USE OF EYE-TRACKING TO MORE EFFECTIVELY MERCHANDISE PLANTS

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ABSTRACT

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Making the process of shopping easier or more enjoyable may bring positive benefits to both the shopper and the retailer. We used an eye-tracking device to investigate and execute two studies related to consumers' use of visual cues (signs) in retail garden center displays. In the first study we focused on informational signs that described that the plants were grown using water conservation practices and separate survey questions about their water conservation practices. From this study we found that attention to the sign communicating water conservation production practices was linked to participants' home water conservation practices. Participants who were more likely to conserve water on their plants at home were also more likely to purchase plants that were grown under water saving practices than those participants that were not as likely to conserve water. Participants from Florida seemed to be more sensitive to water conservation signage than participants from non-drought areas such as Michigan and Indiana. The second study focused on consumers viewing of informational signs that described vegetable and herb transplants grown under sustainable production practices. From this study we were able to show differences in participants' weekly purchases of organic products and its relationship to first fixation duration (FFD) on the informational sign. Participants who spent a larger amount of their weekly budget on organic products had a longer FFD on the sign. Differences between participants who had children under the age of 18 in their household compared to participants who had no children in their household were also found.

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CHAPTER 1

INTRODUCTION

Marketing and consumer behavior have many different research avenues. An improved understanding of the retail setting can help marketers be more successful in selling more products by providing a better purchasing environment for their consumers. Prior studies in these areas can provide insight into to consumers' prior purchase decisions and indicate possible sale relationships between the consumer and the marketer. Future research, guided by past investigations, can fill the void in areas where information is lacking. Since consumers change, their needs and preferences change, more goods are introduced each day, the drive for continued research is necessary.

Markets are numerous and diverse. A very distinct market is the ornamental horticulture market. Horticulture provides a unique retail situation for retailers and marketers and for consumers because retailers and consumers are consistently challenged with a product that is variable from product to product and perishable and is sold in an environment that can also vary drastically. The importance of understanding the cues present that may motivate to a consumers' purchase can help improve an understanding of the horticulture retail market and may have application beyond. Consumers use cues in purchase decisions, thus cues are one means by which, marketers communicate with consumers about specific aspects of the product. The unique challenges facing the horticulture business demands continued research with a focus on marketing and consumer behavior.

One subdivision of horticultural production is sustainably or organically grown plants. The USDA defines organic production as "a production system that is managed in accordance with the Act and regulations in this part to respond to site-specific conditions by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity" (2013), but the term sustainable is considered to be a related concept. While organic has a set of legal requirements before the term can be used on any product, the term sustainable can be produced under varying conditions from plant to plant and from grower to grower. This variation in production methodology can be the cause of confusion for many consumers (Campbell et al., 2013). On the consumption side, consumers may not be fully aware of what is defined as sustainable or organic. This confusion creates a challenge for marketers and retailers who are trying to sell plants as sustainably or organically grown. If consumers do not understand these terms, marketers could have trouble clearly and concisely labeling or signing the plants in an informative manner. A lack of accurate enhancement does not enhance the shopping environment and may exclude an important cue that a consumer could use. Further research is needed to better understand the confusion of terminology and how marketers can apply sustainable terms in advertising.

One way to expand consumer research is with new technology such as eye-tracking technology. Eye-tracking technology provides insight into what the consumer is actually seeing while they are shopping or looking at a product. Eye-tracking also provides both qualitative and quantitative information and data to help answer questions related to shopping behaviors. Being able to track what a consumer is precisely looking at provides a new possibility for better understanding of what that consumer is looking for while shopping.

The purpose of this thesis is to better understand a focused area of horticulture marketing specifically on how to better merchandise sustainably and organically grown plants and the impact information about these grower procedures has on consumers' purchase decisions. Eye-tracking technologies are used to provide a measurable way to capture the participants' experience. With additional survey information about each participant's purchasing behaviors, generally and horticulturally, their preferences for plants is compared with their viewing behavior

CHAPTER 2

LITERATURE REVIEW

Cue Utilization

Multiple studies have investigated consumer decision-making processes including how, where, and what information consumers acquire to make their decisions. When shopping, consumers can use cues to help them make decisions. Cues are signals that the consumer uses to assess products (Olson 1972), and cues can be either intrinsic or extrinsic. Intrinsic cues are product components that, if they were changed, would result in a change in the product itself, for example the smell of a rose. Extrinsic cues are outside the product that, if altered, would not have an impact on the product itself, for example price or brand name (Szybilllo & Jacoby, 1974). The explanation of how consumers use intrinsic and extrinsic product information to make purchase decisions is known as cue utilization. Cue utilization is defined as the cognitive processes that are involved in gathering information from the external environment and using this information to make a cognitive process to act in a particular way (Olson, 1978).

D.F. Cox (1962) demonstrated how consumers placed value on products and used cues to help make the purchase decision. Cox focused on the predictive and confidence values of cues and how these shaped purchases. "Predictive value is a measure of the probability with which a cue seems associated with a specific product attribute. Confidence value is a measure of how certain the consumer is that the cue is what they think it is (Cox, pg. 416,1962)." Cox's hypotheses were formed around these two cue value types. He hypothesized that consumers assigned value to a product based on predictive and confidence value and that if confidence value was held constant, the predictive value would be the primary basis of evaluating a product. The results of

his study showed that these two values can work independently as cues that influence the purchase of a product. Cox concluded that predictive value was the main influence in determining the value or cue utilization, but confidence value could also act as a strong qualifying variable. If a consumer does not feel strongly enough about the capability of a product to perform, based on the cues given, the confidence value will outweigh the predictive value, no matter how strong or high the predictive value.

Olson analyzed consumer research that specifically focused on cue utilization using product quality (Cox, 1962 and Tull, Buring & Gionsior, 1964), price cues (Smith & Broome, 1966), consumer acquisition behavior (Gardner 1970), and a combination of cues (Enis & Stafford, 1969) to gain information about a task. Olson addressed all of these areas and determined that the biggest gap in the consumer literature was investigating judgment processes and how people judge things in the purchase task.

Olson's study (1972) examined multiple cue studies to integrate findings to form a framework that generalized and clarified relationships between product cues and decision-making. In other words, he contributed to the understanding of how multiple cues worked together. Olson used Cox's (1962) notion of predictive and confidence value of cues and suggested that product quality assessment was a two-stage process. Stage one occurred when consumers distinguished certain indicators of product quality, for example the cue of price or brand name. The predictive value of a cue and confidence value of a cue were the two factors included in the first stage of Olson's (1972) conceptual model (Figure 1). Olson's second stage happened when consumers combined these evaluations into an overall judgment of product quality. This second part of the

model examined the dichotomous properties of intrinsic and extrinsic properties of a product. A cue was intrinsic if it was physically part of the product, for example the smell of a flower. A property that was not physically part of the product would be considered an extrinsic cue, for example price. Identifying two stages and distinguishing intrinsic and extrinsic cues helped to clarify cue utilization in the purchase decision process.

Figure 1 depicts the model proposed by Olson to assess product cues. Figure 2 shows an adjusted model of how Olson's stages apply to the proposed model. The adjusted model was created from an understanding of Olson's model and gathering terms and information from several different sources. Predictive and confidence value were ideas that Cox (1962) discussed as part of consumers using cues in the retail setting. Szybilllo & Jacoby (1974) discussed the differences of intrinsic and extrinsic cues and how consumers used these while making a purchase decision.

