group has consistently high factor scores across both sustainability levels, the Planning group has mid-level scores, and the Inactive group has low scores. These results conform with the argument of Mirvis and Googins (2006) that while there may be distinct patterns of activity at each sustainability level, an individual company is rarely at only one stage of sustainable development.

The size of each cluster conveyed information about the companies represented in the survey. In terms of sustainability views, the majority of companies are associated with the Broad Sustainability group, indicating that the majority of agricultural companies recognize the importance and diversity of the roles of agribusinesses in the sustainability debate. For sustainability actions, the largest group is the Planning group and the smallest is the Active group. When comparing the group sizes for views and actions, it is apparent that there are a high percentage of companies claiming to be in the Broad Sustainability group with respect to views, but a much smaller percentage claiming to be active in their sustainability strategies. This may indicate that while companies tend to adopt sophisticated views of sustainability, their programs are more likely to involve actions at the lower levels of sustainability.

There is also a different combination of factors influencing sustainability views as opposed to actions. Involvement in inputs and production in the supply chain are significant for explaining a company's level of sustainability views, but not its actions. On the other hand, customer, supplier, media, and shareholder and owner pressures impact a company's level of sustainability activities, but not its views. The most significant factor affecting both sustainability views and actions is the influence of management. Companies with strong or very strong management influences are more likely than other companies to be associated with broad sustainability views and active sustainability programs. Conversely, size of the company has minimal effect on a company's level of sustainability views or its actions. It is also noteworthy that influences from competition and government regulations have no significant effects. Other significant variables of interest are association with the ARA group and a job title of Sales, Marketing, or Communications. The significance of these variables indicates that a respondent's personal knowledge of sustainability may influence his or her responses for the company.

After filtering the 114 original observations to eliminate those answering "do not know," 109 were retained for analysis of sustainability views, 92 for actions, and only 76 for performance measures. This is an indication that respondents are most familiar with their companies' views of sustainability, less familiar with their specific actions, and even less familiar with performance measures. It may also indicate that deliverable actions and measures are not as common as adopting views, and that implementing any type of performance measures may already be considered a high level of sustainability. While it was not possible in this study to analyze the performance measures of agribusiness companies in a similar manner as views and actions, it is still possible to conclude that the way in which a respondent answered each of the questions on performance measures was associated with whether the company was public, private, or a cooperative, its revenue level, and the respondent's job title. This suggests that there are differences in the flow of information within a company that depend heavily on these factors.

Further Research

This research has provided an introduction to the sustainability initiatives of agribusinesses in terms of views, actions, and performance measures. Similar to the previous literature which suggests that the majority of companies operate at the lower levels of sustainability (Markevich 2009), results from this research indicate that although U.S. agribusiness companies tend to adopt broad sustainability views which are driven by management pressures, they primarily develop actions at the lower sustainability levels which are driven by external pressures such as customers, suppliers, and the media. Further research is needed to fully understand the range and depth of sustainability present in the food and agricultural industry. This includes research to determine which companies embrace the full spectrum of sustainability views and actions, and which companies are more concerned with developing sustainability 'add-ons' as a way to appease stakeholders.

Further research depends primarily on additional data collection. Findings from this study are based on a small (n=114) sample size which mostly consists of input and production companies that view producers as their primary customers. A larger and more balanced sample is necessary for results to be generalized to the entire industry and to make strong comparisons within the supply chain. It would be critical to include more agribusiness companies that focus on the end

consumer as a vital driver of business. The large number of "do not know" responses is also an indication that data should be gathered from executives, rather than managers, to gain deeper insight into sustainability programs. Data collection could also be expanded to include executives in other countries as a way to compare sustainability practices on a global scale.

An additional topic to explore is whether sustainability is a brand issue as well as an issue that depends upon a company's position in the value chain. For example, companies with a cohesive brand name may be more likely to develop sophisticated sustainability programs than companies that deal with a variety of brands. In addition, a more in-depth survey with additional questions on sustainability views, actions, and performance measures would allow for clearer distinctions between levels of sustainability, and possibly even more levels than the ones found. Finally, care should be taken to control for the differences between the views of the respondent completing the survey and the views of the company that he or she represents because individual interpretations can influence how a company is portrayed.

