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College and university dining services administrators’ intention to adopt sustainable practices: An application of the theory of planned behavior

by

Chao-Jung (Rita) Chen

A dissertation submitted to the graduate faculty in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Major: Foodservice and Lodging Management

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2008

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DEDICATION

This dissertation is dedicated to my family and my parents:

Tun-Hsiang Yu
Benjamin J. Yu
Chin-Chuan Chen
Se-Hua Chen Fu

Thank you for the sacrifices you made to make this happened. Thank you father and mother, for believing in me that I could do anything that I want and give me the opportunity to become the first person in our family to earn a doctoral degree. I know you have been proud.
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ABSTRACT

The purpose of this study was to identify sustainable practices existing in college and university dining services (CUDS) and to explore the influence of attitude, subjective norm (social pressures), perceived behavior control and personal norm on college and university dining services administrators’ (CUDSAs) intention to implement sustainable practices in their operations using the theory of planned behavior model. Data were collected with a web-based questionnaire sent to 535 CUDSAs in the United States listed in the National Association of College & University Food Services (NACUFS) directory. Thirteen e-mails were returned as undeliverable. A total of 138 CUDSAs responded, resulting in a 26.4% response rate. Sustainable practices perceived to occur most frequently in CUDS were recycling fat, oil and grease; recycling cardboard; using recycled paper products and recycling aluminum. The least common practices were serving locally grown food and composting.

Structural equation modeling was used to test hypotheses. Findings revealed that subjective norm had the most positive influence on CUDSAs’ intention to adopt sustainable practices, followed by attitude toward sustainable practices and personal norm. There was no significant relationship between perceived behavioral control and behavioral intention, suggesting that implementing sustainable practices was largely under volitional control. Including the personal norm construct in the TPB model reduced unexplained variance in the model by 33.48%, suggesting that personal norm had an effect on CUDSAs’ behavioral intention.
CHAPTER 1. OVERVIEW

Introduction

People’s perceptions have changed regarding the meaning of corporate social responsibility (CSR), from meeting economic and legal requirements to balancing or improving environmental and social impacts without damaging economic performance. Today, sustainability is on the agenda of governments, consumers, investors, and many business leaders in society (Carroll, 1999; Palazzi & Starcher, 2006).

Current food systems depend on industrialization and globalization of food production in order to provide large quantities, high quality, choices, and inexpensive food to more people. However, industrial agriculture requires mechanization, the use of herbicides and pesticides, and intensive confinement of animals. Increasing globalization leads to increased energy consumption as well. Current food systems have raised environmental, social, and economic concerns and challenges of sustainability (Heller & Keoleian, 2003; Murray, 2005; Novotny, 1999; Rimkus, Jones, & Ona, 2004). Many argue there is a need for more sustainable food systems.

A number of colleges and universities are organizing campus activities to create a sustainable food system via teaching and research. Due to the nature of higher education, colleges and universities have a responsibility to increase student environmental awareness and knowledge. As a unit of a higher education institution, college and university dining services provide healthful and nutritious meals and give students a chance to learn how their food decisions affect the whole food system via sustainable practices, including food procurement, waste management, energy and water conservation, and social responsibility.
The theory of planned behavior (TPB), which uses attitude toward behavior, subjective norm, and perceived behavior control constructs to predict certain behaviors, is widely used and a popular conceptual framework for human action (Ajzen, 1991). The TPB has been used in many studies in various areas such as business, ecology, marketing, and human resources.

**Purpose of the Study**

College and university dining services administrators (CUDSAs) are experiencing increased pressure from administrators, students, and staff regarding implementation of sustainable practices in their operations. Previous studies have assessed efficiency, implementation, obstacles, and comparison of sustainable practices in college and university dining services (Daly, 2007; Davies & Konishky, 2000; Ferris & Shanklin, 1993; Gregoire & Strohbehn, 2002; Murray, 2005; Vallianatos, Gottlieb, & Haase, 2004). However, no literature was found on CUDSAs’ intention to adopt sustainable practices and whether their attitude, subjective norm, perceived behavior, and personal norm would influence their behavioral intention. Hence, this study was designed to address this gap.

Specific objectives were to:

1. Identify sustainable practices currently existing in college and university dining services;
2. Examine dining services administrators’ intention to implement sustainability using the theory of planned behavior model.
3. Examine the effect of personal norm on CUDSAs’ behavioral intention.
Definitions

Common terms used in this dissertation are defined below.

**Attitude toward the behavior:** Attitude toward the behavior is the individual’s positive or negative evaluation of performing the particular behavior of interest (Ajzen, 2005, p. 118).

**Community food security (CFS):** CFS is defined as “a condition in which all community residents obtain a safe, culturally acceptable, nutritionally adequate diet through a sustainable food system that maximizes community self-reliance and social justice” (Community Food Security Coalition, 2007, p.4).

**Corporate social responsibility (CSR):** CSR is a concept whereby companies integrate “economic, legal, ethical, and discretionary [philanthropic] expectation that society has of organizations at a given point in time” (Carroll, 1979, p. 500).

**Food system:** A food system is defined as the steps from production (growing and harvesting), through purchasing, processing, packaging, distribution, food preparation, and consumption, to the final stage of food related waste disposal (Rinkus et al., 2004).

**Local food:** Food grown and processed within certain miles or a specific region.

**Organic food:** Organic food is produced by farmers who use renewable resources and conservation of soil and water to enhance environmental quality for future generations (U. S. Department of Agriculture [USDA], 2007).

**Perceived behavioral control:** Perceived behavioral control is one’s perceptions of whether he/she has means or opportunities to do a behavior. The means or opportunities determine the performance of the behavior as easy or difficult (Ajzen, 2005).

**Personal norm:** Personal norm is the feeling of strong obligations that people experience within themselves that prompt them to act in a social behavior (Schwartz, 1977).
**Personal value**: Personal value is beliefs relating to the desired behaviors or modes of conduct that guide choices of actions for an individual (Hansen, 2008).

**Subjective norm**: Subjective norm is the strength of influence other people have over an individual’s intention to perform or not perform a behavior (Ajzen, 2005).

**Sustainability**: Sustainability is defined as activities or practices by college and university dining services staff to establish economic, environmental, and social balance, and maintain or improve the ecosystem both presently and for the future.

**Sustainable food system**: A sustainable food system provides society with an affordable, safe and nutritious food supply. The food is grown in a way that is environmentally sustainable and adds economic and social value to rural and urban communities (W.K. Kellogg Foundation, n.d.).

**Sustainable practices**: Sustainable practices are the actions that college and university dining take in order to conserve resources.

**Theory of planned behavior**: The theory of planned behavior (TPB) is a derived model from the theory of reasoned action. The model assumes that a person’s behavior can be predicted by the person’s intention to perform the behavior, and that behavioral intention is influenced by personal attitude and perceptions of others’ view toward that behavior (subjective norm). The TPB also takes self-efficacy or ability to perform the behavior of interest into account (perceived behavioral control) (Ajzen, 1991).
Dissertation Organization

This dissertation is organized into six chapters: Chapter 1 includes a general introduction of the research topic; Chapter 2 provides a comprehensive review of literature; Chapter 3 methodology; Chapter 4 comprises a manuscript to be submitted to the *Journal of Foodservice Management and Education* with the focus on the existing sustainable practices in college and university dining services; Chapter 5 consists of a manuscript to be submitted to the *Journal of Hospitality and Tourism Research* with focus on the foodservice administrators’ behavioral intention using the theory of planned behavior. The summary and conclusion of the study are presented in Chapter 6. A reference list and appendices follow Chapter 6.
CHAPTER 2. REVIEW OF LITERATURE

Introduction

This literature review includes five major sections. The first section presents an overview of corporate social responsibility (CSR), with an emphasis on historical background and two models for CSR. The second section reviews literature related to food systems and includes concerns for conventional food systems, sustainability in food systems, and alternative food systems. The third section presents the role of higher education and dining services regarding sustainability. The fourth section lists current sustainable practices in the foodservice industry. The theory of planned behavior (TPB) and previous studies that employed the TPB are discussed in the fifth section.

Overview of Corporate Social Responsibility

Business cannot operate without society and society cannot develop well without business. Today, there is an increasing number of organizations that integrate the concept of CSR into their business missions, operations, marketing, and management in Western Europe, Japan, and North America (Fenwick & Bierema, 2008; Palazzi & Starcher, 2006). Businesses need to ensure shareholder wealth and also pursue CSR. Literature indicates potential motivators for organizations acting in socially responsible manners, such as improved bottom line, reduced operating costs, increased employee commitment and involvement, enhanced public and investor relations, improved employee retentions, enhanced organizational reputation and brand value, development of close relationships with customers, and good relations with government and communities (Bevan, Isles, Emery, & Hoskins, 2004; Juholin, 2004; McIntosh, Thomas, Leipzinger, & Colemen, 2003).
Historical Definition of Corporate Social Responsibility

Corporate social responsibility (CSR) is not a new concept. The concept of CSR has gone through several major changes in the last 50 years. However, there is still no commonly accepted definition (Kärnä, Hanse, & Juslin, 2003; Welford, 2004). One reason may be the lack of agreement on what CSR really means (Carroll, 1979). In the 1950s, the definition of CSR focused on the businessman’s responsibility. For example, Bowen (1953) defined CSR as “the obligations of businessmen to pursue those policies, to make those decisions, or to follow those lines of action which are desirable in terms of the objectives and values of our society” (p. 6).

In the 1960s, the idea of CSR changed to focus on going beyond economic and legal requirements. McGuire (1963), for instance, noted in his book Business and Society, that “the idea of social responsibilities supposes that the corporation has not only economic and legal obligations, but also certain responsibilities to society which extend beyond these obligations” (p. 144). And Walton (1967), in his book Corporate Social Responsibilities, stated that CSR should be a concern of top management which recognizes “the intimacy of the relationships between the corporation and society and realizes that such relationships must be kept in mind by top managers as the corporation and the related groups pursue their respective goals” (p. 18).

CSR extended from economic and legal requirements to the characteristics of socially responsible behavior in the 1970s. Davis (1973) suggested that “it is the firm’s obligation to evaluate in its decision-making process the effects of its decisions on the external social system in a manner that will accomplish social benefits along with the traditional economic gains which the firm seeks” (p. 313). Carroll (1979), using the “Four-Part Model of
Corporate Social Responsibility,” defined CSR as encompassing the “economic, legal, ethical, and discretionary [philanthropic] expectations that society has of organizations at a given point in time” (p. 500).

In the 1980s, the focus on CSR changed slightly. Researchers focused on redefining CSR and alternative concepts and themes, such as business ethics and corporate social performance. For example, Frederick (1986) indicated that recognition of business normative (ethical) issues is essential because the relationships between business and society are mutual in character. Social standards may constrain business in different ways, especially when social controls that seek to protect human consciousness and human community override the economizing process.

In the 1990s, researchers tried to measure CSR by applying theories via different aspects such as corporate social performance (CSP), business ethics, and stakeholder theory. Wood (1991), for instance, developed a CSP model, based on Carroll’s (1979) three-dimensional CSR model and the model developed by Wartick and Cochran (1985). In Wood’s model, outcomes and performance were emphasized and CSR was placed into a broader context than just a definition. Wood (1991) stated that “the basic idea of corporate social responsibility is that business and society are interwoven rather than distinct entities; therefore, society has certain expectations for appropriate business behavior and outcomes” (p. 695).

Globalization has changed the view of CSR. Today, CSR is an important business concept and can be found in many corporations’ missions and value statements (Cruz, 2008). It is not only on the agenda of many CEOs, but also on the agenda of governments, consumers, investors, and many business leaders in the society (Palazzi & Starcher, 2006).
Moreover, the concept of sustainability, which requires corporations to balance or improve environmental and social impacts without damaging economic performance, has become an important part of CSR (Williamson, Lynch-Wood, & Ramsay, 2006). For example, the Commission of European Communities (2001) defines CSR as “a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis” (p. 8).

The concept of CSR has changed from providing goods and services to society to contributing welfare to society (Williamson et al., 2006). Palazzi and Starcher (2006) stated in their report that there is an increasing number of companies integrating the interests and needs of customers, employees, suppliers, communities, environment, and shareholders in Western Europe, Japan, and North America. They believe that this approach can generate increased long-term profit and growth. After several decades of discussions, there is still no common definition of CSR. Perhaps, this is better because it allows corporations to interpret CSR as they see suitable and add it to their core operations without significantly changing how corporations operate (Welford, 2004).

**Models for Corporate Social Responsibilities (Dimensions)**

CSR not only has various definitions, but also has several associated terms designed to capture the practices and norms of the relationship between corporations and society. According to Visser (2006), terms such as business ethics, corporate citizenship, sustainability or sustainable development, corporate environmental management, and stakeholder management are the most popular. For the purpose of this study, CSR is viewed as an umbrella concept, which includes stakeholder management, environmental management, business ethics, and corporate performance. This study focuses on Carroll
Carroll’s (1979) “Four-Part Model of Corporate Social Responsibility” is a well-accepted and established CSR model (Matten, 2006). Carroll (1979) identified four categories of CSR: economic, legal, ethical, and discretionary and presented them as a pyramid in 1991. The fundamental responsibility of a corporation is economic, in which corporations meet the basic requirement: producing goods and services that society wants and selling them at a fair price to make a profit.

Legal responsibility of corporations requires obedience to the laws and regulations while businesses execute the pursuit of their economic responsibilities. Society requires businesses to fulfill economic responsibilities, and at the same time, meet legal requirements. The concept of ethics is about what is right, just, and fair behavior when a company is not forced by the laws and regulations. Finally, corporations’ discretionary responsibilities include roles that corporations carry out to provide for the betterment of society (Carroll, 1991). These roles are not required by law and are voluntary. In the model, Carroll (1991) tried to establish a relationship between businesses and society; however, the field of environment sustainability was omitted (Visser, 2006). There is evidence that the current trend of CSR is to integrate the social, economic, and environmental aspects (Visser & Sunter, 2002).

A more recent and inclusive model is one proposed by Palazzi and Starcher (2006). They proposed six key dimensions for CSR: customers, employees, suppliers, investors, communities, and environment.
Customers

Globalization, competition, and environmental changes have shifted power from corporations who make products and provide services, to customers who buy and use them. Therefore, companies are more profitable when they spend time and money on identifying what their customers want and provide quality, reliable goods, and service (Palazzi & Starcher, 2006). Today, there is an increased consumer concern for the environment (Grove, Fisk, Pickett, & Kangun, 1996). Research has shown that customers appreciate and reward corporations that show strong environmental and social responsibility (Bang, Ellinger, Hadjimarcou, & Traichal, 2000; Choi & Parsa, 2006; Palazzi & Starcher, 2006).

Employees

A socially responsible corporation demonstrates a commitment to human rights through offering employees fair wages, a non-discriminating and participatory workplace environment, continuing education and training, and job security. Studies show that corporations that provide these practices increase their employees’ morale, productivity, skills, commitment to corporations, as well as the quality and reliability of their products (e.g., Déniz-Déniz & De Saá-Pérez, 2003; Joyner & Payner, 2002). These practices have a direct impact on their profits (Joyner & Payner, 2002). Moreover, caring for employees will lead to lower turnover rates and absenteeism, and result in higher employee and customer satisfaction and loyalty (Lockwood, 2004). Employees and managers are seeking opportunities to do good and will commit to their corporations if they feel their corporations are “doing the right thing” (Hollender, 2004; Joyner & Payner, 2002).
Suppliers

Having a good long-term relationship and working closely with business partners can be critically important to competitive success (Business for Social Responsibility, 2007). Instead of negotiating the lowest prices, corporations should offer reasonable prices to ensure their suppliers’ profitability, involve suppliers in new product development, and treat their core suppliers as true business partners. In exchange, suppliers will provide quality products and reliable delivery.

Investors

The social responsibility of businesses has shifted from maximizing profit for the stakeholders to depending more heavily on perceived “corporate citizenship” (Kiernan, 2001). Studies show that companies with higher standards on CSR help the bottom line (Lockwood, 2004; Zairi & Peters, 2002). A growing number of investors are demanding CSR information. In recent years, CSR reports, including environmental, social, and governance issues, should be included in corporations’ annual reports. Investors use CSR reports information as a sign of good management and the information also ties into financial performance (Bansal, Maurer, & Slawinski, 2008).

Communities

Corporations operate their business in neighborhood, local, regional, national, and global communities. Corporations with strong CSR programs see communities as assets to be managed as capital and partner with communities to help ensure the health, stability, and prosperity of the society and of the communities in which they operate (Palazzi & Starcher, 2006). Corporations can relate to communities in several ways, such as charitable contributions, social investment, and partnership.
Environment

Corporations have been changing their orientation and behavior when facing environmental concerns. Many corporations adopt environmental management systems to promote pollution prevention, minimize resource consumption, and use clean technologies (Henriques & Sadorsky, 1999). There is increasing pressure from legislators, consumers, shareholders, communities, and insurance companies for corporations to adopt more proactive environmental practices (Tilikidou, 2007). Many corporations’ leaders voluntarily report on environmental and social issues which affect them and how they deal with them (Heilmayr, Adidjaja, & Morhardt, 2006).

Through engagement, disclosure, and constructive responses to those six dimensions of CSR, corporations can build accountability to foster trust from employees, communities, investors, and society. Accountability enhances corporations’ intangible assets such as brand, reputation, and employee and customer loyalty. Kiernan (2001) conducted a study in four industry sectors—mining, integrated oil and gas, steel, and electric utilities—using a time series method to investigate the relationship between a firm’s level of environmental practices and financial performance. The results from the study indicated that stock returns of environmental leaders outperformed those of laggards. Konar and Cohen (2001) analyzed the effect of environmental performance on the market value of manufacturing firms listed in the S&P 500 and found environmental performance had a significant effect on the intangible asset value of publicly traded firms in the S&P 500. The authors estimated that environmental performance was worth about $380 million in market value, which constitutes about 9% of the replacement value of tangible assets.
Food System

Food systems include production (growing and harvesting), purchasing, processing, packaging, distribution (transporting and marketing), food preparation, consumption, and food-related waste disposal (Murray, 2005; Rimkus et al., 2004). Today, numerous concerns have been raised due to increased globalization, which results in products traveling long distances to meet consumers’ demands and needs. The corporate market is dominated by large agribusiness and other corporations (Murray, 2005; Rimkus et al., 2004). The concerns can be broadly categorized as environmental and socio-economic.

Environmental Concerns

Areas related to the environmental concerns in food systems include chemical and water pollution, energy consumption, and food waste. These areas are mainly associated with production, processing and distribution.

Chemical and water pollution

In order to provide large quantities and inexpensive food, modern agriculture relies heavily on chemicals (e.g., fertilizers and pesticides), water, new crop strains, and other technologies (e.g., genetic engineering) (Rimkus et al., 2004; Tilman, Cassman, Mastson, & Polasky, 2002). Farmers have been using water from rivers and groundwater to irrigate crops. Novotny (1999) estimated that agriculture uses about 70% of all freshwater, which makes agriculture the largest user of freshwater resources. Farmers in the U.S. spent $7.6 billion on agricultural chemicals in 2002 (USDA, 2004). High applications of agricultural chemicals can cause toxins in groundwater and surface waters, and weakened soil quality. Poor soil quality will require using more fertilization, irrigation and energy to maintain productivity.
(Heller & Keoleian, 2003; Novotny, 1999; Tilman et al., 2002). Moreover, those chemicals can harm human health (Tilman et al., 2002).

Koneswaran & Nierenberg (2008) estimated that humans consume 56 billion land animals globally each year. This high consumption of land animals leads to an industrial-scale production where several thousand cattle or pigs, or 100,000 or more chickens, were raised in an animal production facility (Tilman et al., 2002). This intensive production system was identified by the Food and Agriculture Organization (FAO) of the United Nations in 2006 as “a major threat to the environment.” Greenhouse gas (GHG) emissions increase when the production of meats, egg, and dairy rises (Koneswaran & Nierenberg, 2008). According to the EPA (2006a), the livestock population size is either a direct or indirect source of GHG emissions. Also the handling and disposal of animal wastes are associated with air, groundwater and surface water pollutions (Koneswaran & Nierenberg, 2008; Tilman et al., 2002). In the U.S., intensive confined production systems produce 500 million tons of solid and liquid waste annually and storing and disposing of this manure accounts for 25% of agricultural methane emission (Koneswaran & Nierenberg, 2008).