Figure 1. Model of Olson's Cue Utilization Process

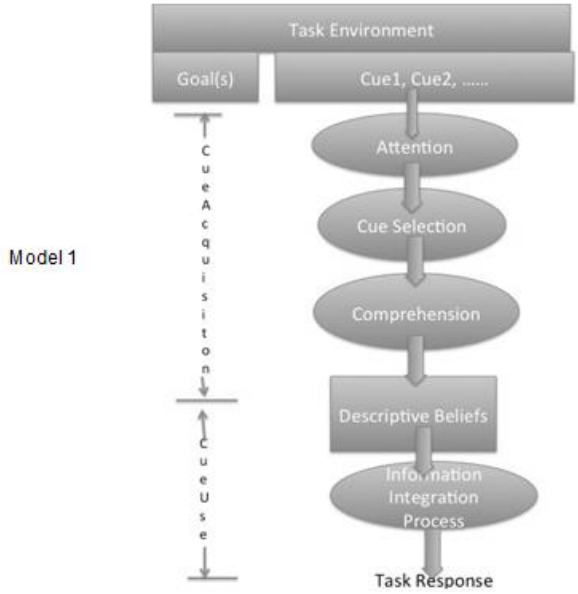
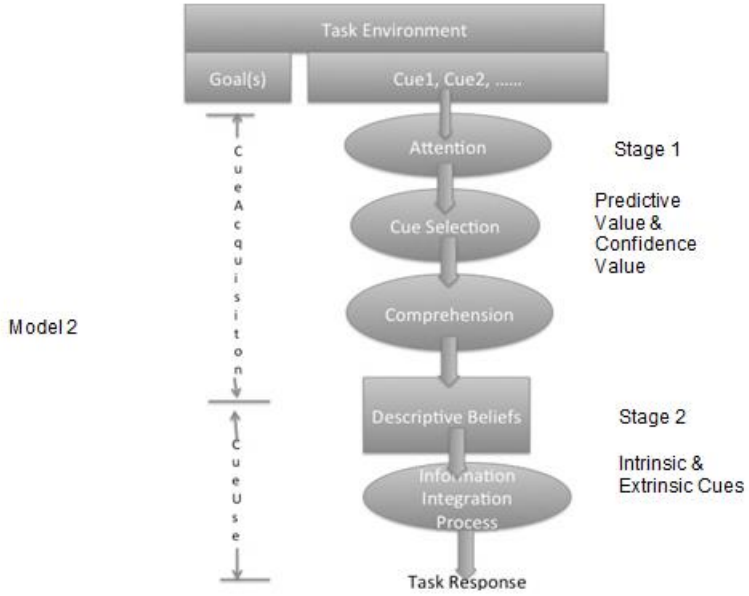


Figure 2. An Adjusted model of Olson's Cue Utilization Process



Olson's model has been implemented in numerous studies on the effects of cues on purchasing behavior. For example, (Jacoby et al., 1971) examined price, brand name and product composition characteristics as determinants (cues) of perceived quality. By using beer as the stimulus product, participants gave an overall quality rating with price either present or absent, brand name either present or absent, and composition levels either present or absent. With three different beer samples, a low price, popular priced, and popular priced premium (Scitvosky, 1967; Gabor & Granger, 1966; McConnel, 1968a, 1968b; Tull, Bording, & Gonsior, 1964), which showed that price was a deciding factor of quality when all other cues were held constant. Jocoby et al.'s (1971) study showed that brand image for the premium beer had a significant positive impact on the quality rating when it was present. Price did not have any impact on quality ratings when it was combined with other cues; price was only significant when it was shown by itself. This caused brand name and product composition of the beer to be perceived as greater quality triggers (cues) than price.

The relationship between intrinsic and extrinsic cue and consumers' purchases has been examined in more recent studies. Lee (1995) investigated how consumers who were more familiar with products had higher enduring involvement, and were more involved in the evaluation situation. Enduring involvement relates to the personal relevance of a product or more of an intrinsic cue while situational involvement deals with the short-term changes in the consumers' environment or an extrinsic cue. Lee proposed that consumers with high familiarity would be more likely to use extrinsic cues, consumers that have high enduring involvement would rely on extrinsic cues, and consumers that are more involved in the evaluation situation would rely on intrinsic product attributes. Results showed confirmed the proposed relationships between these three involvement levels. This study contributed to the cue utilization literature because it demonstrated how consumer characteristics such, as product, enduring involvement, and evaluation situation influenced how cues were used.

Dodds et al. (1991) investigated the effects of extrinsic cues, price, brand and store information, and how these cues influenced a consumers' perceived quality, perceived sacrifice, perceived value, and then their willingness to buy. Similar to Jacoby et al. (1978), their results showed that price was a strong influencer on perceived quality and value when it was the only cue available. However, when price was presented with the other cues, brand and store name, it negated the impact of the price cue. They did find that the relationship between perceived value decreases when price increases. Brand and store name both had strong positive effects on quality perception and willingness to buy. This study (Dodds et al., 1991) was the first to examine extrinsic cues and how they affect the consumers' final decision on willingness to buy.

It is important for marketers to pay attention to product intrinsic and extrinsic cues and to be able to distinguish what these cues are and more importantly how a consumer will use the cues. Every product is different. For example, plants and other horticulture products are often viewed as a cue since plant health, buds and flowers, and foliage color are considered when making purchase decisions (Behe and Barton, 2000). It is also important to understand the shopping environment of a retail garden store where plants are often purchased to understand the different ways cues are approached and used in a retail garden center.

It is important for retailers to know what information consumers use while they shop for products, but the lack of consumer research in horticulture combined with the differences in merchandising exacerbate the retail merchandising challenges. Every plant is going to be slightly different in its shape and size unlike a box of cereal that is always consistent. The plant is what can be seen as the top down part because it is what the consumer is ultimately looking for or wanting to purchase. Plants can be somewhat inconsistent in their health, vigor, and flowering as well. One research study showed that consumers placed plant health and condition as the highest priority when evaluating plant quality (Behe & Barton, 2000). Flowering and foliage plants are visually stimulating products with an array of foliage, flower colors, and forms. When it comes to products that are naturally visually stimulating, like plants, art or fashion, consumers use the cues presented by the product to help guide their willingness to purchase. These visual cues and willingness to purchase relate back to Olson's model and the adjusted model of cue utilization.

Retail Environment

A more organized retail experience will lead to greater satisfaction of the customer, which should lead to greater sales. Silvadas and Baker-Prewitt (2000) found that service quality greatly influences customer satisfaction and customer loyalty. Service quality can be achieved by improving store layouts and signs. Organizing the retail experience can greatly affect the importance of certain phrasing and verbiage used in point of purchase displays.

Bottom-up and top-down effects are an effective way to track at what consumers are looking when viewing an image or display. Bottom-up effects are the characteristics seen of a shelf and top-down effects are for what the consumer is searching (van der Lans, Pieters, and Wedel, 2008). Bottom-up effects include the lighting, color of the shelf, or the materials from what the shelf was made. Top-down effects are the items for which the customer is actually searching, and whether their search is nominal, limited, or extended, or if they searching for a specific brand. A nominal decision is a purchase decision that is made often and does not take much thought, for instance, purchasing toothpaste. A limited decision would require internal and limited external search, few alternatives are included, and there is little post purchase evaluation. In an extended decision there is extensive internal and external research, there are multiple alternatives that are evaluated, and the post purchase decision is evaluated (Hawkins & Mothersbaugh, 2010). Plant purchases likely fall between limited and extended decisions because they are purchased infrequently, perhaps once or twice annually (Dennis and Behe, 2007). When consumers are purchasing plants they may be thinking about where they will be planted and how they are going to care for them. They may even buy the same types of plants

that they have previously purchased because of familiarity. The ongoing care of a plant post purchase often leads to evaluation of their decision as well.

Bottom-up and top-down effects can be investigated to document brand salience. Keller defines brand salience as "the measure of awareness of a brand, for example, how often and how easily the brand is evoked under various situations or circumstances" (Keller, 2008). Most salience is a result of in-store marketing (two thirds) and a smaller part (one third) is due to out-of-store advertisements (van der Lans, Pieters, and Wedel 2008). With improvements of in-store marketing, retailers can improve their brand salience. With improved brand salience consumers will have top of mind awareness and will be more likely to choose that retailer for all three purchase decision types.

Shopping in the retail garden centers and nurseries has a different flow compared to clothing or supermarket shopping experiences, mostly due to store atmosphere. In a clothing store or supermarket, the shopping experience takes place inside a building with the retail items on racks or shelves. In supermarkets, often the merchandise is displayed in aisles of vertical shelves. Typically in the retail garden center, the retail area is located in a greenhouse or a store front with a large warehouse type feel with plant material merchandised on benches sometimes even where the plants were grown. Other times, the plants are merchandised outside with a shade cloth covering the area or no covering at all. These differences create a very different kind of shopping environment compared to a clothing or food store. Customers can be exposed the weather, sun and rain, making the shopping environment more challenging in inclement weather. Most importantly, the merchandise (plants) is displayed horizontally, rather than vertically, in

standard rows of shelves. Even still, a few retailers merchandise plants on the ground. These shopping characteristics would be considered part of the bottom-up effects. They impact the store atmosphere itself how the products are displayed. Occasionally the retail garden center will create end-cap displays that resemble end-caps found in a traditional brick and mortar retail space seen in a clothing store or a supermarket. Locating merchandise outdoors and in horizontal displays can create unique challenges for displaying informational signs. Retail garden centers may use hand written signs that can give a more casual image; or not use any signage at all. This lack of signage may eliminate a very important opportunity for the retailer to provide the consumer with cues and also puts the burden on the plants to be the only cue the consumer has to use.