References

Aigner, D.J., J. Hopkins, and R. Johansson. 2003. Beyond Compliance: Sustainable Business Practices and the Bottom Line. *American Journal of Agricultural Economics* 85:1126-1139.

Ambec, S., and P. Lanoie. 2008. Does It Pay to be Green? A Systematic Overview. *The Academy of Management Perspectives* 22 (4):45-62.

Aragon-Correa, J.A. 1998. Strategic Proactivity and Firm Approach to the Natural Environment. *Academy of Management Journal* 41 (5):556-567.

Aragon-Correa, J.A., N. Hurtado-Torres, S. Sharma, and V.J. Garcia-Morales. 2008. Environmental Strategy and Performance in Small Firms: A Resource-Based Perspective. *Journal of Environmental Management* 86:88-103.

Bansal, P. 2005. Evolving Sustainability: A Longitudinal Study of Corporate Sustainable Development. *Strategic Management Journal* 26:197-218.

Berns, M., A. Townend, Z. Khayat, B. Balagopal, M. Reeves, M.S. Hopkins, and N. Kruschwitz. 2009. Sustainability and Competitive Advantage. *MIT Sloan Management Review*, 19-26.

Brundtland, G.H. 1987. *Our Common Future: The World Commission on the Environment and Development*. Geneva, Switzerland: Oxford University Press.

Buysse, K., and A. Verbeke. 2003. Proactive Environmental Strategies: A Stakeholder Management Perspective. *Strategic Management Journal* 24 (5):453-470.

Carroll, A.B. 1991. The Pyramid of Corporate Social Responsibility: Toward the Moral Management of Organizational Stakeholders. *Business Horizons*:39-48.

Carter, C.R., and D.S. Rogers. 2008. A Framework of Sustainable Supply Chain Management: Moving Toward New Theory. *International Journal of Physical Distribution and Logistics Management* 38 (5):360-387.

Clift, R. 2003. Metrics for Supply Chain Sustainability. *Clean Technologies Environmental Policy* 5:240-247.

Elkington, J. 2004. Enter the Triple Bottom Line. In *The Triple Bottom Line: Does It All Add Up?* edited by A. Henriques and J. Richardson. London: Earthscan.

Epstein, M.J., and M.J. Roy. 2001. Sustainability in Action: Identifying and Measuring the Key Performance Drivers. *Long Range Planning, 34*(5), 585-604.

Esty, D.C., and A.S. Winston. 2009. *Green to Gold: How Smart Companies Use Environmental Strategy to Innovate, Create Value, and Build Competitive Advantage*. Hoboken, New Jersey: John Wiley and Sons, Inc.

Fritz, M., and G. Schiefer. 2008. Food Chain Management for Sustainable Food System Development: A European Research Agenda *Agribusiness* 2 (4):440-452.

Gasparatos, A., M. El-Haram, and M. Horner. 2007. The Argument Against a Reductionist Approach for Assessing Sustainability. In *International Conference on Whole Life Urban Sustainability and its Assessment*, edited by M. Horner, C. Hardcastle, A. Price and J. Bebbington. Glasgow.

Giovannucci, D. 2001. Sustainable Coffee Survey of the North American Specialty Coffee Industry.: The Summit Foundation, The Nature Conservancy, North American Commission for Environmental Cooperation, Specialty Coffee Association of America, and World Bank.

Goldin, I., and L.A. Winters, eds. 1995. *The Economics of Sustainable Development*. Cambridge: Press Syndicate of the University of Cambridge.

Greene, W.H. 2000. *Econometric Analysis* (4th ed.). Upper Saddle River, NJ: Prentice Hall, Inc.