**Energy consumption**

Energy consumption from fossil fuel is one of the major environmental problems associated with food systems (Murray, 2005). A previous study found that food systems used almost 16% of total U.S. energy (Pirog, Pelt, Enshayan, & Cook, 2001). Within food systems, transportation accounted for 11%, agricultural production for 17.5%, processing for 28.1%, restaurants for 15.8%, and home preparation for 25%. Moreover, 3.5% of retail food expenditures or $21.6 billion of the energy bill was spent on marketing food in the U.S. in 1999 (Pirog et al., 2001).
Two common ways to quantify a food system’s environmental impacts are life-cycle analysis (LCA) and food miles. Life cycle analysis is also known as life-cycle assessment, ecobalance, or cradle-to-grave analysis. According to the U.S. Environmental Protection Agency (EPA) (2007a) web site, LCA is a method to assess the potential environmental impacts associated with products, processes, or services. LCA can be used to identify where the largest environmental impacts are occurring and give potential ways to reduce the environmental impacts from the food system (Ohlsson, 2004). Food miles can be defined as “the distance food travels from where it is grown or raised to where it is ultimately purchased by the consumer or other end-user” (Pirog et al., 2001, p. 9). Food travels long distances in the current food system. One study, for example, found fruits traveled an average distance of 2,146 miles, while the average for vegetables was 1,596 miles (Pirog et al., 2001). These distances increase energy use and air pollution (Murray, 2005).

**Food waste**

Food waste and packaging materials make up a significant portion of the overall municipal solid waste (MSW) stream in the U. S. They are the two main categories of solid waste generated by the foodservice industry, most of which can be recycled, reused, composted, used as alternative food sources (animal food), or converted to alternative energy sources (Davies & Konisky, 2000; Ferris & Shanklin, 1993). Despite increased recycling efforts, food and beverage packaging still accounted for about 10.3% of the total MSW in 1997 and only 30% was recovered (Heller & Keoleian, 2003).

Food waste management can be used to assess the environmental impact of the whole food chain (Ohlsson, 2004). It is important to analyze the environmental impact of food production chains, such as how food waste is generated and how it can be returned into the
food chain (Ohlsson, 2004). However, food waste is the single-largest component of discarded waste by weight in the U.S. (EPA, 2007b). Miller (2004) reported that Americans threw away 474.5 pounds of food per year per person, which was 1.3 pounds of food per day per person. Moreover, according to EPA (2006b), about 100 billion pounds of food waste are produced each year. Food waste accounted for 11.7% of the total MSW, and only 2.7% was recovered. The rest was thrown away and disposed of in landfills or combusted in incinerators (EPA, 2005). Furthermore, the cost of national food waste disposal is about $1 billion a year (EPA, 2007b).

Food waste not only increases disposal costs, but also impacts the nation environmentally. Environmental impacts of food waste are: (1) increasing the cost of waste water treatment, (2) contributing to odor and generating green house gases at disposal facilities, and (3) helping generate leachate, the toxic soup that drains from landfills into our drinking water systems (Georgia Pollution Prevention Assistance Division [P²AD], 2000).

Examples of food waste include preparation waste, uneaten portions, grease, dairy products, beverages containing sugar, and dressings (P²AD, 2000). Recovery and recycling are ways to reduce food waste. If 5% of the food waste could be recovered, four million Americans could be fed every day. The EPA (2006b) has suggested a food waste recovery hierarchy providing foodservice providers with a guide in separating excess and uneaten food. The food waste recovery hierarchy is comprised of six steps: (1) source reduction, reducing the volume of food waste generated; (2) feeding hungry people, donating excess food to charities; (3) feeding animals by providing food to farmers; (4) industrial uses, providing fats for rendering and food discards for animal feed production; (5) composting, converting food waste into a nutrient-rich soil additive; and (6) landfill/incineration as the final option.
Socio-economic Concerns

Economic and social problems associated with food systems cannot be separated from economic and social pressure. The socio-economic impacts include loss of farmers, and health and nutrition concerns.

Loss of farmers

In the early 1950s farm units were formed from small family farmers. During the period of late 1950 farming shifted to a larger monoculture with intensively operated farm units. The decrease in farm size reduced the number of people employed in agriculture. For example, farm labor changed from 9.9 million in 1950 to 2.8 million in 1998 (Heller & Keoleian, 2003; Pretty et al., 2001). Moreover, while food production has increased dramatically, profits for farmers have decreased (Novotny, 1999). In the United State, there were about 1.9 million small or limited-resource farms that had an average net income of less than $25,000 (Tropp & Olowolayemo, 2000). According to Heller and Keoleian (2003), the age of farm operators is increasing. In 1997, the average age of the farm operators was 54.3 years and 61% of them were 55 years and older whereas in 1954, only 37% were 55 years and older. Farm operators also face a higher rate of health risk from the use of chemical pesticides than the average population (Hoppin, Umbach, London, Alavanja, & Sandler, 2002). Over half (69%) of farm workers were family workers and the remainder were hired farm workers. However, 28.4% of hired farm workers were not U.S. citizens (Heller & Keoleian, 2003). More than 155,000 farms were lost from 1987 to 1997 because of economic pressures that led to the collapse of rural communities and localized marketing systems (Gold, 1999).
Modern agriculture requires high capital investment, which can lead to high costs for entry and result in a decline in the number of young farmers (Heller & Keoleian, 2003). Food is inexpensive in the U.S. Farmers’ gross return on a consumer’s dollar spent on food in 1998 was 20 cents, compared to 40 cents in 1975. Farmers received a smaller portion of the food bill due to the increased costs of food processing, handling, and marketing, which comprised 80% of the food bill (Heller & Keoleian, 2003). Moreover, major grocery store retailers purchase their produces from large concentrated growers and processors instead of local producers. Without a market for local farmers to sell their produce, there is less money circulated within the local economy (Daly, 2007).

**Health and nutrition**

Nutrition and human health is another social concern. Conventional food systems have provided sufficient food supply in developed countries; however, the systems have failed to provide adequate and nutritionally balanced foods to meet all the nutritional needs of every person. Welch and Graham (1999) indicated that modern agriculture focuses on productivity but gives little thought to nutritional value and human health. In the article, historical statistics such as micronutrient malnutrition in human populations; percentage change in the production of rice, wheat and pulses; and population growth were used to demonstrate the importance of providing balanced and nutritious food to every person.

Intensive animal production operations not only cause pollution but also lead to human health problems. For example, an influenza A virus (H5N1) killed six people and led to more than 1.2 million birds being slaughtered in Hong Kong in 1997. Foot-and-mouth disease caused the destruction of 440,000 hogs in 1967 and 1.2 million in 2001. In 1996, mad cow disease resulted in the destruction of 11 million animals (Tilman et al., 2002). As a
result, antibiotics are used to prevent diseases associated with intensive animal confinement facilities. The production of antibiotics for animal use was eight times more than for human medicine (Salvi & Hatz, 2004; Tilman et al., 2002). However, using huge amounts of antibiotics can lead to the growth of antibiotic-resistant bacteria (Salvi & Hatz, 2004; Sanders, 1999; Tilman et al., 2002).

A higher consumption of meat can lead to certain diseases such as heart disease, certain types of cancer, obesity, overweight, and stroke (Sanders, 1999; Song, Manson, Buring, & Liu, 2004). For example, Song, Manson, Buring, and Liu (2004) did a longitudinal study comparing the highest intake to the lowest intake of red meat consumption among 37,309 women for an average of 8.8 years. They found that consumption of red meat had a positive effect on increased risk of developing type 2 diabetes in middle-aged and older U.S. women. One of the reasons that higher consumption of meat leads to certain diseases might be that animals raised in intensive production systems contain higher saturated fat (Nürnberg, Wegner, & Ender, 1998). Increasing the consumption of whole and higher fiber-containing foods such as vegetables, fruits and whole grains may reduce the risk of those diseases. However, fruits and vegetables tend to be consumed less than the recommended amount (Murray, 2005).

According to Variyam (2005), 81% of total consumer food expenditures is used to pay for marketing. Only $105 million was spent on advertising the consumption of fruits and vegetables and $333 million was spent on nutrition education, evaluation and demonstrations in food marketing. Conversely, foods such as candy and gum ($765 million), beer ($728 million), carbonated soft drinks ($546 million), and snacks and nuts ($330 million) were most advertised and have been overconsumed (Gallo, 1999).
Away-from-home food is an increasing trend; the percentage of total food expenditures that Americans spend on dining out has increased from 28% in 1962 to 47% in 2003 (Variyam, 2005) and the National Restaurant Association predicted by 2010 Americans will spend more money on away-from-home food than at-home food (Davis & Stewart, 2002). One of the reasons for increasing away-from-home food might be the increase in discretionary income. Variyam (2005) indicated that a 10% increase in income would lead to a 4.6% increase in a household’s away-from-home food expenditures compared with only a 1.3% increase in at home food expenditures. However, food consumed away-from-home may cause some health and nutrition concerns, such as obesity because away-from-home foods usually are more calorie-dense than foods prepared at home (Heller & Keoleian, 2003; Variyam, 2005).

**Sustainable Food System**

“Sustainability is critical for ensuring a future food supply that protects both human and environmental health” (American Dietetic Association, 2007, p. 4). There are many different interpretations of the definition of “sustainability”. The term “sustainability” was used in the World Commission on Environment and Development report, the so-called Brundtland Report, in 1987. The report defined sustainability as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (EPA, 2008). Kirschenmann (2006) explained the importance of sustainability in the foodservice industry saying “it’s all connected” because human health cannot be maintained apart from eating healthy nutritious food, which requires healthy soil, clean water and healthy plants and animals (p. 1). Dahlberg (1993) indicated that a sustainable food system is
not only about production, but also processing, distribution, consumption, recycling, and waste disposal.

Kloppenburg, Lezberg, De Master, Stevenson, and Hendrickson (2000) described a set of sustainable food system attributes such as environmentally sustainable, proximate, economically sustaining, participatory, just/ethical, healthful, and diverse. Environmental sustainability is about sustaining the environment for future generations. Proximity emphasizes locally grown food, regional trading, locally-owned processing, and local currency. Economical sustainability means local farmers and area businesses can make a profit, be able to support a good standard of living for their workers, household, and the community. Participation is people becoming active in the democratic, decision-making process of the operation of a food system. Justice/ethics includes human rights, the working environment, providing humane treatment for farm animals, and treating the earth with respect. In sustainable food systems, healthfulness is when food production and consumption contribute to the health of eaters and producers, and both freshness and taste are valued. A diverse food system is to encourage varieties of crops and animals for consumer choices at the market place. Previous research agreed that a sustainable or an alternative food system should emphasize environment and human health, social, and economic areas (Choi & Parsa, 2006; Heller & Keoleian, 2003).

While the current food system enables people to have high quality and inexpensive food, it is also threatening our environmental, social, and economic sustainability. There is a need for an alternative, more sustainable food system. According to the W.K. Kellogg Foundation (n.d.), a more sustainable food system should be able to provide society with (1) an affordable, safe and nutritious food supply which people can purchase and access, and will
not cause chronic illness; (2) foods grown in a way that is environmentally sustainable; and (3) an added economic and social value to rural and urban communities.

Two examples of the concepts of a sustainable food system are sustainable agriculture and community food security. Sustainable agriculture is not only focused on farmers’ organic production practices but also their responsibility of land stewardship, promoting farmers’ markets and community-supported agriculture (Campbell, 2004). Sustainable agriculture attributes include eating local seasonal foods, protecting small diversified family farms, buying produce directly from farms, and performing environmentally sustainable production practices. People who should participate in sustainable agriculture are family farmers, community-supported agriculture farmers, small-scale food processors and distributors, direct marketing outlets such as farmers markets, and independent food retailers (Campbell, 2004).

The concept of community food security (CFS) was originally introduced and designed to feed hungry people. Now CFS is defined as “a condition in which all community residents obtain a safe, culturally acceptable, nutritionally adequate diet through a sustainable food system that maximizes community self-reliance and social justice” (Community Food Security Coalition [CFSC], 2007, p4). CFS links together food system activities (production, processing and distribution) and community goals (health, economic vitality, neighborhood improvement) (Pothukuchi, 2004) and focuses on community-level changes in food sources and resources, transportation, and food access, nutrition and dietary health, food safety, employment opportunities in food production, and reduction of environmental hazards in food production and processing (Campbell, 2004).
Role of Higher Education and Dining Services

Currently, the total population on U.S. college and university campuses, including students, staff and administrators, is around 20 million individuals (Eagan, Keniry, Schott, Dayananda, Jones, & Madry, 2008). In many ways, the higher education sector reflects American society. As colleges and universities educate and prepare future leaders, they spend billions of dollars to build and maintain classrooms/offices, research labs, housing units, foodservices, parking lots, and recreational facilities (Eagan & Keniry, 1998). Considering the amount of energy and water that is used, and the amount of waste and pollutants generated from over 4,000 colleges and universities in the U.S., higher education institutions have a huge impact and influence on the environment. Moreover, colleges and universities provide education to students who will plan and develop future institutions, so higher education institutions have a responsibility to enhance student awareness and knowledge of sustainability. Because of the impact they have on the environment, it is crucial that higher education institutions become environmentally responsible campuses (Earl, Lawrence, Harris, & Stiller, 2003).

What would an environmentally responsible campus be like? An environmentally responsible campus should teach students about the degradation of the environment and encourage students to seek sustainable practices, at the same time, being a role model for students (Clugston & Calder, 1999). Many higher education institutions benefit from reducing their negative impact on the environment via financial incentives (Eagan & Keniry, 1998). Reducing waste leads to a reduced tipping fee, a fee charged for waste disposal in a landfill or incinerator. Energy efficiency and water conservation save utility and water bills. In sum, being an environmentally responsible campus is cost effective. For example, the
University of Wisconsin-Madison began recycling office paper, cardboard, newspaper, and other low grades of paper, which resulted in an average annual cost saving of $48,000. They generated an average annual revenue of $72,000 by selling those recycled materials for market price (Eagan & Keniry, 1998). Table 2.1 lists annual revenues and savings for 23 campus conservation projects in 1998. If every campus could realize resource and financial savings, the impact on the environment and institutional budgets would be huge. As a unit of a higher education institution, dining services are part of colleges’ and universities’ ecological footprints. Dining services not only have a responsibility to provide healthful and nutritious meals to students, but also to help students build good eating habits (Strohbehn & Gregoire, 2004). Moreover, it is important to educate students about how the food systems can impact the environment while adopting sustainable practices in dining services.
Table 2.1 Annual Revenues or Savings for 23 Campus Conservation Projects

<table>
<thead>
<tr>
<th>Conservation Projects</th>
<th>University</th>
<th>Annual Revenues or Savings ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transportation</strong></td>
<td>Cornell University, NY</td>
<td>3,123,000</td>
</tr>
<tr>
<td>Getting students and staff out of the car(^a)</td>
<td>University of Colorado, Boulder, CO</td>
<td>1,000,000</td>
</tr>
<tr>
<td>Creating a Bus-riding campus(^a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Energy Conservation</strong></td>
<td>SUNY-Buffalo, NY</td>
<td>9,068,000</td>
</tr>
<tr>
<td>Creating strategies for saving energy(^a)</td>
<td>Elizabethtown College, PA</td>
<td>247,000</td>
</tr>
<tr>
<td>Lighting and equipment retrofits(^a)</td>
<td>Brevard Community College, FL</td>
<td>2,067,000</td>
</tr>
<tr>
<td>A four-campus energy reduction strategy(^a)</td>
<td>Brown University, RI</td>
<td>15,500</td>
</tr>
<tr>
<td>Laboratory renovations and more(^a)</td>
<td>Dartmouth College, NH</td>
<td>75,000</td>
</tr>
<tr>
<td>Burning better lights in Dorm rooms(^a)</td>
<td>Georgetown University, Washington, DC</td>
<td>45,000</td>
</tr>
<tr>
<td>Solar panels generating saving(^a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Water conservation</strong></td>
<td>Columbia University, NY</td>
<td>235,000</td>
</tr>
<tr>
<td>New toilets and water fixtures(^a)</td>
<td>Brown University, RI</td>
<td>45,800</td>
</tr>
<tr>
<td>Cleaning up with water saving showerheads(^a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dining Services</strong></td>
<td>Harvard University, MA</td>
<td>186,500</td>
</tr>
<tr>
<td>Washable cups in the freshman union(^a)</td>
<td>University of Wisconsin-Madison, WI</td>
<td>11,400</td>
</tr>
<tr>
<td>Saving on refillable &quot;Red Mug&quot;(^ab)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Re-Use</strong></td>
<td>University of Wisconsin-Madison, WI</td>
<td>241,800</td>
</tr>
<tr>
<td>Sale of surplus property(^ab)</td>
<td>University of Illinois-Urbana-Champaign, IL</td>
<td>3,500</td>
</tr>
<tr>
<td>Marinating vehicles with re-refined motor oil(^a)</td>
<td>University of Washington, WA</td>
<td>14,400</td>
</tr>
<tr>
<td>Second time around for chemicals(^ab)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Management of Hazardous Chemicals</strong></td>
<td>Seattle University, WA</td>
<td>1,300</td>
</tr>
<tr>
<td>Cutting out the weed-killers(^a)</td>
<td>University of Minnesota, MN</td>
<td>37,000</td>
</tr>
<tr>
<td>Chemistry classes with fewer chemicals(^a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Composting</strong></td>
<td>Dartmouth College, NH</td>
<td>10,000</td>
</tr>
<tr>
<td>Creating fertilizer with kitchen food waste(^a)</td>
<td>University of Colorado, Boulder, CO</td>
<td>1,300</td>
</tr>
<tr>
<td>Composting landscape waste and scrap wood(^a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Recycling</strong></td>
<td>University of Colorado, Boulder, CO</td>
<td>107,000</td>
</tr>
<tr>
<td>Award-wining materials recovery program(^ab)</td>
<td>Harvard University, MA</td>
<td>79,000</td>
</tr>
<tr>
<td>Dining services recycling(^a)</td>
<td>University of Wisconsin-Madison, WI</td>
<td>120,000</td>
</tr>
<tr>
<td>Getting top dollar from paper recycling(^ab)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analyzing waste to cut costs(^ab)</td>
<td>University of Wisconsin-Madison, WI</td>
<td>21,000</td>
</tr>
</tbody>
</table>

\(^a\) Cost saving  
\(^b\) Revenue  

Sustainable Practices in the Foodservice Industry

The U.S. foodservice industry comprises an estimated 945,000 individual establishments and is expected to have total sales of $558 billion in 2008. The foodservice industry is one of largest employers in the nation, with an estimated 13.1 million people currently working in foodservice establishments (National Restaurant Association [NRA], 2008). The foodservice industry can significantly influence the environment. There are many different sustainable practices that have been adopted by the foodservice industry. The following section will provide some examples of these current practices, divided into two groups: environmental and socio-economic.

Environmental Practices

Recycling

Because of increased tipping fees, reduced landfill space, and regulatory mandates, many foodservice operations have implemented source-reduction activities and began recycling programs (Kim, Shanklin, Su, Hackes, & Ferris, 1997). For example, Harvard University’s dining services recycle steel and aluminum cans, glass and plastic food containers, and substantial quantities of cardboard. As a result of their recycling program, they were able to reduce their tipping fee by 20% in 1996 (Eagan & Keniry, 1998).

Recycling fat, oil, and grease (FOG)

Disposal of FOG into wastewater is a major issue for the foodservice industry, which is attempting to find ways to deal with this problem. For example, Columbia University’s Morningside campus used more than 1,700 gallons of cooking oil in dining and catering services. Since 2007, Columbia University partnered with a local non-profit organization to convert waste cooking oil into biodiesel (Oh, 2007). San Francisco launched
“SFGreasecycle,” a program to help local restaurants, hotels and other commercial food preparation establishments convert used cooking oil and grease into biodiesel, a fuel made of plant oil that burns cleaner than petroleum-based fuels (Burress, 2007). Atlanta restaurants were required to install grease traps, or so-called grease interceptors or separators, where fats, oils and greases are separated into an external container before they reach the sewer system. This grease waste can be collected later for producing biodiesel (Frumkin, 2007). A biodiesel is a renewable alternative fuel that can be made from new or used vegetable oils and animal fats. According to the U.S. Department of Energy (2007), there are three major benefits of using biodiesel as a vehicle fuel: increasing energy security, improving public health and the environment, and providing safety benefits.

Reusable cups, containers and silverware

A person drinking two cups of coffee a day from disposable cups can generate 24 pounds of waste a year (EPA, 2007c); a total of 113 billion disposable cups were used annually in the U.S. in 2005 (Shea, 2006). Disposable cups can be reduced by implementing a reusable cup program. For example, Sodexho promoted a “recycle mug program” at campus accounts. Reusable mugs were sold to students who then got a discount on soft drinks and coffee when they used the mugs. Moreover, a portion of the money from the sale supported the National Fish and Wildlife Foundation. By doing so, the program was able to raise more than $126,000 to help environmental education (Shea, 2006). Another example of reusable cup programs is that of Los Angeles-based Coffee Bean & Tea Leaf. The company bought personalized coffee mugs for all employees in more than 500 units, which not only saved tens of thousands of cups, but also saved money on garbage disposal (Jennings, 2007). If students at Colorado State University would like to take food from a dining hall, they can
ask the meal checker for a reusable to-go container (Brown & Eaton, 2007). Bowdoin College dining services established a refillable mug program in 1990. The dining service distributes a thermal mug to each first-year student which cost them $500 each semester. As a result, more than 2.5 million disposable cups were saved from the landfill (http://www.bowdoin.edu/dining/information/environmental.shtml). Northland College dining services sell refillable travel mugs, which are made of 100% corn-based plastic and are the only refillable mugs allowed in the dining halls (http://www.dineoncampus.com/northland/). Harvard University’s freshman union dining hall purchased glass tumblers and melamine plastic mugs for students’ cold and hot beverages instead of paper cups. As a result, the union was able to cut the cost of paper cups from $191,000 to $12,000 each year (Eagan & Keniry, 1998). Occidental College uses reusable dishware in the main dining facility and offers financial incentives to encourage students to utilize reusable containers for take-out food. The University of British Columbia distributes 1,700 reusable containers to students (Sustainability Endowment Institute, 2008).