Sustainability and Horticulture Consumer Research

The word sustainability draws its definition from six different factors that fall under social, economic and environmental concepts (Brklacich et al., 1991). First sustainability should maintain or enhance environmental quality; second, it should provide adequate economic and social rewards to all individual and firms in the production system; and third, it should produce a sufficient and accessible food supply. Studies regarding sustainable practices have included one, two or all three of these components (Brkalcich et al., 1991). It is important for the farmer and the consumer to recognize that to fully encompass the sustainable practice that all three must be taken into consideration. What is hard to distinguish is if consumers perceive sustainable, organic, and environmentally friendly or eco-friendly terms interchangeably. One study showed that as consumers purchase local products more frequently than they are more like to perceive "locally produced" as eco-friendly (Campbell et al., 2013). The same was true for consumers

who purchased organically-grown products more frequently. They were more likely to relate to the term organic with eco-friendly and sustainable (Campbell et al., 2013).

Observing consumers' willingness to pay for environmentally friendly products is not new. Loroche et al. (2001) identified environmentally friendly consumers and suggested different marketing strategies that could more effectively reach them. They focused on consumers' knowledge, values, attitudes, and behaviors to understand what influenced the way consumers felt about green products. Consumers who were "green" and were willing to pay more for green products tended to not see acting in an environmentally-friendly way as any type of inconvenience. These consumers' life values were based on areas of collectivism and security, and they recognized the impact that non-green companies had on the environment and refused to buy from them (Laroche et al., 2001). Laroche found that the reverse cannot always be said about consumers unwilling to pay premiums for sustainable products. This makes it difficult for marketers to create categories of consumers based on willingness to pay for sustainable products. It does give a baseline framework of environmentally-friendly behaviors and values to recognize and track.

Younger consumers showed a higher interest level in organically-grown plants (Yue et al., 2011) but consumers with higher income levels had a lower interest in plants grown under energy-efficient methods, which could be considered a part of a sustainable practice. They also showed that women were more interested in locally-grown plants, plants that were grown under energy efficient conditions, and plants in containers that could be considered environmentally friendly.

Plants can be split into categories or annual, perennial, vegetable or herb, tree, indoor, plant, shrub, or tree. These categories can carry their own differences on how consumers make their purchase decision on buying organically, locally, or sustainably. People may be more willing to purchase plants that are grown organically if they are vegetables or herbs and that if they have purchased annuals, herbs, veggies, or perennials the year before are more likely to purchase plants that are sustainable (Yue et al., 2011). This research showed the change in consumer behavior over a very short period of time for plants that are normally bought either once a year in the case of annual, veggies and herbs, or very couple years in the case of perennials. Consumers were willing to change their purchase behavior from buying organic and local as opposed to not as they may previously had done. This change in behavior was caused by just simple exposure to the different organic or sustainable products.

The containers that plants are sold in can impact the issues of sustainable growing practices for consumers. Yue et al. (2010) describes consumers willing to pay for containers that are more biodegradable. Consumers were willing to pay a premium for containers that were made more carbon saving than others with a lower carbon footprint. If organic materials were used to make the pot, consumers were willing to pay more for the product. This increase in willingness to pay shows consumers' intentions towards sustainable practices. By willing to pay a higher amount they value the product more. This value can show the importance of the idea of sustainability. These consumers either have strong feelings already towards sustainable practices or they believe it is an idea they should be thinking about and acting on.

Another demographic characteristic that can have an impact on purchase decisions is the household number or more specifically the number of children under the age of 18. Multiple studies have found that households that contain children have a greater tendency to purchase organic products (Huang, 1996 and Thompson and Kidwell, 1998). Huang (1996) found that participants that had families with children where more willing to accept sensory defects on their produce if it was organically grown. Huang attributes this relationship to parents with children being more sensitive to the food their children are consuming that the food being organic is more important than the blemishes. Thompson and Kidwell (1998) then support Huang's findings with their study findings showing that again household with children are more willing to purchase organic produce. They also find that the more individuals under the age of 18 the more likely the purchase of organic produce.

Eye Tracking Technology

Eye movement is not random and consists of two phases; eye fixation occurs when the eye is almost completely still and saccades, which is eye movement and redirecting gaze (Pieters, et al., 2007). By tracking fixations and saccades, researchers are able to tell at what consumers are looking. These fixations can be considered an indication the thought process and are an indication of what the consumer is trying to understand. The locus of a fixation is the point where the consumer is learning the most information about the product. It is important to create possible fixation targets so consumers are able to process thoughts about the product, using cues to gain information to help them make a purchase.

Fixations can play an important role for people to be able to remember products or brands. The number of eye fixations is related to the amount of information a consumer is able to extract from an advertisement, not the fixation duration (Wedel and Pieters, 2000). Fixations are related to consumers' ability to remember brand logos, prices and promotion features of an advertisement or sign (Wedel and Pieters, 2000; Pieters and Wedel, 2004; Pieters et al., 2007;). It is important for marketers to create areas on signs that will increase fixations and in turn the consumer will be able to extract more information about the product. When considering the other advertisement features that are more informative (e.g. text and pictures) a consumer's fixation duration tends to be longer because the areas are more complex (Wedel and Pieters 2000). By knowing how consumers view different types of advertisements based on their fixations, managers can better design advertisements to carry either product information or brand identity.

Eye-tracking technology (ETT) can assist researchers in identifying what consumers are looking at while shopping, especially in the retail garden center. This technology records where the participant is looking. Results can have a large impact at multiple levels of the horticulture supply chain. The grower will be able to see what colors or varieties are attracting the most attention. The wholesaler will be able to see the popularity of different plants and suggest these plants to retailers because both will know which items are selling well. Wholesalers will also be able to coordinate their plants' pots or tags with the ideas and signs that a retailer may have. Retailers will be able to improve their signs and displays to fit what consumers find most attractive and what consumers are able to understand. Coordination between retailers and wholesalers to improve signage will hopefully encourage customers to either purchase more

plants or new plants. Customers' overall shopping experiences will improve because the signage will be focused to them because retailers will be able to know exactly at what customers are looking.

Eye tracking technology gives researchers more quantifiable and precise measures of what consumers are really looking at while they view signs, displays, advertisements, or merchandise while they shop. By using eye-tracking technology researchers found a way for retailers and merchandisers to better target their customers without having to spend extra money on advertisements that are not effective (Pieters, et al., 2007). The study was based on advertisement designs and competitive clutter and showed that attention to advertisements was increased by 45% by decreasing text size and photograph size while enlarging brand, price, and promotion when advertisement placement price stayed the same. They showed that the money that would have been used to create elaborate advertisements may not reach the customer and could be saved to create more effective advertisements. While they did not mention an increase in sales because of this change in advertisements, the decrease in printing cost is a financial benefit the marketer could realize.

Reading Sign Cues

Finding correct wording, whether it is on a survey or a sign, is essential when trying to engage consumers. If consumers are unable to understand a word or phrase, they may look at the words longer and/or become confused, which may lead to an inability to connect with the product/retailer. In an eye-tracking study, researchers looked at participant's visual attraction to different types of survey questions (Lenzner, et al., 2011). Findings showed that there was more

visual attraction to low frequency words, vague or imprecise relative terms, vague or ambiguous noun phrases, complex syntax, complex logical structures, and low syntactic redundancy phrases, which may indicate consumers were looking longer and trying to make sense or understand the words. These results show that with increased fixations, participants were confused by the message that was being presented. This has important managerial impact for in-store signage. Retailers want to make sure they avoid ambiguous and confusing terms so consumers are able to focus on the information and quickly gain meaning. There could be several unfamiliar or confusing terms or words on informational signs for plants. There are differences in plan names (scientific versus common names) and even how the plant is grown. A Minnesota study focused on shelf signage in retail grocery stores (Reicks et al., 1997) and found that signage with organic information did make an impact on customers purchasing decisions. The study compared situations of no signs, moderate level signs, and high level signage and found that have the signage in the stores as POP displays made an impact. They found that if customers did notice the signs that 20% stated that the signage information made an impact on their shopping behavior. The informational signage helped persuade the consumers in this study to examine the product or actually purchase it (Riecks et al., 1997).