Grolleau, G., N. Mzoughi, and A. Thomas. 2007. What Drives Agrifood Firms to Register for an Environmental Management System? *European Review of Agricultural Economics* 34 (2):233-255.

Hart, S.L. 1996. Beyond Greening: Strategies for a Sustainable World. *Harvard Business Review*, 67-76.

Hatcher, L. 1994. *A Step by Step Approach to Using the SAS System for Factor Analysis and Structural Equation Modeling*. Cary, NC: SAS Institute Inc.

Heller, M.C., and G.A. Keoleian. 2003. Assessing the Sustainability of the US Food System: A Life Cycle Perspective. *Agricultural Systems* 76:1007-1041.

Henriques, I., and P. Sadorsky. 1996. The Determinants of an Environmentally Responsive Firm: An Empirical Approach. *Journal of Environmental Economics and Management* 30:381-395.

IMAP. 2010. Food and Beverage Industry Global Report. Sarasota, FL: IMAP.

Jansen, K., and S. Vellema, eds. 2004. *Agribusiness and Society: Corporate Responses to Environmentalism, Market Opportunities and Public Regulation*. London, UK: Zed Books Ltd.

Judge Jr., W.Q., and T.J. Douglas. 1998. Performance Implications of Incorporating Natural Environmental Issues into the Strategic Planning Process: An Empirical Assessment. *Journal of Management Studies* 35 (2):241-262.

Kirchhoff, Stefanie. 2000. Green Business and Blue Angels: A Model of Voluntary Over Compliance with Asymmetric Information. *Environmental and Resource Economics* 15 (4):403-420.

Kriflik, L.S., and H. Yeatman. 2005. Food Scares and Sustainability: A Consumer Perspective. *Health, Risk and Society* 7 (1):11-24.

Marcus, A.A., and M.H. Anderson. 2006. A General Dynamic Capability: Does It Propagate Business *and* Social Competencies in the Retail Food Industry? *Journal of Management Studies* 43 (1):19-46.

Markevich, A. 2009. The Evolution of Sustainability. *MIT Sloan Management Review*, 13-14.

Mirvis, P., and B. Googins. 2006. Stages of Corporate Citizenship. *California Management Review* 48 (2):104-126.

Murray, S. 2010. How to Feed People and Save the Planet. *Financial Times*. Accessed Jan 30. http://www.ft.com/.

Nargundkar, S, and T.J. Olzer. 1998. An Application of Cluster Analysis in the Financial Services Industry. In *Sixth Annual Conference of the South East SAS Users Group*. Norfolk, VA.

Peterson, H.C. 2009. Transformational Supply Chains and the 'Wicked Problem' of Sustainability: Aligning Knowledge, Innovation, Entrepreneurship, and Leadership. *Journal on Chain and Network Science* 9 (2):71-82.

Porter, M.E., and C. van der Linde. 1995. Toward a New Conception of the Environment Competitiveness Relationship. *Journal of Economic Perspectives* 9 (4):97-118.

Punj, G., and D.W. Stewart. 1983. Cluster Analysis in Marketing Research: Review and Suggestions for Application. *Journal of Marketing Research* 20 (2):134-148.

Rigby, D., and D. Caceres. 2001. Organic Farming and the Sustainability of Agricultural Systems. *Agricultural Systems* 68:21-40.

van Marrewijk, M., and M. Werre. 2003. Multiple Levels of Corporate Sustainability. *Journal of Business Ethics* 44 (2):107-119.

Vorley, B. 2001. The Chains of Agriculture: Sustainability and the Restructuring of Agri-Food Markets. London: International Institute for Environment and Development.

Walton, S.V., R.B. Handfield, and S.A. Melnyk. 1998. The Green Supply Chain: Integrating Suppliers into Environmental Management Processes. *International Journal of Purchasing and Materials Management* 34 (2):2-11.

Willard, B. 2002. *The Sustainability Advantage: Seven Business Case Benefits of a Triple Bottom Line*. Gabriola Island, British Colombia, Canada: New Society Publishers.