**Composting**

The definition of composting is “the transformation of organic material (plant matter) through decomposition into soil-like material called compost.” The benefits of composting are reducing the amount of municipal solid waste (MSW) and transforming organic material into a nutrient-rich soil amendment (“Composting: The basics”, n.d.). In San Francisco, restaurant operators can reduce their trash bills by recycling food waste. The city’s garbage and recycling hauler also collects food waste from restaurants, which is turned into compost and sold to area vineyards and farmers (Jennings, 2007). Bates College dining service comports preconsumer wastes and collects postconsumer wastes as feed for a local hog
farmer (http://www.bates.edu/dining-about-us.xml). Bowdoin College dining service worked with Capital City Transport to implement a composting program. The dining service has four 55-gallon plastic garbage cans on the loading docks to collect their food scraps (primarily fruit and vegetable trimmings) for composting which reduced costs up to $1600 annually from their tipping fees on their dumpsters(http://www.bowdoin.edu/dining/information/environmental.shtml). Tufts University collects more than two tons of food waste each week during the school year. Both pre-and post-consumer food waste are collected and transported to a commercial compost site (http://www.tufts.edu/programs/tfap/tuftsdfunding.htm). Dickinson College dining services collects 600-800 pounds of organic waste daily for the Dickinson farm, a student farm, for composting where the farm provides 85% of organic produce to the dining hall, and the other 15% goes to a community supported agriculture program and local farmer’s market (Weisberg, 2008).

**Organic food**

According to the USDA (2007), organic food is produced by farmers who emphasize the use of renewable resources and the conservation of soil and water to enhance environmental quality for future generations. Organic meat, poultry, eggs, and dairy products come from animals that are given no antibiotics or growth hormones (USDA Definition and Regulations section, ¶ 4).

The demand for organic food has grown at a rate of nearly 20% per year and it is going to continue growing. It is predicted that all kinds of organic products will be both accepted and routine by the year of 2025 (Laux, 2006). Tufts University dining service has offered a variety of organic products, such as whole wheat pasta, barley and brown rice, soy milk, cereals, tofu and peanut butter since the fall of 2004 (http://www.tufts.edu/programs/tfap/tuftsdfunding.htm). The source of organic foods for some college and university dining
services come from college/university organic farms such as those at Dickinson College, Furman University, and Gettysburg College. Moreover, UC Berkeley has the first certified organic kitchen on an American college campus in 2006 and had other three of their dining halls certified in 2007. UC Berkeley dining established rules to govern every process from receiving products, through production, and to consumption (Hummel, Dautremont-Smith, & Walton, 2007; http://caldining.berkeley.edu/environment_organic_cert.html).

Some college and university dining services, such as the University of California, Stanford University and Oberlin College, serve hormone-free milk, organic meat and poultry, and cage-free eggs (http://www.ucidining.com/enUS/CSMW/UnivCaliforniaIrvine/Community/UCISustainability/Sustainability.htm; http://www.stanford.edu/dept/rde/dining/index.htm?page=food_quality; http://www.oberlin.edu/cds/social/).

**Trayless dining**

Trays are widely used tools for college students to carry the food they want to eat in the dining halls. Kim (2007) stated that college students tend to take more food and eat more than they need when they have a tray to carry. Hence, a large amount of food is dumped into trash cans in typical all-you-can-eat dining halls. Trayless dining forces students to limit the amount of food they can carry. Therefore, students tend to not keep eating after they are full ("From all-you-can-eat", 2008).

Benefits of doing trayless dining, in which college dining services remove trays that students used to carry their food, include reduced food waste; reduced energy and chemical usage; reduced water, energy and chemical costs; and improved students’ health. Water, energy, and chemical usage can be reduced simply because there are fewer trays to wash ("Dining rooms now going trayless", 2007; Kim, 2007). ARAMARK Higher Education
(2008) conducted a nationwide trayless dining study, which measured 186,000 meals served at 25 institutions during various periods in the 2008 academic year. Over the test period, food waste was reduced from 1.8 ounces to 1.2 ounces per person per meal, which represented a 25% to 30% reduction in per-person waste on trayless days. The study determined there was water saving from tray removal because a tray requires one-third to one-half gallon of water to wash on average (ARAMARK Higher Education, 2008). Grand Valley State University, Allendale, MI, for example, tested trayless dining in the spring of 2007 and permanently adopted the system that fall. They were able to reduce food waste 56 pounds per person per year, conserve 31,000 gallons of water and reduce dish detergent and sanitizer by 540 pounds per year (ARAMARK Higher Education, 2008).

**Bottled water**

According to Arnold and Larsen (2006), the consumption of bottled water increased 57% from 1999 to 2004. On average each U.S. citizen consumed more than 22 gallons of bottled water in 2004. Many people buy bottled water because they think it contains fewer contaminants and is healthier than tap water (Pip, 2000). However, a study conducted by Lalumandier and Ayers (2000) showed that tap water is more effective to prevent tooth decay and is as pure or more pure than bottled water. There is no guarantee that either tap water or bottled water will be free from pathogens. Moreover, the cost of bottled water is $10 per gallon which costs 10,000 times more than tap water (Arnold & Larsen, 2006). The environmental impacts from bottled water include producing unnecessary garbage and consuming huge amounts of energy from production and transportation (Arnold & Larsen, 2006; “Water Wars: Bottled or Tap”, 2008). Americans spent 15 million barrels of oil per year to produce the plastic water bottles and consumed 26 billion bottles of water in 2005.
while 22 billion plastic bottles end up in landfills and incinerators every year. Six times more water bottles were thrown away in 2004 as in 1997 (Franklin, 2006; Knopper, 2008).

Because of the environmental impacts from bottled water, more people are switching from bottled water to tap water (Knopper, 2008). Many college and university dining services removed bottled water from their dining venues. For example, the University of Maryland removed all bottled water from their resident dining halls and instead installed triple filtered water stations for free student access (http://www.ds.umd.edu/greendining/Filteredwater.cfm). Smith College dining services removed bottled water from one to-go location and distributed polycarbonate bottles to students to reuse and refill. Agnes Scott College uses recyclable cups as a substitute for bottled water for the major events such as orientation and graduation (Sustainability Endowment Institute, 2008).

**Biodegradable products**

Over the past decade, the demand for grab-n-go take out venues increased among college and university dining operations (Shea, 2006). At the same time, the demand for disposables in the U.S. also increased and is projected to increase 4.2% annually, reaching $14.4 billion in 2009 (“US foodservice disposables demand”, 2005). While many people have concerns about the impact of disposables on the environment, biodegradable or biobased products can be used to substitute for conventional containers, such as plastic and Styrofoam for take-out businesses.

There is confusion about biodegradable products and biobased products. According to the Biodegradable Products Institute [BPI] (n.d.), biobased products are made from renewable raw materials/feed stocks such as wood, corn, soybeans, and grasses. But not all biobased products are biodegradable. The term “biodegradable” means materials can be used
as a food source when they decompose by the microbial action of naturally occurring microorganisms, when the biodegradable process is in an environment of soils, compost sites, water treatment facilities, and the human body. In order to be called biodegradable products, they have to be tested based on The American Society for Testing and Materials (ASTM) standards, ASTM D6400 (for compostable plastics) or ASTM D6868 (for compostable packaging) (BPI, n.d.).

Compostable products can be made of Polylactides (PLA), made from sugar cane, or derived from potatoes. Materials such as PLA are degraded in 90 days in commercial or institutional composters and use 50% less fossil fuel; moreover, it is not toxic to burn (Bush, 2005). The Evergreen State College dining service switched all of its disposable ware to compostable products (http://www.campusdish.com/en-us/CSMW/EvergreenStateCollege/). Since 2007, the city of Oakland, CA has required all city facilities and food vendors, including restaurants, delis, fast-food establishments, vendors at fairs, and food trucks, not to use polystyrene foam disposable foodservice ware and change to biodegradable disposable foodservice ware (http://www.oaklandpw.com/AssetFactory.aspx?did=2100).

**Emission**

During cooking, the combination of water and grease substances released into the atmosphere or into the kitchen environment will increase air pollution and have an impact on human health. The foodservice industry is seeking to reduce the carbon emissions by purchasing new equipment. In southern California, Burger King converted their traditional Charbroilers from chain-driven broilers to side-loading batch broilers, which use about one-third of the energy and produce only a third of the emissions the charbroilers released. The cost for side-loading batch broilers is about $8,000 apiece, but Burger King was able to save
two-thirds of their energy costs, thus getting the expenditure returned in about eight months. As a result, the company is planning to replace all of its chain-driven broilers at company stores in the U.S. and Europe by 2009 (Frumkin, 2007).

**Eco-friendly products**

The foodservice industry uses many different kinds of fabric products in uniforms, aprons, tablecloths and linens. The traditional fabrics are made from cotton. However, cotton is one of the most pesticide-intensive agricultural crops. Foodservice operators are looking for alternative eco-friendly materials to substitute for cotton (Walkup, 2007). The common cotton substitute materials are bamboo, hemp and organic cotton. The Jardiniere restaurant in San Francisco and the eight-unit Big Bowl, owned by Chicago based Lettuce Entertain You Enterprises, purchase bamboo uniforms. Two Snappy Salads restaurants in Dallas changed their cotton aprons and t-shirts to hemp fabric. Keeping cotton tablecloths clean requires high energy use and water for laundering. Saloon Partner Ltd in Chicago found using vinyl table coverings can save money in laundering (Walkup, 2007). Items such as recycled napkins, eco-friendly cleaning products and detergents are used in many universities including Rockefeller University and the University of Wyoming (Sustainability Endowment Institute, 2008); Bates College purchases 100% recycled napkins (http://www.secondnature.org/efs/profiles/profile_bates.htm).

**Socio-Economic Practices**

**Healthy food**

Two burdensome health issues in the United States are overweight and obesity. Together these are associated with approximately 300,000 deaths a year in the U.S. (U.S. Department of Health and Human Services, 2001). The percentage of obese adults in the U.S.
increased from 15% to 31% between 1980 and 2002. The percentage of overweight children, aged 6 to 11, increased from 7% to 16% while overweight adolescents, aged 12 to 19, rose from 6% to 16% between 1980 and 2002 (Murray, 2005). One of major contributing factors to type 2 diabetes is obesity. A 41% increase in the number of people diagnosed with diabetes was reported between 1997 and 2003 (Morrato, Hill, Wyatt, Ghushchyan, & Sullivan, 2007). Also the national cost of diabetes increased from $132 billion in 2002 to $174 billion in 2007. This cost does not include social costs such as lost productivity and reduced overall quality of life for people with diabetes and their families and friends (American Diabetes Association, 2003; 2008).

Dietary factors have been associated with the onset of type 2 diabetes. People’s dietary preferences have changed because of profound changes in the food system (Vallianatos et al., 2004). Currently, people tend to eat fewer fruits and vegetables but eat more fast foods (foods high in fat), sweets, and sugar-sweetened beverages such as soft drinks. As a result, this dietary change has been directly associated with the onset of both type 2 diabetes and overweight (Vallianatos et al., 2004). Studies have shown that having healthier diets and doing physical activity can prevent or reduce the risk of type 2 diabetes (CDC, 2008; Morrato, et al., 2007). The type of dietary fat also contributes to obesity-related diseases. For example, the intake of saturated fat may cause cardiovascular disease, and trans-fats, which can be found in commercial bakery products and fast foods, can increase the risk of both cardiovascular disease and type 2 diabetes in adults. On the other hand, the risk of these diseases can be decreased by replacing saturated fat with unsaturated fats from vegetable sources (Ebbeling, Pawlak, & Ludwig, 2002). For example, the University of California and Ohio University use trans-fat free oil for frying (Lefebvre, 2007).
More and more college and university dining services accommodate students’ special dietary needs. For example, Bastyr University, WA, provides students with vegetarian foods (http://www.bastyr.edu/tour/cafeteria/) and Middlebury College, VT, accommodates students who are vegetarians and/ or have food allergies (http://community.middlebury.edu/~enviroc/di.html). The University of North Texas’s Mean Greens dining hall serves portion-controlled entrees and offers grilled meats, sushi, organically grown produce and marinated tofu, which are all less than 300 calories and under 10 grams of fat per serving. The goal of Mean Greens dining hall is to educate students about portion size and healthful menu choices.

**Farm to school/college program**

College dining services, which provide the majority of college students’ meals, have an important role in the college students’ eating habits and health (CFSC, n.d.). Farm to college programs are closely tied with the “localized” food system (Murray, 2005), which offers opportunities for improving local/regional farmers’ economic stability, supporting the local economy, protecting the environment, educating students about local farming and the food system, providing more nutritious and appealing meals, improving students’ eating habits and health, and improving institution and community relationships (CFSC, n.d.; Daly, 2007; Gregoire & Strohbehn, 2002; Murray, 2005; Vallianatos, et al., 2004).

CFSC’s farm-to-college survey (n.d.) showed that 41% self-operated and 59% contract managed foodservices operate farm-to-college programs. Over one third of farm-to-college programs (37%) were initiated by dining personnel followed by students (17%), faculty/staff (15%), and foodservice management companies (14%). Moreover, 51% of farm-to-college programs were run by foodservice directors/ managers. Other environmental practices associated with the farm-to-college programs were recycling, composting, nutrition
education, fair trade projects, college/student farm, packaging reduction, farmers’ market, herb/kitchen garden, and water conservation program (CFSC, n.d.). Two studies have shown that there are barriers and benefits from farm-to-college programs (CFSC, n.d.; Gregoire & Strohbehn, 2002). Benefits include supporting local farmers, the local community and/or the local economy, higher quality food (fresher and safer food), lower environmental impact, public relations, opportunities for student education/ research, the desire and demand from customers, the ability to purchase in smaller quantities, the knowledge of product sources, and lower transportation costs. Barriers are the seasonal availability of products, dealing with more growers/local product suppliers, coordinating purchase/delivery of products, product costs, reliable food quality and quantity, safety issues, getting farmer-approved through food service companies, and payment methods.

The CFSC (n.d.) farm-to-college program survey also summarized opinions from foodservice directors/ managers for the best strategies for making a successful program. The foodservice directors/managers surveyed indicated that building positive relationships among key players was the most important strategy for making farm-to-college programs work. It was also important to start the program small, to be patient yet persistent, to engage students in program activities, and to get support from college/university administration.

When Oberlin College dining service started the farm-to-fork program in 2001, only 5% of its total food budget was spent on local food purchases. In 2006, the budget for local food purchasing was 35% and they are planning to increase its local purchasing food budget by 5% annually (http://www.oberlin.edu/cds/social/LocalFoods.html). Many college and university dining services have committed to buying local food, such as Tufts University, the University of California at Santa Barbara (UCSB), the University of Northern Iowa (UNI),
Bates College, Bowdoin College, Cornell University, Vassar College, Middlebury College, the University of Wisconsin at Madison, and Ohio University (Sustainability Endowment Institute, 2009).

Buying local food and organic produce is a trend in the foodservice industry. According to the Sustainability Endowment Institute (2009), 82% of college and university dining services allocate a certain amount of the food budget to buy local food. For example, Iowa State University intends to buy 35% of sustainable, local, and organic foods to raise community awareness and establish connections with Iowa farmers within five years. Buying local food is not only for college and university dining services. Many colleges and universities also encourage their students to use their meal plans to purchase local produce at a farmers’ market on campus in order to support regional farmers. These include the University of Pennsylvania, Santa Clara University, College of the Holy Cross and Harvard University. One of Colorado College’s dining halls received a green restaurant certification from Green Restaurant Association because it offers, almost exclusively, local produce (Sustainability Endowment Institute, 2009).

**Building design**

Compared to other commercial building sectors, the foodservice industry was one of the most intensive energy users. In the U.S., it is estimated that the foodservice industry spends $12 billion on its energy bill annually in the U.S. (Davies & Konisky, 2000; Davis, 1999). In general, a restaurant spends 2.5% to 3.4% of its total sales on utilities. Energy and water bills can be saved by building green, but the process requires a huge capital investment (Jennings, 2007). The Leadership in Energy and Environmental Design (LEED) sets guidelines for all aspects of a building to be eco-friendly from using recycled materials in
construction to waterless urinals in bathrooms (Jennings, 2007). LEED also provides certification for eco-friendly building. Now, many foodservice operators have eco-friendly practices in mind when they remodel their buildings or build new buildings. For example, Harvard University remodeled its Dunster and Mather House Kitchen and Servery into an eco-friendly building design with LEED certification. The green elements included new dishwashers (saving 500,000 gallons of hot water a year), a pulper-extractor (recycling 80% of the water it uses), environmentally friendly paints and adhesives, compact fluorescent lighting, and low-flush toilets (Bertagnoli, 2006).

**Community involvement**

A central goal of higher education is to cultivate citizenship and social responsibility in college students (Jones & Abes, 2004). The American College Personnel Association (ACPA) (1996) indicated that the solution to enhance students’ learning and personal development is to “create conditions that motivate and inspire students to devote time and energy to educationally-purposeful activities, both in and outside the classroom” (p.1). As part of a college or university, dining services also commit to serving their community by sharing their unused food with those in need such as Bates College, University of Northern Iowa (UNI), Washington and Lee University, and Marquette University (Sustainable Endowment Institute, 2008).

**Marketing**

Some college and university dining services not only implement environmental practices, but also include their environmental concerns in their mission statements or goals. For example, the stated goal of Bates College dining service is that “We are committed to finding ways to improve our environment with the educational setting, improving the quality
of the food we serve, reducing waste and ecological effects, helping the local area, and reducing cost” (http://www.secondnature.org/efs/profiles/profile_bates.htm).

**Wellness program**

The goals for worksite wellness programs are to improve employee health, reduce health care costs, and show the company’s obligation to employees’ health and well-being (Ozminkowski et al., 2002). Studies have shown the benefits of implementation of a worksite wellness program include reducing employees’ health claims and employee absenteeism, improving employee health and working environment, and financial savings (Bertera, 1990; Kenkel, 1992; Overman & Thornburg, 1992). An example from the foodservice industry is Dole Food Co. The company launched the Dole wellness program, which includes fitness and yoga classes, and free morning and afternoon fruit and vegetable breaks (Lefebvre, 2007).

**Fair Trade products**

The purpose of fair trade certification is to help farmers and farm workers develop business skills to compete in the global market place in order to help themselves out of poverty. The advantages of fair trade are fair prices, fair labor conditions, direct trade, democratic and transparent organizations, and community development (Fair trade USA, 2006). Current Fair Trade Certified agriculture products are coffee, tea and herbs, cocoa and chocolate, fresh fruit, sugar, rice, and spices (Fair trade USA, 2006). Examples of college and university dining services using fair trade coffee are William College and Oberlin College (Sustainability Endowment Institute, 2008).

**Sustainable seafood**

The seafood watch program is designed to increase customers’ knowledge about what seafoods to buy or avoid, and the importance of buying seafood from sustainable sources.
Northland College and Colby College adopted the Seafood Watch Program to encourage the use of sustainable seafood and avoid threatened species


**Education**

The purpose of dining services is not only to provide students nutritious meals, but also educate students about the food they eat and climate changes. Whitman College dining services has a “Low Carbon Diet” program, created to educate students about the food choices they make and climate change (Sustainability Endowment Institute, 2008). Some universities such as Clark University also provide farm tours for students, to educate students about the source of food. Pomona College has a student-run organic garden which provides the college an opportunity to educate the school community about the importance of eating locally. Tufts University has a program called “Food Education and Action for Sustainability at Tufts” (FEAST) to educate the university community about food production and promote the benefits of buying local, organic grown and fair trade food (Sustainability Endowment Institute, 2008).

**The Theory of Planned Behavior**

In this research, the theory of planned behavior (TPB) was used to examine college and university dining services administrators’ intention to adopt sustainable practices. The TPB is derived from the theory of reasoned action (TRA). The TRA suggests that people evaluate their actions before they act with a particular behavior. The TRA has been used to explain people’s voluntary and volitional behavior. The model assumes that a person’s behavior can be predicted by the person’s intention to perform the behavior, and that behavioral intention is influenced by personal attitude and perceptions of others’ view toward
that behavior (subjective norm) (Eves & Cheng, 2007). Research on the TRA model has been
done in education, food choices, decision-making and health related areas (Bhyan, 2007;
Chen & Chen, 2006; Eves & Cheng, 2007; Wu, & Liu, 2007).