In-store marketing communications and merchandising can have a large impact on consumer purchase decisions towards specific brands. Consumers will only consider brands that they prefer (Dodds, Monroe, & Grewal, 1991). Research showed that participants don't necessarily recall the brand after viewing it (Chandon, et. al, 2009). In that study, researchers used eye-tracking technology (ETT) to relate eye movement with the ability to recall brands and whether in-store marketing or out-of-store marketing contributed to brand recall. Chandon, (2009) used

ETT to show that consumers' brand consideration will rise because of in-store advertisements and cause increased visual attention. In-store attention is limited, but it can make a difference with some consumers especially when they are making a decision on a higher involvement product. The attention that is gained by in-store marketing can help complete a sale of a consumer who is making a decision between multiple products.

An eye-tracking study specifically relating the different eye measures and the participant's ability to recall and recognize information from a sign showed that first fixation (FF), fixation count (FC), and percentage of total fixation durations (TVD) on the sign were correlated with recall and recognition (Maughan et al., 2007). Overall they were able to show that as FF, FC, and % TVD increased for the specific area of interest, the sign, recall and recognition also increased (Maughan et al, 2007). These findings can make an impact on how marketing signs are made. Managers can focus their advertisements on areas that showed increase recall and recognition and save on money by not creating advertisements that do not. The researchers also discussed that there could be issues in whether the participant is looking because they like the message or because they have seen it more often and are just more familiar with it. These are important distinctions.

LITERATURE CITED

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Behe, B., and S. Barton, 2000. Consumer Perceptions of Product and Service Quality. J. Env. Hort. 18(2): 71–78.

Behe, Bridget K., R.T. Fernandez, P. Huddleston, S. Minahan, K. Getter, L. Sage and A. Jones. 2013 (in press). Practical Field Use of Eye Tracking Devices for Consumer Research in the Retail Environment. HortTechnology.

Brklacichi, M., & Bryant, C. R. 1991. Review and Appraisal of Concept of Sustainable Food Production Systems. Environmental Management, 15(1): 1–14.

Campbell, B., B.K. Behe, H. Khachatryan, C. Hall, and J.H. Dennis. 2013 (in review). Consumer Perceptions and Misperceptions of Ecofriendly and Sustainable Terms. Ag. And Resource Economics Review.

Chandon, P., Hutchinson, J. W., Bradlow, E. T., & Young, S. H. 2009. Does In-Store Marketing Work? Effects of the Number and Position of Shelf Facings on Brand Attention and Evaluation at the Point of Purchase. J. of Marketing, 73(6): 1–17.

Cox, D.F. 1962. The Measurement of Information value: A study in consumer decision making, p 413-421. In: W.S. Decker, Emerging concepts in Marketing. Chicago: American Marketing Association.

Dodds, W. B., Monroe, K. B., & Grewal, D. 1991. Effects of Price, Brand, and Store Information on Buyers' Product Evaluations. J. of Marketing Res., 28(3): 307-319.

Laroche, M., Bergeron, J., & Barbaro-Forleo, G. 2001. Targeting consumers who are willing to pay more for environmentally friendly products. J. of Consumer Mktg., 18(6): 503–520.

Lenzner, T., Kaczmirek, L., & Galesic, M. 2011. Seeing Through the Eyes of the Respondent: An Eye-tracking Study on Survey Question Comprehension. Intl. J. of Public Opinion Res., 23(3): 361–373.

Maughan, L., Gutnikov, S., & Stevens, R. 2007. Like more, look more. Look more, like more: The evidence from eye-tracking. J. of Brand Management, 14(4): 335–342.

National Drought Mitigation Center. 2013. Drought Monitor Archives for 2010, 2011, & 2012. National Drought Mitigation Center, Lincoln, NE.

Olson, J. C. 1972. Cue Utilization in the Quality Perception Process: A cognitive model and an empirical test. Purdue University, West Lafayette, PhD Diss.

Olson, J. C. 1978. Inferential Belief Formation in the Cue Utilization Process. Advances in Consumer Res., 5: 706–713.

Pieters, R., & Wedel, M. 2004. Attention Capture and Transfer in Advertising: Brand, Pictoral, and Text-Size Effects. J. of Marketing, 68(2): 36–50.

Pieters, R., Wedel, M., & Zhang, J. 2007. Optimal Feature Advertising Desing Under Competitive Clutter. Management Science, 53(11): 1815–1828.

Stahlberg, M. and V. Malia. 2010. Shopper Marketing: How to Increase Purchase Decisions at the Point of Sale. Kogan Page Limited, London, UK.

Wedel, M., & Pieters, R. 2000. Eye Fixation on Advertisements and Memory for Brands: A Model and Findings. Marketing Science, 19(4): 297–312.

Yue, C., Dennis, J. H., Behe, B. K., Hall, C. R., Campbell, B. L., & Lopez, R. G. 2011. Investigating Consumer Preference for Organic, Local or Sustainable Plants. HortScienc, 46(4): 610–615.

Yue, C., Hall, C. R., Behe, B. K., Campbell, B. L., Dennis, J. H., & Lopez, R. G. 2010. Are Consumers Willing to Pay More for Biodegradable Containers Than for Plastic Ones? Evidence from Hypothetical Conjoint Analysis and Nonhypothetical Experimental Auctions. Journal Of Agricultural and Applied Economics, 42(4): 757–772.

CHAPTER 3

CAN YOU READ THE SIGN? CONSUMERS' UTILIZATION OF WATER USE INFORMATION AND PRICE AS SIGN CUES

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Key words: conservation practices, consumer, eye-tracking, survey, retail

Abstract

Shopping in a retail store can be a pleasure or a chore. Making the process easier or more enjoyable may bring positive benefits to both the shopper and the retailer. A more organized retail experience may lead to greater customer satisfaction, which should lead to greater sales. Since service quality greatly influences customer satisfaction and loyalty, these outcomes may be improved through better store layouts and signs. Better organizing the experience could include changing words or phrases used on signs at the point of purchase or in displays. We used an eye-tracking device to investigate consumers' visual use of price and production practices labeled on signs in retail garden center displays. We

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found that visual attention to water conservation signs was linked to participants' home water conservation practices. Participants who were more likely to conserve water on their plants at home were also more likely to purchase plants that were grown under water saving practices than those participants who were not as likely to conserve water. Participants who either definitely conserved water or definitely did not conserve water had shorter viewing times than participants who sometimes conserved water or had a more neutral behavior. The study also found that location of residence (site of data collection) impacted participants' perception of water conservation. Participants from FL were more aware of the water conservation signage than participants from non-drought areas such as Michigan and Indiana.

Introduction

In-store marketing communications and merchandising can have a large impact on consumer purchase decisions. Over 68% of buying decisions are spontaneous, thus understanding the impact of point-of-purchase communications to capture consumer attention would be of benefit to garden center retailers (Stahlberg and Maila, 2010). Merchandise and environmental design cues are dimensions of the retail experience. Cues are tangible and nontangible characteristics that help a person when making a purchase decision. Price is a common merchandise cue, as are brand name, signage, and store atmosphere elements like music, shelves, and smells (Olson, 1972).

Understanding how consumers use cues while shopping can help retailers achieve greater understanding about how consumers extract meaningful information, or cue utilization. A

better understanding of information at the point of purchase may lead to greater customer satisfaction and sales. In retail garden centers, because they often have minimal packaging, the plant itself is both the product and a source of information thus, an important cue to consumers. Horticulture consumers may also use cues from in-store signage to gather relevant information. It can be hard for marketers and retailers to know if consumers are really seeing the cues while shopping. Documenting consumers' eye movements can better help professionals to organize the retail experience. This study focuses on the retail garden center and how the use of eye-tracking technology can assist in understanding how consumers attend to product cues, which, in turn, will help retailers to predict consumers' willingness to purchase horticulture products. This study looks into how cues are utilized in the horticulture retail center and the importance of establishing these cues for consumers.

Cue Utilization

Consumers can use cues to help them decide whether to make a purchase. Cue utilization refers to the cognitive processes that are involved in gathering information from the external environment and using this information to make a decision to act in a particular way (Olson, 1978). As one of the pioneers of cue utilization research, Cox (1962) concluded that consumers use both predictive value and confidence value cues. Predictive value is "a measure of the probability with which a cue seems associated with a specific product attribute" while confidence value is "a measure of how certain the consumer is the cue is what she thinks it is" (pg. 416). Predictive cues were stronger links between the cue and a behavior, but if a consumer did not a have strong confidence value the predictive

value cue would not have as strong of an impact. Consumers looking at plants should use predictive and confidence value cues together to help make purchase decisions. In shopping for plants, predictive cues might include merchandise signs because these signs can be associated with specific features of plants, such as production method. Confidence values will emerge when a consumer reads a sign or looks at a product and tries to interpret it. If a consumer does not comprehend the information presented on a sign, the lack of understanding could influence their confidence value in the understanding of the sign and how comfortable they are with purchasing the product.

Olson (1972) expanded on Cox's work and reported that the strongest cues that best predicted consumer behavior were found when predictive value and confidence value were high and were associated with intrinsic and extrinsic cues. Intrinsic cues are product characteristics, in this case flower color or leaf shape, while extrinsic cues lie outside the product, in this case signs, labels, price and other point-of-purchase materials. Some horticulture consumers may focus more intently on the plant (intrinsic cue) while others focus on signage or price (extrinsic cues).

The Retail Environment

A more organized retail experience, or better designed signage with appropriate wording, will lead to greater satisfaction of the customer, which should lead to greater sales. Service quality greatly influences customer satisfaction and customer loyalty (Silvadas and Baker-Prewitt 2000) and service quality can be achieved by improving store layouts and signs. Organizing the retail experience is part of improving service quality. Specific wording and

phrasing can help the organization of the retail setting and enhance the customers shopping experience.

The shopping atmosphere in retail garden centers and nurseries is different from clothing or supermarket shopping experiences. In a clothing store or supermarket, the shopping experience takes place inside a building with retail items displayed on racks or shelves. In supermarkets, often the merchandise is displayed in aisles of vertical shelves for items that are not perishable. Typically in a retail garden center, the retail area is located in a greenhouse or a storefront with a large warehouse type feel, with plant material merchandised on benches, rather than display shelves; sometimes merchandise is located where the plants were grown. Other times, the plants are merchandised outside with a shade cloth covering the area or no covering at all. These differences create a very different kind of shopping environment compared to a clothing or food store, as customers can be exposed to sun or rain, making the shopping environment more challenging in inclement weather. Most importantly, the merchandise (plants) is displayed horizontally, rather than vertically, in standard rows of shelves. Some retailers merchandise plants on the ground. Occasionally the retail garden center will create end-cap displays that resemble end-caps found in a traditional brick and mortar retail space as seen in a clothing store or a supermarket. Situating merchandise outdoors and in horizontal displays can create unique challenges for displaying informational signs because they may be in difficult for customers to see or the sign may become damaged from the elements. Retail garden centers may use hand written signs that can give a more casual image; or not use any signage at all. This lack of signage may eliminate an important opportunity for the retailer

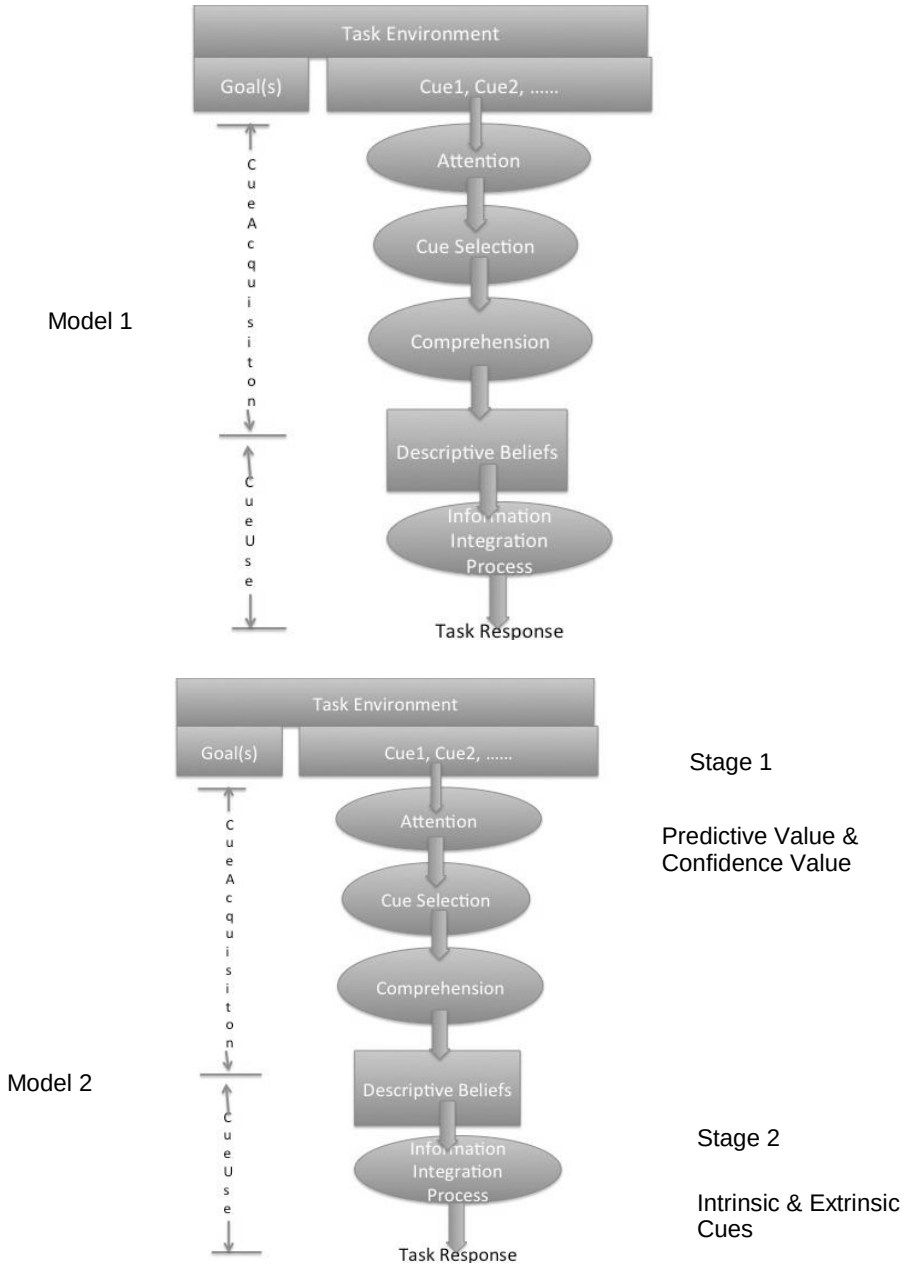
to provide the consumer with extrinsic cues and also puts the burden on plants to be the only cue the consumer uses to make a decision.

While it is important for retailers to know what information consumers use when they shop for products, the lack of consumer research in horticulture and the differences in merchandising tactics exacerbate the retail merchandising challenges. For example, plants are not uniform, i.e. every plant is slightly different in its shape size and health, unlike packaged goods that are always consistent in appearance, and thus effective merchandising of plants can be difficult.

Flowering and foliage plants are visually stimulating products with an array of foliage, flower colors, and forms. When it comes to products that are naturally visually stimulating, like plants, art or fashion, consumers use the cues presented by the product to help guide their willingness to purchase. One research study showed that consumers placed plant health and condition as the highest priority cues when evaluating plant quality (Behe & Barton, 2000). Olson (1972) developed a model based on how consumers gather and use cues presented to them. Models 1 and 2 (Figure 3) shows Olson's model and an adaptation of the model showing how it could be divided into 2 stages. The adjusted model was created from an understanding of Olson's model and gathering terms and information from several different sources. Predictive and confidence values were ideas that Cox (1962) proposed as guides for consumers using cues in the retail setting. Szybilllo & Jacoby (1974) discussed the differences between intrinsic and extrinsic cues and how consumers used these while making a purchase decision. The first stage involves the predictive and confidence value the

consumer assigns to the visual cues of the product. The second stage included how the consumer processes the product's intrinsic or extrinsic cues to help make the purchase decision. These two stages complete the task response or the ultimate willingness to purchase the product.

Figure 3. Olson's proposed cue utilization model and an adjusted model explaining the stages of consumer cue utilization



The increasing demand for sustainably-, organically-, or locally-grown plants could alter how consumers shop for their products. Laroche et al. (2001) discusses the importance of environmentally friendly products and consumers' willingness to pay for these products. These consumers were found to see behaving in an environmentally friendly behavior as important and not an inconvenience and were also willing to pay more for green products. Some consumers have specific preferences when they shop for edible horticulture products and, organically-grown plants are not as interesting as plants that are edible and organically grown, (Yue et al., 2011). Sustainability is very important to some consumers when purchasing edible plants and these consumers are even concerned about the pot that the plant is grown in and the impact it can have on sustainability (Yue et al. 2010).