The only difference between TRA and TPB is that the TPB model takes self-efficacy
or ability to perform the behavior of interest into account (perceived behavioral control)
(Ajzen, 1991). The theory of planned behavior (TPB) is an extended model of TRA; TPB is
widely used and is a popular conceptual framework for human action (Ajzen, 1991).

The TPB model indicates that intentions are the best predictor of behavior because
the stronger a person’s intention to perform the behavior, the greater the chance the behavior
will happen (Kaiser, Schultz, & Scheuthle, 2007; Werder, 2002). Intentions are determined
by three factors: personal character (attitude toward the behavior), social influence
(subjective norm), and issue of control (perceived behavioral control [PBC]) (Ajzen, 2005).
In figure 2.1, the TPB is presented graphically.

![Figure 2.1 Ajzen's Theory of Planned Behavior](image)

**Figure 2.1** Ajzen's Theory of Planned Behavior

Note. From *Attitudes, Personality and Behavior* (p. 118), by I. Ajzen, 2005, Maidenhead, England: Open
University Press. Copyright 2005 by Icek Ajzen. Reprinted with permission
The TPB in Previous Studies

Many studies have utilized the TPB in various areas, including business, career choice, ecology, education, food, human resources, information technology, management, and marketing. Some selected studies that have used TPB are summarized in Table 2.2.

Studies in hospitality management also have utilized the TPB. Ajzen and Driver (1992) used the TPB to understand the factors that decide college students’ leisure activity intentions and behaviors. A customer satisfaction study utilized the TPB to test the relationship between past behavior and customers’ intention to engage in different types of dissatisfaction response (Cheng, Lam, & Hsu, 2005). The TPB was also used to predict tourist intentions to take a vacation to a wine region (Sparkes, 2007). O’Fallon, Gursoy, and Swanger (2007) used the TPB to assess people’s purchasing intentions of genetically modified foods.

<table>
<thead>
<tr>
<th>Area</th>
<th>TPB Applications</th>
<th>Constructs</th>
<th>Author(s) and Year Published</th>
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<tbody>
<tr>
<td>Business</td>
<td>Ethnic entrepreneurship</td>
<td>• Personal Attractiveness</td>
<td>Li, 2007</td>
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<td></td>
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<td>• Social Norms</td>
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<td>• Perceived Feasibility</td>
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<td></td>
<td>• Entrepreneurial Intention</td>
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<td>Factors influence internet stock trading</td>
<td></td>
<td>• Perceived behavior control (PBC)</td>
<td>Gopi &amp; Ramayah, 2007</td>
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<td></td>
<td></td>
<td>• Subject norm</td>
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<td></td>
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<td>• Attitude toward physical object</td>
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<td>• Attitude toward behavior</td>
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<td>• Behavior intention</td>
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<td>• Behavior toward Internet stock trading</td>
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<tr>
<td>Career choice</td>
<td>Career change intention</td>
<td>• Career change intention</td>
<td>Khapova, Arthur, Wilderom, &amp; Svensson, 2007</td>
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<td></td>
<td></td>
<td>• Attitude toward career change</td>
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<td></td>
<td></td>
<td>• Perceived social pressure</td>
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<td>• PBC</td>
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<td>• Professional identity</td>
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<tr>
<td>Occupation intentions</td>
<td></td>
<td>• Attitude</td>
<td>Arnold, Loan-Clarke, Coombs, Wilkinson, Park, &amp; Preston, 2006</td>
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<tr>
<td></td>
<td></td>
<td>• Subjective norm</td>
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<td></td>
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<td>• PBC</td>
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<tr>
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<td>• Intention to work for the UK’s National Health Service (NHS) as a qualified member of that profession</td>
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<td>• Identification with the NHS</td>
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<td>• Moral obligation</td>
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<tr>
<td>Ecology</td>
<td>Explaining proenvironmental intention and behavior</td>
<td>• Past ecological behaviors</td>
<td>Harland, Staats, &amp; Wilke, 1999</td>
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<td>• Behavioral intention</td>
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<td>• Attitude toward ecological behavior</td>
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<td>• Environmental involvement</td>
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<td></td>
<td>Predicting ecological behavior</td>
<td>• Attitude</td>
<td>Kaiser &amp; Gutscher, 2003</td>
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<td></td>
<td>• Subjective norms</td>
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<td>• Behavior intention</td>
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<td></td>
<td>• Ecological behavior</td>
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<td>Education</td>
<td>Students’ beliefs, attitudes and intentions to major in accounting</td>
<td>• Intention to major in accounting or other business disciplines</td>
<td>Tan &amp; Fawzi, 2006</td>
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<td></td>
<td></td>
<td>• Personal perception (Attitude)</td>
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<td>• Subject norm</td>
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<td>• PBC</td>
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<td>Area</td>
<td>TPB Applications</td>
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<tr>
<td>Food</td>
<td>Halal meat consumption</td>
<td>• Attitude&lt;br&gt;• Subjective norm&lt;br&gt;• PBC&lt;br&gt;• Habit&lt;br&gt;• Self-identity (“Being a Muslim)&lt;br&gt;• Dietary acculturation (Food type preferred)&lt;br&gt;• Intention to eat halal meat</td>
<td>Bonne, Vermeir, Bergeaud-Blackler, &amp; Verbeke, 2007</td>
</tr>
<tr>
<td>Buying organic food</td>
<td></td>
<td>• Health consciousness&lt;br&gt;• Attitude toward buying organic food&lt;br&gt;• Subjective norms&lt;br&gt;• Importance of price&lt;br&gt;• Perception of availability&lt;br&gt;• Intention to buy&lt;br&gt;• Reported purchasing frequency</td>
<td>Tarkiainen &amp; Sundqvist, 2005</td>
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<td>Human Resources</td>
<td>Post feedback development</td>
<td>• Demographic and human capital characteristics&lt;br&gt;• Attitude toward behavior&lt;br&gt;• Behavior control&lt;br&gt;• Behavior (Self report behavioral change)</td>
<td>McCarthy &amp; Garavan, 2006</td>
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<tr>
<td>Information Technology</td>
<td>Search engines as substitutes for traditional information sources</td>
<td>• Attitude toward searching information via search engines&lt;br&gt;• Behavior control&lt;br&gt;• PBC</td>
<td>Kink &amp; Hess, 2008</td>
</tr>
<tr>
<td>Management</td>
<td>Customer cluster toward Internet bookstores</td>
<td>• Attitude towards Internet bookstore&lt;br&gt;• Subjective norm towards Internet bookstores&lt;br&gt;• PBC&lt;br&gt;• Behavior Intention&lt;br&gt;• Real behavior at Internet bookstores</td>
<td>Wu, 2006</td>
</tr>
</tbody>
</table>
Table 2.2 Continued

<table>
<thead>
<tr>
<th>Area</th>
<th>TPB Applications</th>
<th>Constructs</th>
<th>Author(s) and Year Published</th>
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</table>
| Marketing                 | Demarketing tobacco through price change  | • Intention to use nicotine replacement therapy as a means to quit smoking  
|                           |                                           | • Attitude toward nicotine replacement therapy  
|                           |                                           | • Subjective norm                                
|                           |                                           | • PBC                                            | Inness, Barling, Rogers, & Turner, 2008 |
| Consumer usage            | intention of e-coupons                    | • Attitude toward the act of using coupons       
|                           |                                           | • Subjective norm                                
|                           |                                           | • PBC                                            
|                           |                                           | • Intention                                      
|                           |                                           | • Past behavior                                  | Kang, Hahn, Fortin, Hyun, & Ecom, 2006 |

**Theoretical Framework**

The TPB, a valuable model in many studies of ecological behavior, was used as the theoretical framework of this study to examine foodservice directors’ intention to implement sustainable practices in the future. The TPB model indicates that intentions are the best predictor of behavior (Kaiser, Schultz, & Scheuthle, 2007). Studies also showed ecological behavioral intention was strongly related (Kaiser & Gutscher, 2003; Kaiser, Wölfing, & Fuhrer, 1999; Lansana, 1992) or moderately related (Hines, Hungerfor, & Tomera, 1986/87) to ecological behavior. As mentioned earlier, the TPB posits that intentions are determined by three constructs: attitude toward the behavior, subjective norm, and PBC (see Figure 2.1). A discussion of these determinants of intentions, their antecedents, and potential to predict intention is presented in the next section.
Attitudes toward the Behavior

According to Ajzen (2005), “attitude toward the behavior is the individual’s positive or negative evaluation of performing the particular behavior of interest” (p.118). In other words, a person will want to engage in a certain behavior when the person has a more favorable attitude toward the behavior (Hansen, 2008). Studies show either a moderate relationship between environmental attitude and ecological behavior (Axelrod & Lehmann, 1993; Smith, Hauktvedt, & Petty, 1994) or a weak relationship (Grob, 1995). The theory assumes that attitude toward the behavior is based on personal beliefs that people are more likely to perform or intend to perform the behavior when they think that the outcome of their behavior will be beneficial (Wu & Liu, 2007). Based on previous studies and the TPB, the following hypothesis was posited:

Hypothesis 1: CUDSAs’ attitude toward sustainable practices will have a positive effect on their intention to adopt sustainable practices.

Subjective Norm

Subjective norm is the strength of influence other people have over an individual’s intention to perform or not perform the behavior (Ajzen, 2005). Subjective norms are aimed at measuring influences of the social pressures on individuals to perform or not to perform a particular behavior. This means if an individual perceives that people important to him/her approve or disapprove a behavior, the individual is more or less likely to intend to perform it (Conner & Armitage, 1998). The relationship between subjective norms and ecological behavior was on a scale from rather weak to fairly strong (Kaiser, Wölfing & Fuhrer, 1999). Thus, the following hypothesis was posited:

Hypothesis 2: CUDSAs’ subjective norm will have a positive effect on their intention to adopt sustainable practices.
Perceived Behavioral Control

Perceived behavioral control (PBC) is peoples’ perception of whether they have means or opportunities to do a behavior. The means or opportunities determine the performance of the behavior as easy or difficult (Ajzen, 2005; Conner & Armitage, 1998). PBC influences behavior either indirectly or directly by two factors: internal (e.g., skills, knowledge, adequate planning) and external factors (e.g., facilitating conditions, availability of resources). The relationship between PBC and behavior suggests that people tend to carry out behaviors that they have control over and try to prevent from engaging in behavior over which they have no control. There are inconsistent findings in the literature about the relationship, ranging from slightly negative to nonexistent to very positive, between PBC and ecological behavioral (Kaiser, Wölfing & Fuhrer, 1999). Kaiser and Gutscher (2003) proposed that the TPB should abandon the notion of PBC having a direct influence on behavior. In sum, the results found that attitude, subjective norms, and PBC explained 81% of the variance in ecological behavior intention, and intention determined 51% to 52% of peoples’ ecological behavior. Based on findings from previous studies, the following hypothesis was posited:

Hypothesis 3: CUDSAs’ perceived behavior control will have a positive effect on their intention to adopt sustainable practices.

Personal Norm

Schwartz (1977) considered personal norms as feelings of strong obligations that people experience within themselves that prompt them to act in social behavior. Personal norms are derived from people’s relevant general and environmental value directions (Nordlund & Garvill, 2002). Hines et al. (1986/87) found a relationship between a feeling of
moral obligation to care for the environment and pro-environmental behavior. Harland et al. (1999) also had similar findings. They proposed that adding personal norms to the TPB could increase 1-10% of explanation power to intention and behavior constructs. Therefore, a personal norm can be viewed as an important predisposition to perform a pro-environmental manner. The following hypothesis was suggested:

_Hypothesis 4: CUDSAs’ personal norm will have a positive effect on their intention to adopt sustainable practices._

**Knowledge**

Stutzman and Green (1982) suggested factual knowledge is a prerequisite for any attitude because people will not act with proper behaviors without proper knowledge (Kaiser & Fuhrer, 2003). However, knowledge should not have a strong relationship with environmental behavior because both ecological attitude and behavioral intention reduce its power (Kaiser, Wölfing & Fuhrer, 1999). Stern (1992) found that the single factor which differentiated between people who were more actively engaged in environmental issues and those who were less actively engaged was knowledge about the specific problem. Simmons and Widmar (1990) had similar findings that one of the barriers for people to recycle was lack of knowledge.

_Hypothesis 5a: CUDSAs’ knowledge about sustainable practices will have a positive effect on their attitude toward sustainable practices._

_Hypothesis 5b: CUDSAs’ knowledge about sustainable practices will have a positive effect on their perceived behavior control._

_Hypothesis 5c: CUDSAs’ knowledge about sustainable practices will have a positive effect on their personal norms._

**Personal Value**

Personal value can be defined as beliefs relating to the desired behaviors or modes of conduct that guide choices of action for an individual (Hansen, 2008). Studies have
consistently shown that values are important factors of environmentally related behavior (e.g.,
Grob, 1995; Stern, Dietz, Kalof, & Guagnano, 1995; Thøgersen & Grunert-Beckman, 1997).
Grob (1995) used the TPB to examine the relationship between environmental attitudes and
pro-environmental behavior. He found that personal philosophical values had the strongest
effect on environmental behavior. Stern et al. (1995) suggested that personal values influence
the formation of attitudes. Thøgersen and Grunert-Beckman (1997) also found a relationship
between personal values and environmental friendly behavior. The relationship is expected
because personal values act like blueprints influencing specific attitudes and personal norms
(Fransson & Gärling, 1999). Fransson and Gärling (1999) stressed the importance of
including personal values in the TPB because they can explain why and when people act in
an environmentally responsible way.

Hypothesis 6a: CUDSAs’ personal value will have a positive effect on their attitude toward
sustainable practices.
Hypothesis 6b: CUDSAs’ personal value will have a positive effect on their subjective norm.
Hypothesis 6c: CUDSAs’ personal value will have a positive effect on their perceived
behavior control.
Hypothesis 6d: CUDSAs’ personal value will have a positive effect on their personal norm.

Past Experience

A relationship was found between past behavior and behavioral intentions (Bagozzi
& Warshaw 1990; Bentler & Speckart 1979; Kashima, Gallois, & McCamish, 1993;
O’Callaghan, Chant, Callan, & Baglioni, 1997) and past behavior tends to predict intention
and future behavior (Ouellette & Wood, 1998; Terry, Hogg, & White, 1999). One
explanation for this relationship might be that past behavior influences attitudes toward
future behavior. Doll and Ajzen (1992) found that actual experience with a behavior
increases attitude behavior consistency and the predictive power of TPB was greater among
people who had prior experience with the behavior under examination. People who have personally been involved in a behavior in the past, and who have positive or negative attitudes about it, have attitudes of intention to perform or not to perform the behavior. Furthermore, people tend to perform the behavior in the future if they have had a successful performance of the behavior in the past (Kashima et al., 1993; O'Callaghan et al., 1997). Ajzen (1991) indicated that including past behavior in TPB can increase the explained variance and the correlation between past and later behavior. Consequently, in accordance with previous findings, it was predicted that positive past experience with sustainable practices would increase the reliability of the attitude-intention relationship. Based on previous studies, this leads to the following hypotheses:

Hypothesis 7a: CUDSAs’ past experience with sustainable practices will have a positive effect on their attitude toward sustainable practices.
Hypothesis 7b: CUDSAs’ Past experience will have a positive effect on their subjective norm.
Hypothesis 7c: CUDSAs’ past experience with sustainable practices will have a positive effect on their perceived behavior control.
Hypothesis 7d: CUDSAs’ past experience has positive effect on their personal norm.

Proposed Model

The following model (Figure 2.2) is proposed to explore college and foodservice administrators’ intention to implement sustainable practices. Knowledge was examined as the antecedent of attitude toward sustainable practices, PBC and personal norms. Personal value was examined as an antecedent of attitude and behavioral intention in the context of implementing sustainable practices. The effect of past experience on attitude and PBC was explored in this model as well.
Proposed Hypotheses

Hypothesis 1: CUDSAs’ attitude toward sustainable practices will have a positive effect on their intention to adopt sustainable practices.

Hypothesis 2: CUDSAs’ subjective norm will have a positive effect on their intention to adopt sustainable practices.

Hypothesis 3: CUDSAs' perceived behavior control will have a positive effect on their intention to adopt sustainable practices.

Hypothesis 4: CUDSAs’ personal norm will have a positive effect on their intention to adopt sustainable practices.

Hypothesis 5a: CUDSAs’ knowledge about sustainable practices will have a positive effect on their attitude toward sustainable practices.

Hypothesis 5b: CUDSAs’ knowledge about sustainable practices will have a positive effect on their perceived behavior control.

Hypothesis 5c: CUDSAs’ knowledge about sustainable practices will have a positive effect on their personal norm.
Hypothesis 6a: CUDSAs’ personal value will have a positive effect on their attitude toward sustainable practices.

Hypothesis 6b: CUDSAs’ personal value will have a positive effect on their subjective norm.

Hypothesis 6c: CUDSAs’ personal value will have a positive effect on their perceived behavior control.

Hypothesis 6d: CUDSAs’ personal value will have a positive effect on their personal norm.

Hypothesis 7a: CUDSAs’ past experience with sustainable practices will have a positive effect on their attitude toward sustainable practices.

Hypothesis 7b: CUDSAs’ Past experience will have a positive effect on their subjective norm.

Hypothesis 7c: CUDSAs’ past experience with sustainable practices will have a positive effect on their perceived behavior control.

Hypothesis 7d: CUDSAs’ past experience has positive effect on their personal norm.
CHAPTER 3. METHODOLOGY

The purposes of this study were to identify sustainable practices currently in use in college and university dining services operations, to test the TPB model in college and university dining services, and to examine the effect of personal norm on behavioral intention. The theory of planned behavior model was used as a framework for this exploration. This chapter describes the research design, use of human subjects, sample selection, questionnaire development, data collection, and data analysis.

Research Design

A cross-sectional, survey research design with a web-based questionnaire was used to collect data on attitudes and sustainable practices from college and university foodservice directors. Survey research design was a suitable and cost-effective method to study attitudes towards a practice (Creswell, 2005).

Use of Human Subjects

The Human Subjects Review Committee at Iowa State University (ISU) reviewed and approved the research protocol and questionnaire for this study (Appendix A). The researcher completed human subjects training and was certified by ISU. The ISU Human Subjects Review Board ensured that the rights and welfare of human subjects were adequately protected and participants were not exposed to risk or discomfort.

Sample Selection

The target population for this study was college and university foodservice administrators in the United States. A sample was selected from the National Association of College and University Food Services (NACUFS) 2008 Directory. The directory contained a
total of 555 college and university foodservice directors with e-mail addresses; all were used in the study (20 for the pilot study and 535 for the actual study).

**Questionnaire**

A web questionnaire (Appendix B) was developed to determine current sustainable practices used in college and university foodservice operations and assess foodservice administrators’ intention to adopt sustainable practices. The questionnaire contained three primary sections: current practices, foodservice administrators’ experience with sustainable practices, and demographic information. At the beginning of the questionnaire, the purpose of the study and definitions of the terms (e.g., sustainability and sustainable practices) were provided to ensure that all respondents understood the terms used in the questionnaire.

**Current Practices**

Section A of the questionnaire included 28 questions regarding current practices in college and university dining services, which were compiled from college and university dining services websites and other sources (e.g., CFSC, n.d.; Horovitz, 2006; Lefebvre, 2007; Shea, 2006; Sustainability Endowment Institute, 2008). Twenty one sustainable practices questions were rated by CUDSAs using a 7-point scale from 1 (never, not done in any of our dining operations) to 7 (always, done daily in more than 90% of our operations). Five yes or no questions and two multiple choices questions regarding current practices were also included in this section. Questions regarding degree of influence of nine constituent groups rated using a 7-point scale from 1 (no influence) to 7 (strongly influence) were also included in Section A. Nine constituent groups were rated: (1) dining/foodservice personnel, (2) faculty/staff, (3) students, (4) university administrators, (5) cooperative extension agent, (6)
Experience with Sustainable Practices

Section B of the questionnaire measured the eight constructs proposed in the model for this research (Figure 2.2). The eight constructs were intention, attitude toward sustainable practices, subjective norm, perceived behavioral control, personal norm, knowledge, personal value, and past experience.

Intention

Three items were used to assess the foodservice administrators’ intention to adopt sustainable practices. The items were measured on 7-point scales as shown in Table 3.1.

Table 3.1 Questions Regarding Intention

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I intend to adopt more sustainable practices in my operation during the next year. (1, extremely unlikely to 7, extremely likely)</td>
</tr>
<tr>
<td>2</td>
<td>I will try to adopt sustainable practices in my operation during the next year. (1, definitely false to 7, definitely true)</td>
</tr>
<tr>
<td>3</td>
<td>I plan to adopt sustainable practices in my operation during the next year. (1, strongly disagree to 7, strongly agree)</td>
</tr>
</tbody>
</table>

Attitudes toward Sustainable Practices

The six items used to measure the foodservice administrators’ attitudes toward sustainable practices were based on work by Ajzen (1988) (Table 3.2). A 7-point semantic differential scale was used, where the respondents were asked to rate their attitude toward sustainable practices.
Subjective Norm

The items measuring subjective norm were adopted from Ajzen (1988). Five items were used to measure foodservice administrators’ subjective norm (Table 3.3). The items were measured on 7-point scales as shown in Table 3.3.