Sustainability and its Influence on Purchasing

The word sustainability draws its definition from three different dimensions classified under social, economic and environmental concepts (Brklacichi et al., 1991). First sustainability should maintain or enhance environmental quality; second, it should provide adequate economic and social rewards to all individual and firms in the production system; and third, it should produce a sufficient and accessible food supply. Studies regarding sustainable practices have included one, two or all three of these components (Brkalcich et al., 1991). It is important for the farmer and the consumer to recognize that to fully encompass the sustainable practice that all three dimensions must be considered. It is hard to distinguish if consumers perceive sustainable, organic, and environmentally friendly or eco-friendly terms interchangeably. One study showed that as consumers purchase local

products more frequently, they are more like to perceive "locally produced" as eco-friendly (Campbell et al., 2013). The same was true for consumers who purchased organically-grown products more frequently. They were more likely to relate the term organic with eco-friendly and sustainable (Campbell et al., 2013).

The study of consumers' willingness to pay for environmentally friendly products is not new. Laroche et al. (2001) identified environmentally friendly consumers and suggested different marketing strategies that could more effectively reach them. They focused on consumers' knowledge, values, attitudes, and behaviors to understand what influenced the way consumers felt about green products. "Green" consumers who were willing to pay more for green products tended to not see acting in an environmentally-friendly way as inconvenient. These consumers' life values were based on values of collectivism and security (Laroche et al., 2001). Laroche found that consumers unwilling to pay premiums for sustainable products do not disregard the value of environmentally-friendly behaviors but that they do not see it as a main part of their lifestyle. The dichotomy in consumer values makes it difficult for marketers to categorize consumers based on willingness to pay for sustainable products. It does give a baseline framework of environmentally-friendly behaviors and values to recognize and track.

Interest in organic merchandise varies by demographic characteristics. Younger consumers showed a higher interest level in organically-grown plants (Yue, et al., 2011) but consumers with higher income levels had a lower interest in plants grown under energy-efficient methods, which could be considered a sustainable practice. Women are

more interested in locally-grown plants, plants that were grown under energy efficient conditions, and plants in containers that could be considered environmentally friendly (Yue et al., 2011).

Eye Tracking Technology

Eye movement is not random and consists of two phases; eye fixation occurs when the eye is almost completely still and saccades occur when the eye is moving between fixations and redirecting its gaze (Pieters, et al., 2007). By tracking fixations and saccades, researchers are able to tell at what consumers are looking. These fixations indicate the thought process and are an indication of what the consumer is trying to understand. The locus of a fixation is the point where the consumer is learning the most information about the product. From a merchandising standpoint, it is important to create targets for fixations so consumers are able to process thoughts about the product, gaining information to help them make a purchase.

Fixations can play an important role in remembering products or brands. The number of eye fixations, rather than fixation duration, is related to the amount of information a consumer is able to extract from an advertisement (Wedel and Pieters, 2000). These fixations are related to consumers' ability to remember brand logos, prices and promotion features of an advertisement or sign (Wedel and Pieters, 2000; Pieters and Wedel, 2004; Pieters et al., 2007). It is important for marketers to create areas on signs that will increase fixations and, in turn, the consumer will be able to extract more information about the product. A consumer's fixation duration tends to be longer for informative features such as

text and pictures because the areas are more complex (Wedel and Pieters 2000). By knowing how consumers view different types of advertisements based on their fixations, managers can better design advertisements to carry either product information or brand identity.

Eye-tracking technology (ETT) can assist researchers in identifying what consumers are looking at while shopping by recording where the participant is looking. Information resulting from eye-tracking analysis can have a large impact at multiple levels of the horticulture supply chain. The grower will be able to see what colors or varieties attract the most attention. The wholesaler will be able to see the popularity of different plants and suggest these plants to retailers because both will know which items are selling well. Wholesalers will also be able to coordinate their plants' pots or tags with the ideas and signs that a retailer may have so there is organization and consistency in the information being delivered. Retailers can improve their signs and displays to highlight what consumers find most attractive and assess what consumers are able to understand. This coordination between retailers and wholesalers and improved signage by retailers increase purchases. Signage informed by ETT analysis can enhance customers' overall shopping experience because the targeted display signage is based upon retailer's knowledge of consumer attention.

Eye tracking technology gives researchers more quantifiable and precise measures of what consumers are looking at while they view signs, displays, advertisements, or merchandise. Using ETT allows retailers and merchandisers to better target their customers without

having to spend extra money on advertisements that are not effective (Pieters, et al., 2007). A study of advertisement designs and competitive clutter showed that attention to advertisements was increased by 45% by decreasing text size and photograph size while enlarging brand, price, and promotion when advertisement price placement stayed the same (Pieters, et al., 2007).

Reading Sign Cues

Finding correct wording, regardless of the context, is essential when trying to engage consumers. When consumers are unable to understand a word or phrase it can lead to longer time spent looking at these words. This can lead to confusion and an inability to connect with the consumer. In an eye-tracking study that examined the visual attraction activity of participants for different types of survey questions findings showed that there was more visual attraction to low frequency words, vague or imprecise relative terms, vague or ambiguous noun phrases, complex syntax, complex logical structures, and low syntactic redundancy phrases (Lenzner, et al., 2011). The increased fixations mean that participants were confused by the message that was being presented. This has important managerial impact for in-store signage.

Terms or wording of plant signage can be confusing because there are differences between plant names, scientific versus common names, or how the plant is grown. Plants that are grown sustainably could cause confusion amongst consumers because of the lack of clarity of the wording (Campbell et al., 2013). Consumers may not fully understand all of the sustainability components and how these components affect how plants are grown

sustainably. With the use of eye-tracking it becomes possible to see which consumers, if any, are paying attention to information about sustainable production practices printed on signs. We may also be able to draw conclusions from the amount of time consumers spend reading signs and the elements they read or ignore. The information on sustainability could have a very similar affect to low frequency words. Consumers may have to spend more time reading signs if they do not clearly understand the meaning or have not been exposed to it (Lenzner et al., 2011).

In-store marketing communications and merchandising can have a large impact on consumer purchase decisions towards specific brands. Consumers will only consider brands that they prefer (Dodds, Monroe, & Grewal, 1991). Research shows that participants don't necessarily recall the brand after viewing it (Chandon, et. al, 2009). In that study, researchers used eye-tracking technology (ETT) to relate eye movement to the ability to recall brands and examined whether in-store marketing or out-of-store marketing contributed to brand recall. Chandon, (2009) used ETT to show that consumers' brand consideration will increase because of in store advertisements that cause increased visual attention. The attention that is captured by in-store marketing can help a consumer choose among multiple products and close the sale.

An eye-tracking study relating measures of attention and the participant's ability to recall and recognize information from a sign showed that first fixation duration (FFD), fixation count (FC), and percentage of total fixation durations (TVD) on the sign were positively correlated with recall and recognition (Maughan et al., 2007). The researchers purposed

that there could be misunderstanding regarding whether the participant is looking at a sign because they like the message or because they have seen it more often and are just more familiar with it. These are important distinctions because they indicate if a participant is able to possibly understanding the sign.

Using ETT researchers can investigate which image dimensions customers focus on first or longest, and which areas get less attention. Investigators can draw areas of interest (AOIs) in displays to create them. AOIs are polygon shapes that separate elements (Pieters, Wedel, and Zhang, 2007).

With the current interests in sustainability and the need to further horticulture consumer research, eye-tracking can be used to answer questions regarding where consumers are looking while shopping and their purchasing behaviors. Based on the literature review, we propose the following hypotheses:

H1a: Participants who make a lot of effort to conserve water on lawns or outdoor plants will spend more time viewing the sign containing information on water-conservation in production of perennials and shrubs.

H1b: Participants who are likely to conserve water in their lawn or landscape will also be more likely to purchase plants grown under water saving practices.

H2a: Participants who make a lot of effort to conserve water in their lawn and landscape will spend less time looking at the water conservation production sign for perennials and shrubs.

H2b: Participants who make a lot of effort to conserve water in their lawn and landscape will be more likely a) to purchase plants grown under water saving production practices and b) have shorter mean time to first fixation and c) lower mean fixation count.
H3a: Participants who have experienced drought conditions (FL, TX) will be a) more likely to expend effort on water conservation in their lawn and landscape and b) will have shorter mean time to first fixation and c) shorter mean total visit duration than participants who have not experienced drought.