Table 3.2 Questions Regarding Attitude toward Sustainable Practices

<table>
<thead>
<tr>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>For me, sustainable practices are</td>
</tr>
<tr>
<td>1. Bad/Good</td>
</tr>
<tr>
<td>2. Negative/Positive</td>
</tr>
<tr>
<td>3. Worthless/Valuable</td>
</tr>
<tr>
<td>4. Unexciting/Exciting</td>
</tr>
<tr>
<td>5. Not needed/Needed</td>
</tr>
<tr>
<td>6. Unimportant/Important</td>
</tr>
</tbody>
</table>

Table 3.3 Questions Regarding Subjective Norm

<table>
<thead>
<tr>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. My dining services’ work colleagues would think that _____ adopt sustainable practices. (1, I should not to 7, I should)</td>
</tr>
<tr>
<td>2. My external work colleagues (e.g., college/university president) think that _____ adopt sustainable practices in my operation. (1, I should not to 7, I should)</td>
</tr>
<tr>
<td>3. Other institutions’ foodservice directors think _____ implement sustainable practices in my operation. (1, I should not to 7, I should)</td>
</tr>
<tr>
<td>4. Generally speaking, how much do you want to do what your dining services’ work colleagues think you should do? (1, not at all to 7, very much)</td>
</tr>
<tr>
<td>5. Generally speaking, how much do other institutions’ foodservice directors influence your opinions? (1, not at all to 7, very much)</td>
</tr>
</tbody>
</table>

Perceived Behavioral Control

Three items were designed to capture respondents’ perceived ease or difficulty in carrying out sustainable practices (see Table 3.4). Respondents were asked to rate each statement on a 7-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree).

Table 3.4 Questions Regarding Perceived Behavioral Control

<table>
<thead>
<tr>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. My budget allows me to implement sustainable practices.</td>
</tr>
<tr>
<td>2. The lack of information regarding how to start sustainable practices makes it difficult for me to implement them.</td>
</tr>
<tr>
<td>3. Whether or not to implement sustainable practices is not in my control or my decision.</td>
</tr>
</tbody>
</table>
Personal Norm

The concept of personal norm was measured by adopting three items from Harland et al. (1999) (Table 3.5). The items were rated on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree).

Table 3.5 Questions Regarding Personal Norm

1. I feel a strong personal obligation to have sustainable practices in my operation.
2. I am personally willing to put extra effort into sustainable practices in my operation on a regular basis.
3. I would feel guilty if I did not have sustainable practices in my operation.

Knowledge

Four items were designed to capture respondents’ basic ecological knowledge (see Table 3.6). Respondents were asked to answer true or false for each statement.

Table 3.6 Questions Regarding Knowledge

1. Packaging waste and food waste are two examples of solid waste generated by the foodservice industry.
2. Food waste is the single-largest component of discarded waste by weight in the United States.
3. In general, it takes more energy to produce new products from recycled waste than from virgin materials.
4. The purpose of Fair Trade is to alleviate global poverty and promote sustainability.

Personal Value

Four items were used to measure foodservice directors’ perceptions of sustainable practices (Table 3.7). The items were measured on 7-point scales from 1 (strongly disagree) to 7 (strongly agree).

Table 3.7 Questions Regarding Personal Value

1. I think sustainable practices can help the environment.
2. I think sustainable practices are good for an institution’s public relations.
3. In my opinion, my customers desire sustainable practices in foodservice operations.
4. Overall, sustainable practices have reduced my operational costs.
Past Experience

Five items were used to assess the respondents’ previous experiences with sustainable practices (Table 3.8). The first and second questions asked respondents whether they had adopted sustainable practices in the past two years and if so, to indicate the adopted sustainable practices. Three questions were used to measure their satisfaction with their current sustainable practices using a 7-point scale from 1 (strongly disagree) to 7 (strongly agree).

Table 3. 8 Questions Regarding Past Experience

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Have you adopted any sustainable practices in your operation in the past two years?</td>
</tr>
<tr>
<td>2</td>
<td>If yes, please indicate the sustainable practices you have adopted in your operation during the past two years.</td>
</tr>
<tr>
<td>3</td>
<td>Overall, I am satisfied with the outcome of the current sustainable practices in my operation.</td>
</tr>
<tr>
<td>4</td>
<td>I am not satisfied with the amount of resources I have for my sustainable practices in my operation.</td>
</tr>
<tr>
<td>5</td>
<td>I am satisfied with my customers’ positive reaction toward sustainable practices in my operation.</td>
</tr>
</tbody>
</table>

Demographic Information

Demographic questions were the final part of the questionnaire. Respondents were asked personal information, including gender, age, level of education, number of years as a foodservice director, number of years working with current institution, number of years in current position and if respondents had any environmental courses or training. Respondents also were asked to provide information about their facility, including size of operation, number of meals served daily, region, institution status, type of management, and degree of influence by others in the organization.

Web Questionnaire Development and Procedures

Expert Panel

University faculty (n = 5) and university foodservice managers (n = 3) reviewed the hard copy of questionnaire for content validity, clarity, and ease of completion. For items that
were unclear, panel members were asked for revision suggestions. Based on the comments from the expert panel, necessary corrections were made in the questionnaire.

**Web Questionnaire Development**

An HTML format was used to create the web-based questionnaire. The questionnaire was uploaded on to the Iowa State University server. The website consisted of two parts: collection of questionnaire data and of participants’ e-mail address. Data were stored in delimited text format and then transferred into Excel files. The e-mail file data were stored alphabetically to ensure that researchers would not able to match a response to an e-mail address by the order of responses received. Also entering e-mail addresses was voluntary. The email addresses were only used for sending the summary of the study to participants as an incentive for responding to the questionnaire.

The purpose of the study and definitions of the terms such as sustainability and sustainable practices were provided on the first page of the questionnaire to ensure that all respondents understood the terms used in the questionnaire. A maximum of 12 questions were on a single page. When respondents submitted their responses for the questionnaire, they were directed to a new form which prompted them to submit their e-mail address if they wanted a summary of the study results.

The researcher tested the web questionnaire with different answers several times to ensure the web questions were coded correctly in the HTML program and the codes were able to be transferred to Excel format correctly.

**Pilot Test**

A pilot test was conducted with a randomly selected group of 20 foodservice administrators from the NACUFS’S 2008 Directory to seek comments on clarity and
relevancy of directions and statements in the questionnaire, length of time needed to complete the web questionnaire, and any experience of technical problems. Foodservice administrators completed a web evaluation form (Appendix C) after completing the web questionnaire. Foodservice administrators who participated in the pilot test were excluded from the survey sample.

Data Collection

This study followed Dillman’s (2007) suggestions regarding distribution of web-based questionnaires. During a one-week period, the researcher contacted respondents two times via email. The first email invitation letter (Appendix D) explained the purpose of the study and its potential implications, and requested participation. Three days later, an email cover letter was sent out (Appendix E) with a hyperlink to the web questionnaire. Respondents were directed to the web questionnaire by clicking on the URL. About six days after the email cover letter, the first email follow-up letter (Appendix F) was sent to thank those who had responded and to remind those who had not responded to complete the questionnaire. A total of three email follow-up letters were sent out. A summary of the results was provided to the foodservice directors who responded to the questionnaire as an incentive to increase participation.

Data Analysis

The Statistical Package for the Social Sciences (SPSS) Version 16.0 and the Analysis of Moment Structures (AMOS) Version 16 statistical software were used for data analyses. Descriptive statistics were computed for frequencies, means, and standard deviations. Before analyzing the data, frequencies for all variables were examined to clean the data and correct mis-coding. Regression analysis was used to detect any outliers, non-linear relationships, and
influential data points. Reliability analysis, one way analysis of variance (ANOVA), independent-samples \( t \) test and exploratory factor analysis for variables in the study were also analyzed using SPSS. Exploratory factor analysis, maximum likelihood analysis with varimax rotation, was used to group the items together to be used as reasonably indicators of the various latent dimensions. Confirmatory factor analyses and structural equation modeling (SEM) analyses were conducted using AMOS.

**Structural Equation Modeling**

Anderson and Gerbing (1988) suggested using the two-step modeling for SEM. To determine the construct validation, the first step, using confirmatory factor analysis (CFA) confirmed the measurement model. In the second step, a series of structural equation path models were tested to measure the adequacy of constructs in explaining the CUDSAs’ intention to adopt sustainable practices and to measure whether adding personal norm (PN) as a predictor in the model could increase explanation of variance in behavioral intention. The maximum-likelihood estimation procedure was used to analyze the SEM.

The tests of reliability and validity included standardized Cronbach’s alpha, convergent validity and discriminant validity for the research instrument. To retain an item in a scale, a Cronbach’s alpha of 0.7 is widely used; however, 0.6 or higher is considered acceptable in social psychology research (Robinson, Shaver, & Wrightsman, 1991). Convergent validity was indicated by factor loadings and average extracted variance. An average extracted variance was used to assess for all constructs and it should be 0.50 or more (Fornell & Larcker, 1981). Hair, Anderson, Tatham, and Black (1998) indicated that loadings that are greater than 0.30 are considered important; loadings greater than 0.40 are more important, and loadings 0.50 or greater are considered to be very significant. Correlations
were used to check discriminant validity ($p < .05$). Brown (2006) indicated that in applied research, a factor correlation that exceeds .80 or .85 indicated poor discriminant validity.

The overall fit of the model to data was examined through chi-square, comparative fit index (CFI), and root mean square error of approximation (RMSEA). Chi-square measures the difference between the theorized model’s covariance matrix and observed covariance matrix. A large chi-square result indicates poor model fit. However, chi-square is not a sufficient test alone to assess model fit. It has been criticized for its sensitivity to sample size, assumptions, and distribution (Brown, 2006). Therefore, CFI and RMSEA were also calculated. By convention, models with a good fit have fit statistics above 0.95 for CFI and below 0.05 for RMSEA. There is adequate fit if the RMSEA value is between 0.05-0.08 and CFI is between 0.90 - 0.95 (Brown, 2006).
CHAPTER 4. WHAT SUSTAINABLE PRACTICES EXIST IN COLLEGE AND UNIVERSITY DINING SERVICES?

A paper to be submitted to the *Journal of Foodservice Management and Education*

Chen, C-J., Arendt, S. & Gregoire, M. B.

Abstract

College and university dining services administrators (CUDSAs) were surveyed using a web-based questionnaire to determine sustainable practices in their operations. Results from 138 CUDSAs (26.4% response) indicated that the most frequently used sustainable practices included: recycling of fats, oils, grease, cardboard, white paper, aluminum, tin cans, and newspaper; use of recycled products such as napkins, and use of permanent tableware. CUDSAs reported that students, university administrators, and customers influenced their sustainable decisions and they were satisfied with their sustainability decisions but not with their resources. CUDSAs at private schools had implemented more practices and were more satisfied than were CUDSAs at public institutions.

Key words: sustainable practices; college and university dining services; college and university dining services administrators; satisfaction.

Introduction

Many concerns have been raised about sustainable characteristics of the current food system (Murray, 2005; Rimkus, Jones, & Ona, 2004). In order to provide large quantities, high quality, choices, and inexpensive food to more people, current industrial agriculture applies chemicals and pesticides that can cause toxins in groundwater and surface waters, and weaken soil quality. Moreover, those pesticides can harm human health (Tilman, Cassman, Mastson, & Polasky, 2002). Increasing globalization has led to foods traveling long distances,
increasing energy use and air pollution (Murray, 2005; Pirog, Pelt, Enshanyan, & Cook, 2001).

According to the American Dietetic Association (2007), the future food supply needs to incorporate sustainability to ensure human and environmental health. A sustainable food system should provide society with (1) an affordable, safe and nutritious food supply that people can purchase and access, and one that will not cause chronic illness; (2) foods grown in a way that is environmentally sustainable; and (3) a food system that provides economic and social value to rural and urban communities (W.K. Kellogg Foundation, n.d.).

Many higher education institutions are becoming environmentally responsible campuses, teaching students about degradation of the environment, encouraging students to seek sustainable practices, and serving as a role model in sustainability for students (Earl, Lawrence, Harris, & Stiller, 2003; Clugston & Calder, 1999). College and university dining services (CUDS) are part of these institutions’ ecological footprint.

The literature has documented many different sustainable practices that have been implemented by CUDS (Bush, 2005; Eagan & Keniry, 1998; McIntosh, Gaalswyk, Keniry, & Eagan, 2008; Sustainability Endowment Institute, 2009). Yet limited research has been done documenting the prevalence of sustainable practices in CUDS. The objectives of this research were to (1) identify sustainable practices existing in CUDS, (2) determine whether sustainable practices differ based on demographic characteristics of schools, and (3) examine CUDS administrators’ (CUDSAs) satisfaction level with their sustainable practices.

Method

This cross-section survey research project involved the use of a web-based questionnaire distributed nationwide to college and university dining services administrators
(CUDSAs). The project was reviewed and approved by the university’s Institutional Review Board prior to data collection.

**Sample Selection**

The research sample included all 555 CUDSAs in the United States listed in the National Association of College & University Food Services (NACUFS) directory who had an email address listed in the NACUFS’ 2008 directory. Twenty of the administrators were randomly selected for the pilot test; the remainder (n=535) became the study sample.

**Web Questionnaire**

A web-based questionnaire was developed based on previous research (Horovitz, 2006; Sustainability Endowment Institute, 2008), trade journal articles, and CUDS websites. The questionnaire was reviewed by an eight-member expert panel of faculty and university foodservice managers to evaluate its clarity, content validity, and appropriateness of questions. A pilot test was conducted with a random sample of 20 CUDSAs. The questionnaire was modified slightly based on comments from the expert panel and pilot test participants.

The questionnaire included a list of 21 sustainable practices that CUDSAs rated using a 7-point scale from 1 (never, not done in any of our dining operations) to 7 (always, done daily in more than 90% of our operations). CUDSAs indicated their satisfaction with their program’s sustainable outcomes, amount of resources, and customer’s reactions using a 7-point scale ranging from 1 (strong disagree) to 7 (strongly agree). CUDSAs also were asked to rate the degree of influence of several constituent groups using a 7-point scale from 1 (no influence) to 7 (strongly influence). Demographic data for the CUDSAs, the dining services program, and the university were collected.
The distribution of the online questionnaire followed Dillman’s (2007) suggestions. An invitation letter e-mail and a cover letter e-mail were sent within a one week period. Three follow-up e-mails were sent one week apart to help encourage response. Respondents were offered a summary of results to encourage participation in the project.

The Statistical Package for the Social Sciences (SPSS) Version 16.0 was used for all data analyses. Descriptive statistics (including means, standard deviations, and frequencies) were calculated. Independent-Samples $t$ test and one-way Analysis of Variance (ANOVA) were used to compare mean responses based on demographic characteristics.

**Results and Discussion**

Of the 535 CUDSAs contacted, 13 (2.4%) were undeliverable and were returned to the sender. The total number of responses was 138 resulting in a 26.4% response rate. About two-third of the respondents were males (65.4%) and 72.8% were older than 45 years (Table 4.1). More than half (59.3%) had a bachelor’s degree and 41.9% had held their position for less than five years. The majority of participants had attended sustainable workshops and provided educational materials to their students (76.6% and 86.2%, respectively). About one-third of the respondents (37%) had student enrollment of fewer than 4,000, 33.8% were located in Midwest, 63.2% had self-operated dining services, and 52.6% were associated with public institutions. The estimated value of standardized Cronbach’s coefficient alpha was used to test internal consistency of the instrument. The standardized Cronbach’s alpha value was 0.82 for the 21 sustainable practices section.

Of those who provided students with educational materials or programs on sustainable issues, 90.8% provided nutrition education, such as providing information or
consulting to help students eat healthier, followed by food waste reduction education (69.7%), environmental awareness education (66.4%), and tours to farm programs (20.2%).

As depicted in Table 4.1, the institutional characteristics for those who responded were similar to those of the NACUFS population of institutions. The results from non-parametric chi-square indicated that there was no difference between sample and population \( (p > .05) \) except status \( (p = .045) \). The sample for this study consisted of a greater proportion of CUDSAs from private schools than in the overall population (47.4% and 38.9%, respectively).

Sustainable practices perceived to occur most frequently in CUDS were: recycling fat, oil and grease; recycling cardboard; using recycled paper products; and recycling aluminum (Table 4.2). Sustainable practices least likely to occur were serving locally grown food and composting. Of the listed practices, all were considered sustainable practices except serving bottled water and using Styrofoam cups. An average practices score was computed by summing the ratings for the 21 sustainable practices, creating a sustainable practice score ranging from 21 (never) to 147 (always). Since “serving bottled water” and “using Styrofoam cups” were not sustainable practices, the ratings for those two items were reverse coded prior to computing the sustainable practices score.

Participants indicated several sustainable practices that had been adopted within the past two years in their operations including composting \( (n = 32) \), trayless dining \( (n = 28) \), local purchasing \( (n = 28) \), purchasing biodegradable/compostable service wares and containers \( (n = 26) \), recycling programs \( (n = 16) \), garden on campus \( (n = 12) \), eliminating Styrofoam and plastic usage \( (n = 11) \), purchasing organic foods/beverages \( (n = 10) \), and recycling oil to biodiesel \( (n = 10) \). About one-third of the participants indicated that they
adopted other sustainable practices not listed in the questionnaire, including selling reusable bags \( (n = 4) \), using a pulper \( (n = 4) \), and purchasing green products and cleaners \( (n = 4) \).

The frequent occurrence of waste reduction practices in CUDS is not surprising given the reports in the literature about foodservice operations implementing source-reduction activities because of increasing tipping fees, reduced landfill space, and regulatory mandates (Eagan & Keniry, 1998; Eagan, Keniry, Schott, Daynanada, Jones, & Madry, 2008; Kim, Shanklin, Su, Hackes, & Ferris, 1997). Although there have been many CUDS programs profiled in the trade press for their purchase of organic and local products, composting, and trayless dining (ARAMARK Higher Education, 2008; Laux, 2006; Sustainability Endowment Institute, 2009), the actual occurrence of these practices was somewhat limited.

Energy saving equipment is being purchased for CUDS operations, particularly light bulbs (78.3%), refrigerators (46.4%), and dish machines (41.3%). Approximately one-third (36.2%) of foodservice administrators indicated they have incorporated sustainability in their mission statements. As an example, the mission statement for the University of Massachusetts Dining states “the Mission of UMass Dining is to contribute to the campus life experience by providing a variety of healthy, flavorful food by serving local, regional and world cuisine in the most sustainable manner.” Some universities (14.5%) had dining halls that were certified as a Leadership in Energy and Environmental Design (LEED) building.

Independent samples \( t \) test and ANOVA were used to examine whether the sustainable practice score differed based on demographic characteristics of the program and the participants. No statistically significant differences were found in sustainable practice score and level of satisfaction based on participants’ demographic characteristics (gender,
age, and educational level). A few differences were found based on institutional characteristics (Table 4.3).

CUDS programs in private institutions had a significantly ($p < .01$) higher sustainable practice score ($mean = 105.21 \pm 15.33$) than those in public institutions ($mean = 96.11 \pm 18.90$). CUDSAs who provided educational materials and had attended sustainable workshops had significantly ($p < .001$) higher practice score ($mean = 103.22 \pm 15.21$ and $mean = 103.27 \pm 16.17$, respectively) than those who had not ($mean = 82.79 \pm 21.96$ and $mean = 91.44 \pm 19.68$, respectively). CUDS programs located in the Northeast ($mean = 108.88 \pm 13.54$) had significantly ($p < .01$) higher score in sustainable practices as compared to CUDS programs located in the Midwest ($mean = 97.22 \pm 16.95$) and South ($mean = 93.88 \pm 18.94$).

Participants were asked to rate their satisfaction with (1) the outcomes of sustainable practices, (2) the amount of resources available to support sustainable practices, and (3) their customers’ reactions. In general, CUDSAs were satisfied with their outcomes of the current sustainable practices and their customer’ reactions toward sustainable practices ($mean = 4.50 \pm 1.54$ and $mean = 4.68 \pm 1.51$). However, CUDSAs were slightly unsatisfied with the amount of resources they have to support sustainable practices ($mean = 3.80 \pm 1.73$). Results from Independent sample $t$ test indicated that CUDSAs associated with private institutions indicated a significantly ($p < .05$) higher level of satisfaction from customers’ reactions compared to those associated with public institutions ($mean = 4.94 \pm 1.32$, $mean = 4.41 \pm 1.65$, respectively). Also CUDSAs with contract management companies had significantly ($p < .05$) higher levels of satisfaction with the amount of resources supporting sustainable practices as compared to CUDSAs of self-operated programs ($mean = 4.18 \pm 1.59$, $mean = \ldots$)
3.54 \pm 1.77, respectively). Ratings for all three satisfaction items were found to differ significantly \((p < .01)\) based on whether participants provided educational materials to their students; those who provided information were more satisfied than those who had not. Moreover, CUDSAs who had attended a sustainable workshop were more satisfied with sustainable outcomes and customers’ reaction than those who had not (Table 4.3).

Participants indicated that students, customers, and university administrators had the greatest influence on their sustainable decisions (Table 4.4). Independent samples \(t\) test and ANOVA results suggested several differences based on demographic characteristics. Students in the West (mean = 6.27 \pm 1.14) had more influence than did students in the South (mean = 5.46 \pm 1.36). University administrators, suppliers, and management companies had a stronger influence with contract managed CUDSAs (mean = 5.76 \pm 1.01, mean = 3.87 \pm 1.55, mean = 5.37 \pm 1.68, respectively) than they did with self-operated CUDSAs (mean = 5.19 \pm 1.53, and mean = 3.26 \pm 1.63, mean = 1.53 \pm 1.20, respectively).

The results are consistent with other findings that higher education institutions in the Northeast and the West have higher participation rates on waste reduction and conserving energy and students have a strong influence in sustainable practices (McIntosh et al., 2008).

Limitations

There are limitations to the study. The sample was drawn from a professional association (NACUFS) database; therefore, the results might not generalize to all CUDSAs in the U.S. The low response rate is another limitation of this study. Reasons for this low response are not known. Possibly CUDSAs receive a large volume of email communication and discard the email requests to participate in this study. The web questionnaire was sent out
in late August. This may have impacted the response rate, if this was a busy time for CUDS administrators.

**Conclusions and Applications**

This study examined current sustainable practices existing in CUDS; the CUDSAs’ satisfaction with the outcome; and the number of resources and customers’ reactions to their sustainability efforts. Results showed that all 21 sustainable practices examined do exist to some degree in CUDS programs. The most widely used practices were recycling plastics, aluminum, cardboard, newspaper, and fat, oil and grease, and using reusable containers. More recently implemented practices include composting, trayless dining, local purchasing, and purchasing of biodegradable/compostable service ware and containers. These results provide CUDSAs information about what other CUDSAs are currently doing and suggest sustainable practice benchmarks for their operations in the future.

Research is needed regarding how sustainable practices impact dining services’ financial performance, student participation, and customer satisfaction. Evaluation is needed to determine resources needed to implement new sustainable practices. The effectiveness of educational materials and programs should be examined as well.

Findings from this study suggest that various constituent groups, particularly students, university administrators, and customers can influence CUDSAs’ sustainable decisions. CUDSAs can proactively educate themselves by attending sustainable workshops and should involve students, university administrators, and customers in the planning for and implementation of sustainable practices.
References


Table 4.1  Demographic Characteristics of College and University Dining Service Participants (n = 138)

<table>
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<th>Frequency</th>
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<th>Population Percent</th>
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<td>Over 50</td>
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<td>18</td>
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<tr>
<td>Years in current position</td>
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Table 4.1  (Continued)

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</table>

a Percent of the total population (N=555).

Table 4.2  Practices in College and University Dining Services (n= 138)

<table>
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<tr>
<th>Practices</th>
<th>Meana</th>
<th>SD</th>
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<tr>
<td>1. Recycling fat, oil, &amp; grease</td>
<td>6.53</td>
<td>1.16</td>
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<tr>
<td>2. Recycling cardboard</td>
<td>6.50</td>
<td>1.22</td>
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<td>3. Using recycled paper products (e.g. napkins)</td>
<td>5.91</td>
<td>1.52</td>
</tr>
<tr>
<td>4. Selling bottled waterb</td>
<td>5.90</td>
<td>1.43</td>
</tr>
<tr>
<td>5. Recycling white paper, computer printouts, etc</td>
<td>5.88</td>
<td>1.55</td>
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<tr>
<td>6. Recycling aluminum (e.g., cans, foil)</td>
<td>5.68</td>
<td>1.87</td>
</tr>
<tr>
<td>7. Using reusable tableware</td>
<td>5.54</td>
<td>1.72</td>
</tr>
<tr>
<td>8. Recycling tin cans</td>
<td>5.47</td>
<td>2.19</td>
</tr>
<tr>
<td>9. Recycling newspaper</td>
<td>5.43</td>
<td>1.94</td>
</tr>
<tr>
<td>10. Serving Fair Trade coffee</td>
<td>5.38</td>
<td>1.90</td>
</tr>
<tr>
<td>11. Recycling plastic products (e.g. plastic containers, plastic packaging)</td>
<td>5.33</td>
<td>1.96</td>
</tr>
<tr>
<td>12. Using refillable mug program for drinks</td>
<td>4.82</td>
<td>2.05</td>
</tr>
<tr>
<td>14. Using biodegradable disposable products</td>
<td>4.38</td>
<td>1.89</td>
</tr>
<tr>
<td>15. Serving sustainable seafood</td>
<td>3.99</td>
<td>2.00</td>
</tr>
<tr>
<td>16. Sharing unserved food with those in need</td>
<td>3.89</td>
<td>2.29</td>
</tr>
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<td>17. Serving organic foods</td>
<td>3.60</td>
<td>1.64</td>
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<tr>
<td>18. Operating trayless</td>
<td>3.47</td>
<td>2.27</td>
</tr>
<tr>
<td>19. Composting</td>
<td>3.07</td>
<td>2.34</td>
</tr>
<tr>
<td>20. Using Styrofoam cupsb</td>
<td>2.67</td>
<td>1.90</td>
</tr>
<tr>
<td>21. Serving locally grown food</td>
<td>1.31</td>
<td>1.55</td>
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<tr>
<td><strong>Average of practice scorec</strong></td>
<td>100.41</td>
<td>17.68</td>
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</table>

a Scale: 1 (never, not done in any of our campus dining operations) to 7 (always, done daily in more than 90% of our campus dining operations).

b Item reported original mean score. Item reverse coded when average of practice score computed.

c Sum score for all 21 practices score; possible score range 21 - 147.
Table 4.3  Demographic Traits Related to Sustainable Practices and Satisfaction ($n=138$)

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<tr>
<th></th>
<th>Satisfaction Level&lt;sup&gt;b&lt;/sup&gt;</th>
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<tr>
<td></td>
<td>Average Practices Score&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Outcomes&lt;sup&gt;c&lt;/sup&gt;</td>
<td>Resources&lt;sup&gt;d&lt;/sup&gt;</td>
<td>Customers’ reactions&lt;sup&gt;e&lt;/sup&gt;</td>
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<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
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<td><strong>Status</strong></td>
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<td>4.65 (1.38)</td>
<td>3.97 (1.69)</td>
<td>4.94 (1.32)</td>
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</tr>
<tr>
<td>Public</td>
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<td>4.30 (1.65)</td>
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<td>4.41 (1.65)</td>
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</tr>
<tr>
<td>t-value</td>
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<td>1.32</td>
<td>1.29</td>
<td>2.01*</td>
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<tr>
<td><strong>Management type</strong></td>
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<td></td>
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<td></td>
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<tr>
<td>Self-operated</td>
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<td>4.37 (1.60)</td>
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<td>4.67 (1.54)</td>
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<tr>
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<td>4.90***</td>
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<td>3.80 (1.73)</td>
<td>4.68 (1.51)</td>
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</table>

<sup>a</sup> Sum of all 21 practices (range from 1, never to 7, always); possible range in scores 21 - 147.
<sup>b</sup> Scale: 1 (Strongly disagree) to 7 (Strongly agree).
<sup>c</sup> Overall, I am satisfied with the outcome of the current sustainable practices in my operation.
<sup>d</sup> I am satisfied with the amount of resources (e.g., labor and finances) I have to support sustainable practices in my operation.
<sup>e</sup> I am satisfied with my customers’ reactions toward sustainable practices in my operation.
Table 4.4  Influencer of Constituent Groups on Foodservice Administrators' Decisions to Implement Sustainable Practices (n = 138)

<table>
<thead>
<tr>
<th>Influencers</th>
<th>Students (Mean, SD)</th>
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<th>Personnel (Mean, SD)</th>
<th>Faculty/staff (Mean, SD)</th>
<th>Suppliers/vendors (Mean, SD)</th>
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<th>Management company (Mean, SD)</th>
<th>Extension agent (Mean, SD)</th>
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<tr>
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<td>5.00 (1.53)</td>
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<td>5.19 (1.53)</td>
<td>4.89 (1.60)</td>
<td>4.54 (1.40)</td>
<td>3.26 (1.63)</td>
<td>3.10 (1.90)</td>
<td>1.53 (2.10)</td>
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<td>5.76 (1.01)</td>
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<td>4.93 (1.38)</td>
<td>3.87 (1.55)</td>
<td>3.67 (1.75)</td>
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<td>-1.57</td>
<td>-2.13*</td>
<td>-1.72</td>
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<tr>
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<td>6.04 (1.17)</td>
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<td>5.40 (1.39)</td>
<td>4.89 (1.61)</td>
<td>4.67 (1.40)</td>
<td>3.48 (1.64)</td>
<td>3.31 (1.94)</td>
<td>2.89 (2.36)</td>
<td>2.58 (1.64)</td>
</tr>
</tbody>
</table>

*p < .05, **p < .01

Scale: 1 (No influence) to 7 (Strong influence).
CHAPTER 5. USE OF THE THEORY OF PLANNED BEHAVIOR AND THE EFFECT OF PERSONAL NORM TO EXAMINE COLLEGE AND UNIVERSITY DINING SERVICES ADMINISTRATOR'S INTENTION TO ADOPT SUSTAINABLE BEHAVIORS

A paper to be submitted to the Journal of Hospitality and Tourism Research

Chen, C-J., Gregoire, M. B., Arendt, S., & Shelley, M.

Abstract

This study used the theory of planned behavior (TPB) model to examine college and university dining services administrators’ (CUDSAs) intention to adopt sustainable practices. The impact of the personal norm construct on intention also was explored. This study used data from a web-based questionnaire completed by 138 (26.4% response) CUDSAs in the U.S. Results indicated that subjective norm had the most influence on CUDSAs’ intention to adopt sustainable practices, followed by attitude and personal norm. Including the personal construct in the TPB model reduced unexplained variance by 33.48%.

Introduction

Corporations today are expected to meet economic and legal requirements and balance environmental and social impacts without damaging economic performance (Carroll, 1999; Palazzi & Starcher, 2006). Institutions of higher education are no exception. College and University Dining Services (CUDS) have environmental and social responsibilities including providing healthy food, teaching students good eating habits, educating students about how the food systems can impact the environment, and being good environmental stewards (Strohbehn & Gregoire, 2004).

What factors prompt some College and University Dining Services Administrators (CUDSAs) to adopt sustainable practices behaviors? The theory of planned behavior (TPB)
provided the theoretical base for the current study to examine the CUDSAs’ intention to adopt sustainable practices in their dining services operation.

**Review of Literature**

The TPB is an extension of the theory of reasoned action (TRA). Both models are widely used and popular conceptual frameworks for human action (Ajzen, 1991; Armitage & Conner, 2001). The TRA model assumes that intentions can be predicted by a person’s behavior, and that intention is influenced by personal attitude and personal perceptions of others’ view toward the behavior (subjective norm) (Eves & Cheng, 2007). The only difference between the TRA and the TPB is that the TPB model takes self-efficacy or ability to perform the behavior of interest into account (perceived behavioral control) (Ajzen, 1991).

*Intention.* The TPB model indicates that intentions are the best predictor of behavior (Kaiser, Schultz, & Scheuthle, 2007). Studies also showed ecological behavioral intention was strongly related (Kaiser & Gutscher, 2003; Kaiser, Wölfing, & Fuhrer, 1999; Lansana, 1992) or moderately related (Hines, Hungerfor, & Tomera, 1986/87) to ecological behaviors, such as recycling glass, recycling paper, and recycling empty bottles.

The TPB hypothesizes that intentions are based on three constructs: attitude toward the behavior, subjective norm, and perceived behavior control (PBC). Research by Kaiser and Gutscher (2003) found that attitude, subjective norm, and PBC explained 81% of the variance in ecological behavior intention, and intention determined 51% to 52% of peoples’ ecological behavior. The following section describes these determinants of intentions, the antecedents and proposed hypotheses for this study.

*Attitude.* When a person has a more positive attitude toward a behavior, the person will want to engage in a certain behavior (Hansen, 2008). Studies have shown that attitude
has either a moderate (Axelrod & Lehmann, 1993; Smith, Haugetvedt, & Petty, 1994) or a weak (Grob, 1995) relationship with ecological behavior. Therefore, the following hypothesis was proposed:

Hypothesis 1: CUDSAs’ attitude toward sustainable practices will have a positive effect on their intention to adopt sustainable practices.

Subjective norm. Subjective norm measures the influence of social pressures on individuals to perform or not to perform a particular behavior. This means if an individual perceives that people important to him/her approve or disapprove of a behavior, the individual is more or less likely to intend to perform it (Conner & Armitage, 1998). Kaiser, Wölfing and Fuhrer (1999) reported a relationship between subjective norm and ecological behavior ranging from rather weak to fairly strong. Thus, it was proposed that:

Hypothesis 2: CUDSAs’ subjective norm will have a positive effect on their intention to adopt sustainable practices.

Perceived behavior control. Perceived behavior control (PBC) is a person’s perception of whether he/she has the means or opportunities to do a behavior (Ajzen, 2005; Conner & Armitage, 1998). The relationship between PBC and behavior suggests that people tend to carry out behaviors that they have control over and try to prevent from engaging in behavior over which they have no control. There were inconsistent findings in the literature about the strength of this relationship with reports ranging from a slightly negative to nonexistent to very positive relationship between PBC and ecological behavioral intention (Kaiser, Wölfing, & Fuhrer, 1999). Based on findings from previous studies, the following hypothesis was posited:

Hypothesis 3: CUDSAs’ perceived behavior control will have a positive effect on their intention to adopt sustainable practices.
**Personal norm.** Personal norm is defined as feelings of strong obligations that people experience within themselves that prompt them to act on social behaviors. (Schwartz 1977). Hines et al. (1986/87) reported a relationship between personal norm and ecological behavior. Harland, Staats, and Wilke (1999) found that including personal norm could increase the proportion of explained variance of behavioral intention. Therefore, the following hypothesis was suggested:

*Hypothesis 4: CUDSAs’ personal norm will have a positive effect on their intention to adopt sustainable practices.*

**Knowledge.** People will not act with proper behaviors without proper knowledge; therefore, factual knowledge is a prerequisite for any attitude (Stutzman & Green, 1982). Kaiser, Wölfing, and Fuhrer (1999) contended that even though knowledge may be the basis for any attitude, it would not have a strong relationship with ecological behavior because ecological attitude and behavioral intention reduce its power. Stern (1992) and Simmons and Widmar (1990) found knowledge differentiated people’s involvement with specific problems. Thus, it was proposed that

*Hypothesis 5a: CUDSAs’ knowledge about sustainable practices will have a positive effect on their attitude toward sustainable practices*

*Hypothesis 5b: CUDSAs’ knowledge about sustainable practices will have a positive effect on their perceived behavior control.*

*Hypothesis 5c: CUDSAs’ knowledge about sustainable practices will have a positive effect on their personal norm.*

**Personal value.** Personal value can be defined as beliefs relating to the desired behaviors or modes of conduct that guide an individual’s actions (Hansen, 2008). Studies found that personal value had a strong effect on environmental behavior (Grob, 1995; Thøgersen & Grunert-Beckman 1997). Stern, Dietz, Kalof, and Guagnano (1995) suggested that personal value influenced the formation of attitudes. Therefore, it is proposed that
Hypothesis 6a: CUDSAs’ personal value will have a positive effect on their attitude toward sustainable practices.
Hypothesis 6b: CUDSAs’ personal value will have a positive effect on their subjective norm.
Hypothesis 6c: CUDSAs’ personal value will have a positive effect on their perceived behavior control.
Hypothesis 6d: CUDSAs’ personal value will have a positive effect on their personal norm.

Past experience. People who have had a successful performance of a behavior in the past tend to perform the behavior in the future (Kashima, Gallois, & McCamish, 1993; O’Callaghan, Chant, Callan, & Baglioni, 1997). A relationship was found between past behavior and behavioral intention (Kashima et al., 1993; O’Callaghan et al., 1997). Consequently, it was predicted that positive past experience with sustainable practices would increase the attitude-intention relationship. This led to the following hypotheses:

Hypothesis 7a: CUDSAs’ past experience with sustainable practices will have a positive effect on their attitude toward sustainable practices.
Hypothesis 7b: CUDSAs’ past experience will have a positive effect on their subjective norm.
Hypothesis 7c: CUDSAs’ past experience with sustainable practices will have a positive effect on their perceived behavior control.
Hypothesis 7d: CUDSAs’ past experience has positive effect on their personal norm.

Aims of the Study

The theory of planned behavior (TPB) is often used to analyze people’s behavior (Ajzen & Madden, 1986). Although there is a substantial amount of research predicting personal environmental intention behaviors, limited research has been conducted in the foodservice field. Hence, the objectives of this study were to test the TPB model in college and university dining services and examine the effect of personal norm on CUDSAs’ behavioral intention to adopt sustainable practices in their dining operation.
Method

Subjects and Procedures

All 555 CUDSA in the United States, who had their e-mail listed in the 2008 Directory of the National Association of College & University Food Services, were included in the study. Twenty of the 555 administrators were randomly selected for the pilot test and the remainder \((n = 535)\) became the study sample.

A web-based questionnaire was developed based on a literature review and input from an expert panel of eight hospitality management faculty members and dining service managers. A pilot test was conducted to seek comments on clarity and relevancy of directions and statements in the questionnaire, length of time needed to complete the questionnaire, and any experience of technical problems. Minor revisions were made to the questionnaire prior to distribution to the study sample. The study was reviewed and approved by the university’s Institutional Review Board prior to data collection.

Dillman’s (2007) recommendations for design and distribution of a web-based questionnaire were followed. An invitation e-mail and a cover letter e-mail were sent within a one-week period and three follow-up emails were sent one week apart to encourage response.

Web Questionnaire

The web-based questionnaire was designed with questions in nine sections: attitude toward sustainable practices, subjective norm, perceived behavior control, personal norm, intention to adopt sustainable practices, knowledge, past experience, and personal value, and demographic information.
Attitudes toward sustainable practices (ATT). The items used to measure the CUDSAs’ attitudes toward sustainable practices were based on the suggestions from Ajzen (1988). Respondents were asked to rate the question: “For me, sustainable practices are” on six 7-point semantic differential scales. The anchors of these scales were: (ATT1) bad-good, (ATT2) negative-positive, (ATT3) worthless-valuable, (ATT4) unexciting-exciting, (ATT5) not needed-needed, and (ATT6) unimportant-important.

Subjective norm (SN). The items measuring subjective norm were adopted from Ajzen (1988). Respondents were asked to indicate the importance of three referents using 7-point scale ranging from 1 (I should not) to 7 (I should). The referents were (SN1) “my dining services’ work colleagues”; (SN2) “my external work colleagues (e.g., college/university president)”; and (SN3) “other institutions’ foodservice directors think ____ implement sustainable practices.” Two items were rated on a 7-point scale from 1 (not at all) to 7 (very much). Those two items were (SN4) “generally speaking, how much do you want to do what your dining services’ work colleagues think you should do?;” and (SN5) “general speaking, how much do other institutions’ foodservice administrators influence your opinions?;

Perceived behavioral control (PBC). Three items were designed to capture respondents’ perceived ease or difficulty in carrying out sustainable practices. Respondents were asked to rate the following statements on 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree): (PBC1) “my budget allows me to implement sustainable practices;” (PBC2) “the lack of information regarding how to start sustainable practices makes it difficult for me to implement them;” and (PBC3) “whether or not to implement sustainable practices is not my control or my decision.”
Personal norm (PN). The concept of personal norm was measured by adopting three items from Harland et al. (1999): (PN1) “I feel a strong personal obligation to have sustainable practices in my operation,” (PN2) “I am willing to put extra effort into sustainable practices in my operation on a regular basis,” and (PN3) “I would feel guilty if I did not have sustainable practices in my operation.” The items were rated on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree).

Intention to adopt sustainable practices (Int). The items measuring intention were adopted from Ajzen (1988). The likelihood that respondents would adopt sustainable practices in the future was assessed using 7-point scales ranging from 1 (extremely unlikely/definitely false/strongly disagree) to 7 (extremely likely/definitely true/strongly agree) to indicate level of (INT1) “I intend to adopt more sustainable practices in my operation during the next year,” (INT2) “I will try to adopt sustainable practices in my operation during the next year,” and (INT3) “I plan to adopt sustainable practices during the next year.”