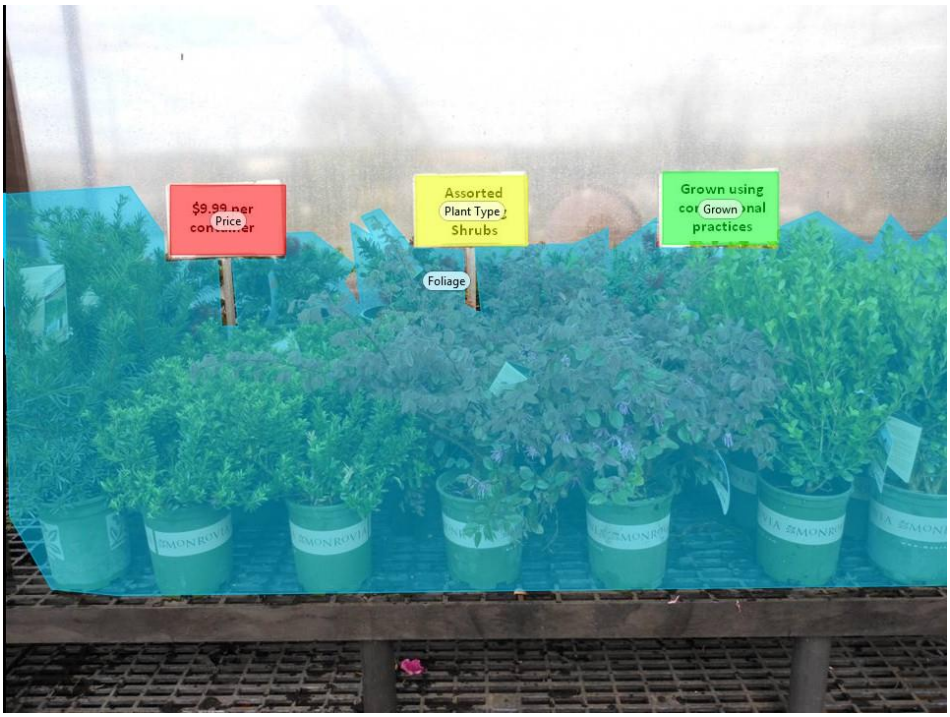
Methods

The study consisted of two parts: a written survey and an eye-tracking experiment. The written survey was completed in two sections. The first section consisted of demographic questions. The second section was composed of 4 different parts: purchasing preference questions, current and past purchases of horticultural products and basic purchasing behavior. All questions used a 7 point Likert scale with 1=extremely uncharacteristic and 7= extremely characteristic. For the eye-tracking portion, participants viewed a series of 32 images on a desktop computer monitor. During eye tracking, each participant's eye movements were tracked and recorded by the eye-tracking device.

Displays

A horizontal display of mixed herbaceous perennial plants was created and included (list genera). Pictures were taken of each display with three blank signs; one sign on the right, middle and left (Figure 4). Images of plant displays were created and taken in Dallas, TX, in March 2012.

Figure 4. Retail garden center display of woody perennials with digitally altered signs and the areas of interest created in the eye-tracking software



In each display three signs were visible. Initially all were blank but were digitally altered to show plant identification, price, and production practice. The signs were at equal levels and in consistent positions through the displays. The price and growing practice signs were left and right sides while the identification sign was always in the middle. Perennials were priced at $9.99, $14.99, or $19.99 and displayed in x l containers. For the perennials, the price was on the left side of the display. The third sign indicated how the plant was grown: using either conventional practices, energy-saving practices, water-saving practices, or sustainably-grown. This sign was always on the right side of the display for the perennial plants.

Order of Image Presentation

Once sign text was digitally added to the images in PowerPoint, they were uploaded into the Tobii software, version 3.0.2.218, to create an eye-tracking test. The 16 images for each plant type were randomized between data collection sites. For each image, the participant was asked to give a verbal response to the question, "how likely are you to buy a plant from this display?" on a Likert scale from 1 to 10. Once the rating was given the researcher would advance to the next image.

Data Collection Sites

We collected data at six different locations: College Station TX, April 27 and 28, 2012; Apopka, Florida, May 4 and 5, 2012; Ontario, Canada, May 10, 11, and 12, 2012; East Lansing, MI, May 18 and 19, 2012; Columbia City, IN, May 24 and 25, 2012; and Minneapolis, MN, June 28, 29, and 30, 2012. Participants were recruited at each location by different methods, including use of a list serve from previous studies, Craigslist advertisement, colleagues and cohorts, or email blast through the academic colleges. Each location recruited at least 50 different participants. Participants were scheduled at 15-minute intervals over a two to three day span.

Data Collection

When participants were introduced to the study, the eye-tracking equipment was briefly explained and the participant signed an IRB approved consent form (IRB #11-404). Participants were compensated $25 cash. Each participant was instructed to complete the

first page of the survey (demographic questions) then they were taken to the computer monitor where the eye-tracking portion of the study was conducted.

The Tobii Eye-Tracker Lite was used for the study, which, was attached to a LG Flatron 56 cm monitor and Toshiba laptop. Each participant was calibrated to an acceptable level (Behe et al., 2013) and was asked to remain as still as possible for the eye-tracking portion. An introduction and instruction slide was shown and read at the beginning of each visual data collection test. One practice image was shown to familiarize participants with the study flow. Participants gave their ratings verbally, to decrease body movement and to standardize each participant's viewing experience. Each participant viewed 32 images, 16 of which pertained to this study. The images the participants viewed were randomized by location of where the data location took place.

After all visual data was collected, four specific areas of interest (AOIs) were drawn on each image. One AOI was drawn around each of the three signs. Another AOI was drawn around all the foliage in the plant displays. AOIs were identical in size and copied from one image to the next (Fig 2).

Data analysis was conducted using SAS 17.2 (Cary, NC) and SPSS Statistics Version 19 (Armonk, New York). A paired mean comparison GLMMIX procedure was run in SAS and a paired t-test was run in SPSS Statistics.

Analysis

The four visual measures of interest extracted for each AOI were time to first fixation (TFF), first fixation duration (FFD), total visit duration (TVD), and fixation count (FC). TFF measured what initially caught the participants' attention and the order in which their attention was grabbed. FFD showed how long their attention was kept at first glance. TVD indicated how long a participant spent looking a particular area. FC showed how often they visually returned to an AOI. We exported these four measures and imported the survey information data into Microsoft Excel Version 14.3.4 and then SAS version 9.3 and SPSS version 19.

Results

A total of 344 participants completed the survey. Of these, there were 307 usable responses. Participants were omitted from the results if they were unable to be calibrated during eye-tracking or if the calibration was not correct. Some reasons for incorrect calibration were light colored eyes, saggy eyelids, or corrective lenses including transitional, bifocal, or trifocal lenses. From the six different locations there were 46 (14.9%) participants from Florida, 41 (13.3%) participants from Indiana, 66 (21.4%) participants from Michigan, 47 (15%) participants from Minnesota, 58 (18.8%) participants form Ontario, Canada, and 51 (16.6%) participants from Texas. The majority of participants were female (72.3%). Participants' ages ranged from 20 to 91 years old, with a mean age of 49 years. One third of participants were college educated (34.4%) and 58.3% of participants lived in a suburban region. Participants were 90.2% Caucasian. The mode for income fell in the category of $70,000 (19.5%) and $90,000 (18.9%). A majority

of participants, 62.5%, had one other adult living in their household and a majority, 69.7%, also had no children, 18 years or younger, living in their household.

Table 1 shows the mean visual metrics for respondents from their views of the perennial displays with only the signs about water-conservation and Table 2 shows the mean comparisons using ANOVA via SAS running a GLMMIX code. We saw that as participants responded with "no effort" to "some effort" to "a lot of effort" about their water conservation practices, the participant's LTB rating response increased by nearly 10%. The more likely a participant was to have made an effort to conserve water, the higher their LTB rating for the perennials with a sign about water conservation. The greatest differences in means were observed between participant's LTB rating for those participants reporting "no effort" and "some effort" compared to those reporting "a lot of effort" in water conservation.

Table 1. Mean likeliness to buy (LTB), total visit duration (TVD), time to first fixation (TFF), first fixation duration (FFD), and fixation count (FC) by response to water conservation question of lawn for only the water sign AOI of perennial plants.