Knowledge (KNOW). Knowledge was measure by four true or false questions: (KNOW1) “food waste is the single-largest component of discarded waste by weight in the U.S;” (KNOW2) “packaging waste and food waste are two examples of solid waste generated by the foodservice industry;” (KNOW3) “in general, it takes more energy to produce new products from recycled waste than from virgin materials;” and (KNOW4) “the purpose of Fair Trade is to alleviate global poverty and promote sustainability.”

Personal value (PV). Four items were used to assess personal value. Each was rated using a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). Respondent were asked to rate the items: (PV1) “I think sustainable practices can help the environment,” (PV2) “I think sustainable practices are good for an institution’s public relations,” (PV3) “in
my opinion, my customer desire sustainable practices,” and (PV4) “overall sustainable practices have reduced my operational costs.”

Past experience (PE). Three items were used to assess the respondents’ previous experiences with sustainable practices using a 7-point scale from 1 (strongly disagree) to 7 (strongly agree). The items were: (PE1) “overall, I am satisfied with the outcome of the current sustainable practices in my operation,” (PE2) “I am satisfied with the amount of resources (e.g., labor and finances) I have to support sustainable practices in my operation,” and (PE3) “I am satisfied with my customers’ reactions toward sustainable practices in my operation.”

Data Analysis

The Statistical Package for the Social Sciences (SPSS) Version 16.0 was used to conduct data analysis using frequencies, Pearson correlation, reliability, and exploratory factor analysis. A confirmatory factor analysis, analysis of the measurement model, and structural equation modeling (SEM) analysis were conducted using the Analysis of Moment Structures (AMOS) Version 16.0.

Exploratory factor analysis, using maximum likelihood extraction with varimax rotation, was used to group the items together to be used as indicators of the various latent dimensions. Internal consistency was examined for each of the multi-item constructs included in the study (e.g., attitude, subjective norm, perceived behavior control, personal norm, and intention).

Anderson and Gerbing (1988) suggested using two-step modeling for SEM. The first step confirmed the measurement model using confirmatory factor analysis (CFA), which determined construct validation. In the second step, a series of structural equation models
were tested to measure the adequacy of constructs in explaining the CUDSAs’ intention to adopt sustainable practices and to measure whether adding personal norm (PN) as a predictor in the model can increase explanation of variance in behavioral intention. The maximum-likelihood estimation procedure was used to estimate the SEM with AMOS 16.0.

Evaluation of the measurement model includes estimation of standardized Cronbach’s alpha, and the convergent and discriminant validity of the research instrument. To retain an item in a scale, a Cronbach’s alpha value of 0.7 is widely used; however, 0.6 or higher is considered acceptable in social psychology research (Robinson, Shaver, & Wrightsman, 1991). Convergent validity was indicated by factor loadings and average extracted variance. An average extracted variance was used to assess for all constructs and it should be 0.50 or more (Fornell & Larcker, 1981). Hair, Anderson, Tatham, and Black (1998) indicated those loadings greater than 0.30 are considered important; loadings greater than 0.40 are more important, and loadings 0.50 or greater are considered to be very important. Correlations among factors were used to check discriminant validity ($p < .05$). Brown (2006) indicated that in applied research, a factor correlation that exceeds 0.80 or 0.85 indicated poor discriminant validity.

The overall fit of the model to data was examined through chi-square, comparative fit index (CFI), and root mean square error of approximation (RMSEA). Chi-square measures the difference between the theorized model’s covariance matrix and observed covariance matrix. A large chi-square result indicates poor model fit. However, chi-square is not a sufficient test alone to assess model fit. It has been criticized for its sensitivity to sample size, assumptions, and distribution (Brown, 2006). Therefore, CFI, and RMSEA were also calculated. By convention, models with a good fit have fit statistics above 0.95 for CFI and
below 0.50 for RMSEA. There is adequate fit if the RMSEA value is between 0.05-0.08 and CFI is between 0.90 - 0.95 (Brown, 2006).

**Results**

**Demographic Profile**

Out of the 535 CUDSAs contacted, 13 (2.4%) were undeliverable and were returned to the sender. A total of 138 questionnaires were completed and returned, resulting in a 26.4% response rate. Approximately one-third (34.6%) of respondents were female, 71.1% were older than 45 years of age, and 59.3% had a bachelor’s degree. The majority of participants had been with the current institution (75%) and had held their current position (58.1%) for more than five years.

**Measurement Model**

Based on the results of exploratory factor analysis, PE2 “I am satisfied with the amount of resources” shared common variables with PBC; therefore, PE2 was grouped with the PBC construct. All knowledge items except KNOW1 had low factor loading (<0.1), thus KNOW1 was used as a single item to measure knowledge for further data analysis. Due to model fit indices from the first CFA, a number of observed variables were deleted because of their low factor loadings and low squared multiple correlations to improve model fit. Then the second CFA was performed, the overall model fit suggested a good fit of the data with $\chi^2$ (125, n=133) = 182.60; RMSEA= .059 (90% CI = .039 - .077); CFI = .97; $\chi^2$/df=1.46). Table 5.1 shows the standardized Cronbach’s alphas and factor loadings of observed items on the latent constructs. The range of standardized Cronbach’s alphas was from 0.62 to 0.96, indicating acceptable internal consistency (Nunnally, 1978). The factor loadings are moderately high and all freely estimated parameter estimates are significant at $p< .001$ which
indicated convergent validity (Anderson & Gerbing, 1988). The average extracted variance of past experience was slightly below 0.50. Since the factor loadings were significant and the reliability of the construct was an acceptable value, the construct was retained.

Table 5.2 presents the correlations among the study variables. Pearson correlations were used to examine whether there was an association among variables for the proposed model and discriminant validity. All latent variables, except knowledge had significantly associated \((p < .05)\) with intention to adopt sustainable practices. Even though knowledge was not significantly associated with intention, the results indicated that knowledge had positive correlations with personal value, past experience, and personal norm latent variables \((p < .05)\). The factor correlations ranged from 0.16 to 0.62 and were significantly different from one, establishing discriminant validity.

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Insert Table 5.1

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Insert Table 5.2

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Causal Equation Model

The causal model consisted of three exogenous constructs (knowledge, personal value, and past experience) and five endogenous constructs (attitude, subjective norm, perceived behavior control, personal norm, and intention to adopt sustainable practices). Casual model analyses were conducted by maximum-likelihood estimation procedures using AMOS 16.0. Standardized path coefficient and t-values for each path as well as fit indices of the model are presented in Figure 5.1. Results of casual model obtained for the theoretical model revealed a

\[
\chi^2 (133, n=133) = 189.85, p = .001; \chi^2/df = 1.43; \text{RMSEA} = .057 (90\% \text{ CI} = .037 - .075);
\]
CFI = .969 which indicated an acceptable fit to the data. Squared multiple correlation ($R^2$) for each endogenous constructs ranged from 0.42 to 0.66.

The results from SEM (Figure 5.1 and Table 5.3) revealed hypothesis 1, predicting a positive relationship between attitude toward sustainable practices and intention to adopt sustainable practices was supported ($\beta = .33, t(133) = 3.95, p < .001$). The proposed positive relationship between subjective norm and intention to adopt sustainable practices ($H_2$) was also supported ($\beta = .40, t(133) = 3.77, p < .001$). The third hypothesis, predicting a positive relationship between perceived behavior control (PBC) and intention to adopt sustainable practices was not supported. Significant ($p < .01$) and positive path coefficient was observed between personal norm and intention to adopt sustainable practices ($H_4$) ($\beta = .24, t(133) = 2.63, p < .01$). The knowledge construct was not found to significantly ($p > .05$) affect attitude ($H_{5a}$), PBC ($H_{5b}$), or personal norm ($H_{5c}$). Personal value had a significant and positive path coefficient with attitude ($H_{6a}$) ($\beta = .55, t(133) = 5.39, p < .001$), subjective norm ($H_{6b}$) ($\beta = .30, t(133) = 2.68, p < .01$), and personal norm ($H_{6c}$) ($\beta = .68, t(133) = 6.83, p < .001$). Hypothesis $6c$, predicting a positive relationship between personal value and PBC, was not supported ($p > .05$). Past experience was predicted to have positive relationships with attitude ($H_{7a}$), subjective norm ($H_{7b}$), PBC ($H_{7c}$), and personal norm ($H_{7d}$). The respective path coefficient provided support for Hypotheses $7_a$, $7_b$, $7_c$, and $7_d$ ($\beta = .24, \beta = .51, \beta = .74$, and $\beta = .29$ respectively). These results suggest that CUDSAs’ attitude toward sustainable practices, subjective norm, and personal norm have significant positive influence on their intention to adopt sustainable practices.

-----------------------------------------------

Insert Figure 5.1

-----------------------------------------------
To explore whether personal norm influenced intention to adopt sustainable practices, two models were analyzed. Model 1 hypothesized the inclusion of personal norm in the model. Model 2 was very similar to Model 1; however, all paths associated with the personal norm construct were deleted.

Comparing the two models yielded a statistically significant difference, $\Delta \chi^2 = 95.57$, $p < .001$, indicating that including the personal norm construct in the TPB model reduced unexplained variance of behavioral intention by 33.48% ($\frac{95.57}{285.42} \times 100$) (Table 5.4). Including personal norm in the model resulted in a decreased effect of attitude and subjective norm on intention (Table 5.5) and the percentage of variance explained increased 11% for attitude, 3% for perceived behavior control, and 2% for intention.

**Discussion and Implications**

The present study used the TPB model to examine CUDSAs’ intention to adopt sustainable practices and explored the impact of the personal norm construct on this intention. Findings from this study were similar to previous studies that suggested behavioral intention could be predicted by attitude, social pressures, and personal norm (Axelrod & Lehmann, 1993; Conner & Armitage, 1998; Hartland et al., 1999). The results revealed that CUDSAs’
subjective norm (social pressures from internal and external colleagues) had the most influence on their behavioral intention to adopt sustainable practices, followed by their attitude toward sustainable practices and personal norm about sustainable practices. PBC did not have a significant influence on intention in this study; suggesting its influence on sustainable decisions might not as important as subjective norm, attitude, and personal norm for CUDSAs.

Even though knowledge was not found to be significantly predictive of other constructs, the findings from correlation matrix (Table 5.2) suggested that there was a positive relationship among knowledge, personal value, past experience, and personal norm. The absence of significance of knowledge in the SEM model was inconsistent with previous studies (e.g., Stern, 1992; Simmons & Widmar, 1990).

Stern et al. (1995) found personal value influenced attitude. Findings from this study suggested that personal value not only influenced CUDSAs’ attitude toward sustainable practices, but also their subjective norm and personal norm. Moreover, results from this study also indicated that past experiences had a positive impact on attitude, subjective norm, PBC, and personal norm.

Hartland et al. (1999) found adding personal norm increased 1-10% explanation of variance for intention. This study had similar findings. Including the personal norm construct in the TPB model reduced the unexplained variance for intention by 33.48%, suggesting the importance of including personal norm in the TPB model for predicting sustainable behavior.

There were several limitations in this study. First, the sample used in this study consisted of members of a professional organization (National Association of College and University Food Service). Generalizability of results to all CUDSAs may be limited.
depending on the representativeness of NACUFS to the larger population. The response rate for the study was low. Reasons for this low response rate are not known but demographic characteristics of the participating schools were similar to the NACUFS population of schools. This study did not measure future behaviors and thus could not test applicability of that portion of the TPB model in CUDS setting.

Future research could examine the effect of PBC and personal norm on specific sustainable behaviors (e.g., composting). In addition, since it is suggested that both past behavior and future behavior be included in the TPB model, future studies could examine the effect of past behavior on future behavior.

References


<table>
<thead>
<tr>
<th>Table 5.1</th>
<th>Scale Items and Confirmatory Factor Analysis Results (n = 133)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Factor</strong></td>
<td><strong>Standardized Factor Loadingsa</strong></td>
</tr>
<tr>
<td>Personal Valuec</td>
<td></td>
</tr>
<tr>
<td>Helping environment</td>
<td>0.92</td>
</tr>
<tr>
<td>Good for public relations</td>
<td>0.72</td>
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<td>Past Experiencec</td>
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</tr>
<tr>
<td>Satisfied with the outcome</td>
<td>0.72</td>
</tr>
<tr>
<td>Satisfied with customers’ reaction</td>
<td>0.64</td>
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<tr>
<td>Attituded</td>
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<tr>
<td>Negative/ positive</td>
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<tr>
<td>Worthless/ valuable</td>
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<td>Not needed/ needed</td>
<td>0.91</td>
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<tr>
<td>Unimportant/ important</td>
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<td>Subjective Normc</td>
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<td>Dining Personnel</td>
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<td>Perceive Behavior Controlc</td>
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<tr>
<td>Satisfied resources</td>
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<tr>
<td>Personalc</td>
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<tr>
<td>Intentionc</td>
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<td>Willing to try adopt</td>
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</tr>
<tr>
<td>Planning to adopt</td>
<td>0.93</td>
</tr>
</tbody>
</table>

*aAll standardized factor loadings (λ) are significant at 0.001 level*

*b Average Variance Extracted (AVE) = [sum (λ^2)]/[sum (λ^2)+sum (1-λ^2)]

*c Scale: 1 (strongly disagree) to 7 (strongly agree)*

*dScale: 7 point semantic differential scale*

*eScale: 1 (I should not) to 7 (I should)*
### Table 5.2 Pearson Product-moment Correlations among Study Variables

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<td>2. Personal value</td>
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<td>3. Past experience</td>
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<td>0.542**</td>
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<td>4. Attitude</td>
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<td>0.262**</td>
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<td>5. Subjective norm</td>
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<td>0.351**</td>
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<td>0.484**</td>
<td>0.258**</td>
<td>0.331**</td>
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<td>7. Personal norm</td>
<td>0.188*</td>
<td>0.585**</td>
<td>0.405**</td>
<td>0.619**</td>
<td>0.476**</td>
<td>0.327**</td>
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<td>8. Intention</td>
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<td>0.455**</td>
<td>0.383**</td>
<td>0.558**</td>
<td>0.507**</td>
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<td>0.602**</td>
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</table>

* $p < .05$; ** $p < .01$  

a Perceived behavior control

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**Figure 5.1 Causal Relationships between Study Variables**

- Hypothesis supported
- Hypothesis not supported

- PV: Personal value
- PE: Past experience
- SN: Subjective norm
- PBC: Perceived behavior control
- PN: Personal norm
- SMC: Squared Multiple Correlations

<table>
<thead>
<tr>
<th>Model fit</th>
<th>SMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\chi^2(152) = 189.85^{***}$</td>
<td>Attitude = 0.424</td>
</tr>
<tr>
<td>RMSEA = 0.057</td>
<td>SN = 0.432</td>
</tr>
<tr>
<td>CFI = 0.969</td>
<td>PBC = 0.545</td>
</tr>
<tr>
<td>$\chi^2/df = 1.43$</td>
<td>PN = 0.655</td>
</tr>
<tr>
<td>$^* p &lt; .05$</td>
<td>Intention = 0.527</td>
</tr>
<tr>
<td>$^{**} p &lt; .01$</td>
<td></td>
</tr>
<tr>
<td>$^{***} p &lt; .001$</td>
<td></td>
</tr>
</tbody>
</table>
### Table 5.3 Summary of hypothesized paths from SEM

<table>
<thead>
<tr>
<th>Hypothesized Path</th>
<th>Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude → Intention (H1)</td>
<td>S</td>
</tr>
<tr>
<td>Subjective norm → Intention (H2)</td>
<td>S</td>
</tr>
<tr>
<td>Perceived behavior control → Intention (H3)</td>
<td>NS</td>
</tr>
<tr>
<td>Personal norm → Intention (H4)</td>
<td>S</td>
</tr>
<tr>
<td>Knowledge → Attitude (H5a)</td>
<td>NS</td>
</tr>
<tr>
<td>Knowledge → Perceived behavior control (H5b)</td>
<td>NS</td>
</tr>
<tr>
<td>Knowledge → Personal norm (H5c)</td>
<td>NS</td>
</tr>
<tr>
<td>Personal value → Attitude (H6a)</td>
<td>S</td>
</tr>
<tr>
<td>Personal value → Subjective norm (H6b)</td>
<td>S</td>
</tr>
<tr>
<td>Personal value → Perceived behavior control (H6c)</td>
<td>NS</td>
</tr>
<tr>
<td>Personal value → Personal norm (H6d)</td>
<td>S</td>
</tr>
<tr>
<td>Past experience → Attitude (H7a)</td>
<td>S</td>
</tr>
<tr>
<td>Past experience → Subjective norm (H7b)</td>
<td>S</td>
</tr>
<tr>
<td>Past experience → Perceived behavior control (H7c)</td>
<td>S</td>
</tr>
<tr>
<td>Past experience → Personal norm (H7d)</td>
<td>S</td>
</tr>
</tbody>
</table>

S: supported; NS: not supported

### Table 5.4 Comparing Model 1 and Model 2

<table>
<thead>
<tr>
<th>Models</th>
<th>( \chi^2 )</th>
<th>Df</th>
<th>( \Delta \chi^2 )</th>
<th>CFI</th>
<th>RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1-including personal norm</td>
<td>189.85</td>
<td>133</td>
<td></td>
<td>.969</td>
<td>.057</td>
</tr>
<tr>
<td>Model 2-without personal norm</td>
<td>285.42</td>
<td>137</td>
<td>95.57***</td>
<td>.919</td>
<td>.091</td>
</tr>
</tbody>
</table>

*** \( p < .001 \)

### Table 5.5 Change in R² and Standardized Regression Coefficients (\( \beta \)) for Model 1 and Model 2

<table>
<thead>
<tr>
<th>Latent variable</th>
<th>Model 1 (with PN)</th>
<th>Model 2 (without PN)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R²</td>
<td>( \beta )</td>
</tr>
<tr>
<td>Attitude → intention</td>
<td>.42</td>
<td>.33***</td>
</tr>
<tr>
<td>SN → intention</td>
<td>.43</td>
<td>.40***</td>
</tr>
<tr>
<td>PBC → intention</td>
<td>.55</td>
<td>-.11</td>
</tr>
<tr>
<td>Intention</td>
<td>.53</td>
<td>-</td>
</tr>
</tbody>
</table>

**p < .01, *** p < .001

SN: subjective norm
PBC: perceived behavior control
PN: Personal norm
CHAPTER 6. SUMMARY AND CONCLUSIONS

This chapter includes a summary of the study and results and conclusions drawn. Limitations of the study and recommendations for future research are described. Also implications of the study for college and university foodservice administrators are discussed.

Summary of Research

Many individuals have raised concerns about the current food system because of applying large amount of chemicals and pesticides in current agriculture system and transporting foods from long distance (Murray, 2005; Pirog et al., 2001). A more sustainable food system is believed to be needed. Many college and university dining services (CUDS) have implemented sustainable practices to improve their impact on the environment.

The purposes of this study were to identify existing sustainable practices in CUDS, examine CUDSAs’ intention to adopt sustainable practices using the theory of planned behavior, and determine the influence of personal norm in the TPB.

The study sample was drawn from the 555 CUDSAs in the U.S. who had their e-mail listed in the 2008 Directory of the National Association of College & University Food Services (NACUFS). Twenty of the administrators were randomly selected for the pilot test and excluded from the sample. The remaining 535 CUDSAs were identified as the study sample.

A web-based questionnaire was developed based on previous research (Horovitz, 2006; Sustainability Endowment Institute, 2008), trade journal articles, and CUDS websites. The questionnaire was reviewed by an eight-member expert panel of faculty and university foodservice managers to evaluate its clarity, content validity, and appropriateness of questions. A pilot test was conducted with 20 CUDSAs. The comments from the expert
panel and pilot test participants were used to modify the questionnaire prior to distribution to the study sample.

The research procedures for web questionnaire distribution followed Dillman’s (2007) suggestions. An invitation letter e-mail and a cover letter e-mail were sent within a one week period and three follow-up e-mails were sent one week apart to encourage response.

The Statistical Package for the Social Sciences (SPSS) Version 16.0 was used to conduct descriptive statistics (means, standard deviations, and frequencies), compare means, and determine correlations, reliability, and exploratory factor analysis. The Analysis of Moment Structure (AMOS) Version 16.0 was used to conduct confirmatory factor analysis and structural equation modeling analysis.

Summary of Results

Of the 535 CUDSAs contacted, 13 e-mailed were undeliverable and were returned to the sender. A total of 138 CUDSAs responded (26.4% response). More than two-thirds of respondents (73.8%) were 45 years and older and 65.4% were males. More than half (59.3%) had a bachelor’s degree, 76.6% had attended sustainability workshops, and 86.2% provided educational materials about sustainability to their students. The majority of participants had been with the current institution (75%) and had held their current position for more than five years (58.1%).

The most frequently used sustainable practices in CUDS were recycling of fats, oils, grease; cardboard; white paper; aluminum; tin cans; and newspaper. Practices most likely to have been adopted in the previous two years were composting, trayless dining, local purchasing, and purchasing biodegradable/ compostable service wares and containers. Participants reported that students, university administrators, and customers influenced their
sustainable decisions. Participants were unsatisfied with the amount of resources they had to support sustainable practices. There were some differences in findings based on type of institution (public vs. private). CUDSAs at private institutions had implemented more practices and were more satisfied than CUDSAs at public institutions. Also findings suggested that CUDSAs who had attended sustainability workshops had higher satisfaction with their sustainable practices outcomes and their customers’ reactions.

Internal consistency for each of the multi-item constructs was determined using Cronbach alpha; all scales were found to be reliable. The hypothesized model was tested using AMOS 16.0. Results of the analysis showed that the hypothesized model had an adequate fit to the data. Model results are summarized in Table 6.1. Chi-square change was used to measure whether the personal norm construct helped reduce unexplained variance in the TPB model. Including Personal norm in the TPB model resulted in a significantly better fit to the data and reduced unexplained variance by 33.48%.

<table>
<thead>
<tr>
<th>Hypothesized Path</th>
<th>Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude → Intention (H₁)</td>
<td>S</td>
</tr>
<tr>
<td>Subjective norm → Intention (H₂)</td>
<td>S</td>
</tr>
<tr>
<td>Perceived behavior control → Intention (H₃)</td>
<td>NS</td>
</tr>
<tr>
<td>Personal norm → Intention (H₄)</td>
<td>S</td>
</tr>
<tr>
<td>Knowledge → Attitude (H₅a)</td>
<td>NS</td>
</tr>
<tr>
<td>Knowledge → Perceived behavior control (H₅b)</td>
<td>NS</td>
</tr>
<tr>
<td>Knowledge → Personal norm (H₅c)</td>
<td>NS</td>
</tr>
<tr>
<td>Personal value → Attitude (H₆a)</td>
<td>S</td>
</tr>
<tr>
<td>Personal value → Subjective norm (H₆b)</td>
<td>S</td>
</tr>
<tr>
<td>Personal value → Perceived behavior control (H₆c)</td>
<td>NS</td>
</tr>
<tr>
<td>Personal value → Personal norm (H₆d)</td>
<td>S</td>
</tr>
<tr>
<td>Past experience → Attitude (H₇a)</td>
<td>S</td>
</tr>
<tr>
<td>Past experience → Subjective norm (H₇b)</td>
<td>S</td>
</tr>
<tr>
<td>Past experience → Perceived behavior control (H₇c)</td>
<td>S</td>
</tr>
<tr>
<td>Past experience → Personal norm (H₇d)</td>
<td>S</td>
</tr>
</tbody>
</table>

S: supported; NS: not supported
Conclusions

This study examined current sustainable practices in CUDS, CUDSAs’ intention to adopt sustainable practices using the TPB model, and the effect of including personal norm in the TPB model. Results indicated the many CUDS operations have implemented sustainable practices. The most widely used sustainable practices were recycling fat, oil, grease, recycling cardboard, using recycled paper products, and recycling aluminum. More recently adopted sustainable practices were composting, trayless dining, local purchasing, and purchasing of biodegradable/compostable table wares and containers. Results of descriptive analysis and the TPB model revealed that CUDSAs’ social pressures (internal and external colleagues) had the most positive influence on their behavioral intention to adopt sustainable practices, followed by their attitude toward sustainable practices and their personal norm about sustainable practices. Moreover, including personal norm in the TPB model improved the understanding of CUDSAs’ intention to adopt sustainable practices.

Managerial Implications

CUDSAs need to recognize that adopting sustainable practices is becoming a common practice. The results of this research provide CUDSAs information about what other CUDSAs are currently doing and suggest sustainable practice benchmarks for their operations in the future.

Findings suggested that CUDSAs who had provided students with educational materials about sustainability were more satisfied with outcome of current sustainable practice, amount of resources they have to support sustainable practices, and their customers’ reactions toward sustainable practices. Therefore, CUDSAs who are implementing or
currently have sustainability programs are encouraged to provide educational materials to educate their students, customers and employees.

Students, customers, university administrators, internal and external colleagues all influence CUDSAs’ sustainability decisions. Therefore, when CUDSAs are deciding which sustainable practices they should adopt, they should talk with their students, administrators, and internal and external colleagues.

Results of this study indicated that CUDSAs who attended sustainability workshops had higher satisfaction with the outcome of current sustainable practices and customers’ reaction. CUDSAs who have limited knowledge about sustainability might find it beneficial to attend sustainability workshops.

Limitations

There are several limitations that should be recognized in this study. The study sample was chosen from the membership of a professional organization, the National Association of College and University Food Service (NACUFS). The results of the study are limited to the extent that NACUFS members are representative of the population of all college and university foodservice administrators. Another potential limitation of the study is the low response rate. Reasons for this low response are unknown. A web-based questionnaire was used to collect the data for this study. Technology problems, such as inability to access the web questionnaire and inability to submit the questionnaire after completion were reported by some participants; such problems could have occurred for others in the completion of the questionnaire and reduced response. The web questionnaire was sent out in late August which may have impacted the response rate if this was a busy time for CUDS administrators. Distribution as bulk e-mails (5 or 10 e-mails as a group)
might also have contributed to the low response if the email was screened by the institution’s spam filters.

**Recommendations for Future Research**

Based on findings of this study, several recommendations for future research are suggested. First, this study focused on identifying current sustainable practices and factors that impacted CUDSA’s intention to adopt sustainable practices. Further research could be conducted to explore how implementing sustainable practices impacts budget planning, financial performance, students’ participation, and customer satisfaction. In order to increase generalizability of the findings, further research could be conducted from more diverse CUDSA groups including those who are not members of NACUFS or those from institutions in other countries.

In addition, future research could identify resources needed for implementing successful sustainable practices. Further exploration on effectiveness of educational materials and programs could be done. This study did not examine whether intentions actually predict future behavior. Future research could use a longitudinal methodology to explore past, current, and future behavior using the TPB model to examine whether past and/or current behavior can be used to predict future behavior. Moreover, future research should consider including customers and students as one of the constituent groups for the subjective norm since they had a strong influence on CUDSAs’ sustainable decisions.
REFERENCES


2004003final_version.pdf](http://www.fsmec.org/pdf/manuscript
2004003final_version.pdf)


The Institutional Review Board (IRB) Chair has reviewed the modification of this project and has declared the study remains exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b). The IRB determination of exemption means that:

- You do not need to submit an application for annual continuing review.

- You must carry out the research as proposed in the IRB application, including obtaining and documenting (signed) informed consent if you have stated in your application that you will do so or if required by the IRB.

- Any modification of this research should be submitted to the IRB on a Continuing Review and/or Modification form, prior to making any changes, to determine if the project still meets the Federal criteria for exemption. If it is determined that exemption is no longer warranted, then an IRB proposal will need to be submitted and approved before proceeding with data collection.

Please be sure to use the documents with the IRB approval stamp in your research.

Please note that you must submit all research involving human participants for review by the IRB. Only the IRB may make the determination of exemption, even if you conduct a study in the future that is exactly like this study.
Sustainable Practices in College and University Residential Dining

Definitions:
Sustainability is defined as activities or practices by college and university dining services staff to establish economic, environmental, and social balance, and maintain or improve the ecosystem presently and for the future.
Sustainable practices are the actions that college and university dining take in order to conserve resources.
Sustainable Seafood is defined as seafood caught in a way that does not harm the ocean or deplete the supply. For example, buying fish are caught by hook and line. Or buying fish are not carnivore, or buying fish are from U.S. farms.

Purpose of the study:
This study is designed to identify sustainable practices currently in existence at college and university dining services and determine foodservice directors views about sustainability.

Section A: Current Practices
Direction: Using this frequency scale, please indicate how often the following practices occur in your operation.
1 = Never, not done in any of our campus dining operations
7 = Always, done daily in more than 90% of our campus dining operations

<table>
<thead>
<tr>
<th>Practice</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recycling white paper, computer printouts, etc</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Recycling newspaper</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Recycling cardboard</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Recycling tin cans</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Recycling aluminum (e.g., cans, foil) Recycling plastic products (e.g. plastic containers, plastic packaging)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Recycling fat, oil, &amp; grease</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>
22. Have you purchased any energy saving equipment in your operation?

☐ Yes, Please go to question 23
☐ No, Please go to question 24

23. What types of energy saving equipment have you purchased? Please check all that apply

☐ Dish Machine
☐ Light bulbs
☐ Oven
☐ Fryer
☐ Refrigerator
☐ Freezer
☐ Other, Please specify __________________________
24. Do you have other sustainable practices in your operation that are not included in this questionnaire?

☐ Yes, Please specify: ______________________

☐ No

25. Do you include the concept of sustainability in your mission statement?

☐ Yes, If yes, what is your mission statement ______________________

☐ No

26. Do you have any dining halls that are rated in the Leadership in Energy and Environmental Design (LEED) Green Building Rating System™?

☐ Yes  ☐ No

27. Do you provide students any educational materials or programs on sustainable issues?

☐ Yes, Please go to question 28

☐ No, Please go to question 29

28. What types of materials or programs do you provide to your students or customers? Please check all that apply

☐ Tour to farm

☐ Food waste reduction education

☐ Nutrition education (e.g., providing information or consulting to help students to eat healthier)

☐ Environmental awareness education

☐ Other, Please specify ______________________

29. Please indicate the number that best describes the degree of influence of each influencer on your decision to implement sustainable practices in your operation using the following scale:

1 = No influence to 7 = strongly influence

<table>
<thead>
<tr>
<th>Influencers</th>
<th>Degree of influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dining/food services personnel</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>Faculty/Staff</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>Students</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>University Administrators</td>
<td>1 2 3 4 5 6 7</td>
</tr>
</tbody>
</table>
Cooperative
Extension agents
Foodservice
management
company
Suppliers/ Vendors
Customers
State/ Local
Government

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Section B: Please indicate your views about sustainable practices

1. Have you adopted any sustainable practices in your operation in the past two years?

☐ Yes    ☐ No

2. If yes, please indicate the sustainable practices you have adopted in your operation during the past two years.

<table>
<thead>
<tr>
<th>Question</th>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Overall, I am satisfied with the outcome of the current sustainable practices in my operation.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>4. I am satisfied with the amount of resources (e.g., labor and finances) I have to support sustainable practices in my operation.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>5. I am satisfied with my customers’ reactions toward sustainable practices in my operation.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>6. I feel a strong personal obligation to have sustainable practices in my operation.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>7. I am personally willing to put extra effort into sustainable practices in my operation on a regular basis.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>
8. I would feel guilty if I did not have sustainable practices in my operation.  
   | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

9. I think sustainable practices can help the environment.  
   | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

10. I think sustainable practices are good for an institution's public relations.  
    | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

11. In my opinion, my customers desire sustainable practices in foodservice operations.  
    | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

12. Overall, sustainable practices have reduced my operational costs.  
    | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

13. My budget allows me to implement sustainable practices.  
    | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

14. The lack of information regarding how to start sustainable practices makes it difficult for me to implement them.  
    | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

15. Whether or not to implement sustainable practices is not in my control or my decision.  
    | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

16. My dining services' work colleagues think that ____ adopt sustainable practices.  

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>I should not</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I should</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

17. My external work colleagues (e.g., college/university president) think that ____ adopt sustainable practices in my operation.  

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>I should not</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I should</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
18. Other institutions' foodservice directors think _____ implement sustainable practices in my operation.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>I should not</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>I should</td>
</tr>
</tbody>
</table>

19. Generally speaking, how much do you want to do what your dining services' work colleagues think you should do?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Very much</td>
</tr>
</tbody>
</table>

20. Generally speaking, how much do other institutions' foodservice directors influence your opinions?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Very much</td>
</tr>
</tbody>
</table>

21. I intend to adopt more sustainable practices in my operation during the next year.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely Unlikely</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Extremely Likely</td>
</tr>
</tbody>
</table>

22. I will try to adopt sustainable practices in my operation during the next year.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definitely False</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>Definitely True</td>
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23. I plan to adopt sustainable practices in my operation during the next year.

<table>
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<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<tbody>
<tr>
<td>Strongly Disagree</td>
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<td>Strongly Agree</td>
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</tbody>
</table>
24. Packaging waste and food waste are two examples of solid waste generated by the foodservice industry.

☐ True  
☐ False

25. Food waste is the single-largest component of discarded waste by weight in the United States.

☐ True  
☐ False

26. In general, it takes more energy to produce new products from recycled waste than from virgin materials.

☐ True  
☐ False

27. The purpose of Fair Trade is to alleviate global poverty and promote sustainability.

☐ True  
☐ False

28. What are your personal feelings about sustainable practices?
   For me, sustainable practices are:

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<th>2</th>
<th>3</th>
<th>4</th>
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<tbody>
<tr>
<td>Bad</td>
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<tr>
<td>Worthless</td>
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<tr>
<td>Unexciting</td>
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<tr>
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</tbody>
</table>

   Good
   Positive
   Valuable
   Exciting
   Needed
   Important

Section C: About yourself and your operation

1. Gender

☐ Female  ☐ Male
2. Age
   □ 30 or less □ 31-35 □ 36-40 □ 41-45 □ 46-50 □ Above 50

3. Level of Education
   □ Bachelor □ Master □ Doctorate □ Other ______________________

4. Number of years working with current institution

5. Number of years in charge of college or university dining services

6. Number of years in current position

   Please indicate your position title ________________________________

7. Have you taken an environmental education course in college?
   □ Yes □ No

8. Have you attended any environmental workshop or meeting?
   □ Yes □ No

9. Do you recycle paper (color and white) at home?
   □ Yes □ No

10. Do you recycle plastic products (bottles and bags) at home?
    □ Yes □ No

11. Do you purchase organic food item?
    □ Yes □ No

12. Do you purchase locally grown foods?
    □ Yes □ No
13. In what state do you work?

14. Number of students enrolled in your university

☐ Under 4,000
☐ 4001-12,000
☐ Above 12,000

15. What is the number of each dining facilities in your operation?

☐ Dining Halls
☐ Retail Stores
☐ Restaurants
☐ Café’s
☐ Catering
☐ Commissary Kitchen

16. What meals are served at your operation? (Check all that apply).

☐ Breakfast ☐ Lunch ☐ Dinner ☐ Late night ☐ 24/7

17. What is the average number of meals served daily in your operation?

18. What is the number of full-time equivalent employees (FTEs) in your operation?

19. What is the number of student workers in your operation?

20. How is your foodservice operation managed?

☐ Self-operated
☐ Contract managed

21. What is your college’s/ university’s status?

☐ Private ☐ Public
APENDIX C. PILOT TEST EVALUATION FORM

1. How long did it take for you to fill out this questionnaire?
   ___________ minutes

2. Were the questions clear and understandable?
   □ Yes       □ No
   If no, please indicate question number and what needs to be clarified.
   
<table>
<thead>
<tr>
<th>Question number</th>
<th>Clarification</th>
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</table>

3. Were the scales clear and understandable?
   □ Yes       □ No
   If no, please indicate what could be done to make them more understandable.

4. What suggestions do you have to make this questionnaire better?

5. Did you experience any technical problems with the online questionnaire?
   □ Yes       □ No
   If yes, Please indicate the problems you encountered.

Thank you for your assistance with this pilot study.
APENDIX D. EMAIL INVITATION LETTER

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

College of Human Sciences
Department of Apparel, Educational Studies,
and Hospitality Management
31 Mackay Hall
Ames, Iowa 50011-1191
319-294-5475
FAX 319-294-6364
e-mail: esthm@iastate.edu

Dear College and University Dining Services Director,

In a few days you will receive an email request to complete an online questionnaire for a research project we are conducting. The questionnaire is about current sustainable practices in college and university dining services operations and the views of directors about sustainability. Your participation in the project is strictly voluntary but will provide valuable information for others on current sustainable practices.

We are writing in advance because we have found many people like to know ahead of time that they will be contacted. The study is important to document current sustainable practices in college and university dining services and determine foodservice directors’ views about sustainability.

Thank you for your time and consideration of this project.

Sincerely,

Chao-Jung Chen
PhD Candidate
Foodservice and
Lodging Management
Iowa State University
ritachen@iastate.edu

Mary Gregoire, PhD, RD
Professor and Director
Food and Nutrition Services
Rush University Medical Center
Mary_Gregoire@rush.edu

Susan Arendt, PhD, RD
Assistant Professor
Hotel, Restaurant
and Institution Management
Iowa State University
sarendt@mail.adp.iastate.edu
Dear College and University Dining Services Director,

We are asking for a few minutes of your time to complete a questionnaire about sustainable practices in college and university dining services operations and views of directors about sustainability. You will receive a summary of our findings, if you participate in the study.

Your input is important to us. Below is a link to an online questionnaire. The survey should take you less than 15 minutes to complete. All data will be kept confidential and will be stored on a password protected computer. All data will be reported in summary form only; neither you nor your institution will be identified in published reports from this study. Receiving your response by August 15, 2008 will be very much appreciated.

Please go to this website to access the questionnaire (______________________________________)

There are no foreseeable risks from participating in this study. You may skip any question you do not feel comfortable answering. There is no penalty or loss to you for not completing the questionnaire or if you begin the questionnaire but wish to withdraw and discontinue. All responses are voluntary and will be kept confidential.

If you have any questions about this study, please contact Chao-Jung Chen (ritachen@iastate.edu), Dr. Mary Gregoire (Mary_Gregoire@rush.edu), or Dr. Susan Arendt (sarendt@iastate.edu).

If you have any questions about the rights of research subjects, please contact the IRB Administrator, (515) 294-4566, IRB@iastate.edu, or Director, Office of Research Assurances, (515) 294-3115, 1138 Pearson Hall, Ames, IA 50011.

Thank you so much for your participation in this study.

Sincerely,

Chao-Jung Chen
PhD Candidate
Foodservice and Lodging Management
Iowa State University
ritachen@iastate.edu

Mary Gregoire, PhD, RD
Professor and Director
Food and Nutrition Services
Rush University Medical Center
Mary_Gregoire@rush.edu

Susan Arendt, PhD, RD
Assistant Professor
Hotel, Restaurant, and Institution Management
Iowa State University
sarendt@iastate.edu
Dear College and University Dining Services Director:

Approximately one week ago, we sent you an email with a link to an online questionnaire and asked for your participation in a study regarding sustainable practices in college and university dining operations. If you have already responded to the questionnaire, please accept our sincere thanks for your input. If you have not had time to complete the questionnaire, we would appreciate you taking time to do so as soon as possible. Your opinions are important to the accuracy of the information we will share with other directors about sustainability practices in college and university dining operations.

The online questionnaire is available for you at (___________).

All responses are voluntary and will be kept confidential. There is no penalty or loss to you for not completing the questionnaire. To show our appreciation for your participation in the online questionnaire, you will receive a summary of findings upon completion of the study.

If you have any questions, please feel free to contact one of the researchers listed below. Thank you very much for your participation.

Sincerely,

Chao-Jung Chen  
PhD Candidate  
Foodservice and  
Lodging Management  
Iowa State University  
ritachen@iastate.edu

Mary Gregoire, PhD, RD  
Professor and Director  
Food and Nutrition Services  
Rush University Medical Center  
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Susan Arendt, PhD, RD  
Assistant Professor  
Hotel, Restaurant  
and Institution Management  
Iowa State University  
sarendt@mail.adp.iastate.edu
ACKNOWLEDGEMENTS

It is with great pleasure and gratitude I acknowledge many individuals whose expertise and support contributed to the completion of this dissertation.

I am grateful to my major professor, Dr. Gregoire for the insight, guidance, and assistance she has provided me throughout my study; and from whom I learned to keep my motivation in spite of life challenges.

I also would like to express my appreciation to another co-major professor, Dr. Arendt for her guidance, encouragement, helpful constructive suggestions and recommendations in preparations of this dissertation. She also provides her time as my teaching mentor.

My sincere thanks to Dr. Shelley for his patience, time, and tremendous support to guide my data analysis in my study. I also would like to extend special thanks to the members of my committee, Dr. Hendrich and Dr. Jeong, who offered the valuable feedback and direction. It is my privilege to work with a team of distinguished scholars. Every student should receive such a support in their academic life.

I am thankful to my host family Sunny and Rod Power for their unconditional love, help, and prayers; and to my church family—Cornerstone church, Ames, IA for their prayers and support. I would like to express my heartfelt thanks to Jane and Doug Elliot, and Cathy Yang and Herman Huang for their love, spiritual, and emotional support in many ways.

A million thanks go to my husband Edward and my child Benjamin. I could not reach this goal in my educational journey without your daily sacrifices. I am very grateful for all your love, support, understanding, and prayers.
Saving the most important for last, I want to give my heartfelt thanks to my parents and my siblings for their unwavering love, encouragement, and support in this endeavor. I especially dedicate this dissertation to my parents for they have contributed the most and deserve much of the credit. Their substantial efforts and personal dedication in caring for my son aided in the completion my doctoral degree. Their valued love, help, support, and personal sacrifices enabled me to complete of this dissertation.