Water conservation response	**N**	**Mean LTB (SD)**	**Mean TVD (SD)**	**Mean TFF (SD)**	**Mean FFD (SD)**	**Mean FC (SD)**
No effort (2)	32	5.19 (2.37)	0.61 (0.95)	0.87 (1.39)	0.29 (0.51)	2.09 (2.09)
Some effort (3)	155	5.58 (2.35)	0.75 (0.99)	1.04 (1.35)	0.28 (0.35)	2.13 (2.13)
A lot of effort (4)	120	6.05 (2.34)	0.55 (0.81)	0.84 (1.34)	0.21 (0.32)	2.01 (1.51)

Table 2. Multiple mean comparisons of water conservation effort by visual metrics and LTB for only perennial displays with the "grown under water conservation practices" sign.

Comparison between responses	LTB p-value	TVD p-value	TFF p-value	FFD p-value	FC p-value
2 and 3	0.2946	0.4059	0.6069	0.9926	**0.0081**
2 and 4	**0.0004**	0.9477	0.9989	**0.0722**	0.9103
3 and 4	**0.0024**	**0.0006**	**0.0512**	**0.0037**	**0.0010**

Multiple mean comparisons determined using SAS 17.2 GLMMIX procedure where $p < .05$

The participants who expended "some effort" in water conservation had a mean TVD that was highest on plants displayed with the water-conservation grow sign and was similar to those who expended "no effort," and higher than those who "expended a lot of effort" to conserve water. We saw a similar pattern for mean TTF and FC metrics. The mean TFF for was greatest for participants who "expended some effort" compared to those who "expended a lot effort." In fact, it was 20% greater. For FC, we observed that respondents who expended "no effort" visited the sign less than those who expended "some effort," in fact 2% less. When we compared respondents who expended "some effort" to those who expended "a lot of effort," we observed that the latter group visited the sign 6% more often. We saw a slightly different pattern for FFD. Here, we saw greatest differences between the two extremes. For participants who "expended no effort" and participants who "expended a lot of effort" there was a difference of 28%. Similar to the other measures there was also a difference between people who "expended some effort" and people who "expended a lot of effort" for FFD. People who "expend a lot of effort" had a mean FFD, which was 25% less than people who "expend some effort". Differences for the mean LTB rating were similar

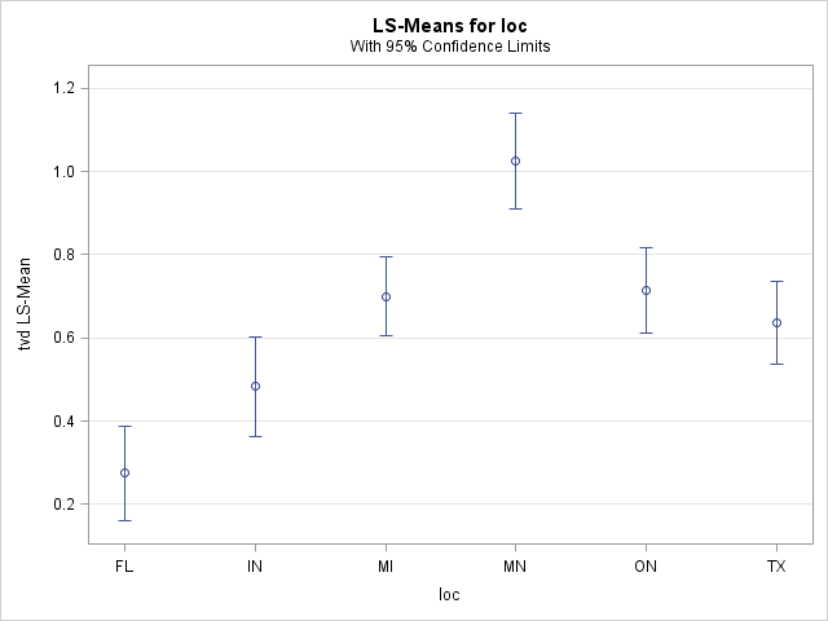
to the differences for FFD in that there was a difference between the two extremes. People who "expended no effort" were 14% less likely to purchase the plants than people who "expended a lot of effort". There was also an 8% difference between people who "expended some effort" and people who "expended a lot of effort". People who "expended a lot of effort" were the most likely to purchase the plants.

Table 3 shows the mean LTB and visual metrics by location for participants' views only on perennial plants with a water-conservation in production sign. Fig 5 shows the multiple mean comparisons for TVD between states using SAS GLIMMX test. We saw the most differences when comparing FL with all other states. These differences appeared in all dependent variables. There were also a lot of differences when comparing MN to the other states for LTB and TVD.

Table 3. Mean likeliness to buy (LTB), total visit duration (TVD), time to first fixation (TFF), first fixation duration (FFD), and fixation count (FC) by data collection location for the water sign AOI of perennial plants.

Location	Mean rating mean (SD)	Mean TVD (SD)	Mean TFF (SD)	Mean FFD (SD)	Mean FC (SD)
FL	6.13 (2.83)	0.27 (0.52)	0.63 (1.21)	0.12 (0.21)	0.9 (1.60)
IN	4.89 (2.38)	0.48 (0.78)	0.99 (1.66)	0.18 (0.30)	1.53 (2.12)
MI	5.06 (2.12)	0.7 (0.96)	0.99 (1.31)	0.3 (0.43)	1.48 (1.82)
MN	6.19 (2.29)	1.03 (1.02)	1.01 (1.50)	0.33 (0.44)	2.66 (2.51)
ON	6.52 (1.88)	0.71 (0.82)	1.04 (1.28)	0.26 (0.31)	2.06 (2.25)
TX	5.25 (2.29)	0.64 (1.06)	0.89 (1.19)	0.24 (0.32)	1.63 (1.97)

Figure 5. Comparison of participants'' total visit duration (TVD) by location for perennial plants with a water conservation sign AOI.



Multiple mean comparisons determined using SAS 17.2 GLMMIX procedure where p <.05

Participants from FL had a lower mean TVD on the grow sign compared to participants from MN, MI, ON, and TX. Participants from MN had a mean TVD four times more TVD than participants from FL. ON participants spent 0.44 seconds longer viewing the sign compared to FL participants. This time difference was about the same when comparing the difference between FL and MI participants. Participants from FL and TX had a mean TVD 2.5 times higher than TX participants.

The differences between FL and the other locations with TVD were the same for FFD. Again the biggest difference we saw was between FL and MN. Participants from MN took on average 2.75 times longer to fixate on the sign than FL participants. MI participants on average were similar to MN participants with a difference of 2.5 times longer to fixate than

FL participants. Participants from ON and TX were also about the same difference at two times longer to first arrive and fixate on a sign compared to participants from FL. There was a slight difference when comparing the TFFs between the locations. Participants from FL had the shortest TFF but there were differences seen when comparing participants from FL to MI, MN, ON, and IN participants, but no difference between FL and TX participants. Here the largest difference was ON with MN taking participants almost two times longer to fixate on the sign. IN and MI had the exact same mean TFF. It took participants from FL one-third the amount of time to fixate on the sign than participants from IN and MI.

When looking at the comparisons between states and the LTB ratings the pattern of differences was not the same. Participants from ON had the highest LTB rating with MN next highest. There were no differences found in the ratings between FL, MN, and ON. There were differences between FL and IN with participants in FL being 25% more likely to purchase a perennial grown under water conservation practices. Participants from MI were 21% less likely to purchase the perennial plants than participants from FL. The smallest difference was between FL and TX where TX participants were 17% less likely to purchase the plants. With ON and MN participants having the highest LTB ratings it is interesting that these two locations also had the highest TVD and had the longest TFF.

Discussion and Conclusions

Hypotheses 1 and 2 examined the relationship between participants who made "a lot of effort" to conserve water and the TVD on the grow sign (an extrinsic cue). These hypotheses examined the behavior of participants and how they used the cues that were

provided. H1 and H2 test hypotheses regarding extrinsic cues or the different signs that were provided in the retail display and what impact these signs had on the viewing behavior of the participant. H1 was not supported because participants who "made a lot of effort" to conserve water had the shortest TVD and the lowest mean FC. This may be an indication that they quickly understood the information communicated and is consistent with the findings from Lenzner et al. (2011) where more fixations corresponded with confusion or less of an understanding of information.

H2 was supported. We observed that participants who "made a lot of effort" to conserve water did have a lower mean TVD compared to participants who "made some effort" to conserve water. The mean TFF an FC was also lower for participants who "made a lot of effort" compared to those who "made some effort". The strongest support for H2 was shown in comparing the LTB ratings. Here participants who "make a lot of effort" to conserve water had a higher LTB than participants who "make no effort" and who "make some effort" to conserve water. H1 and H2 show consistent findings to the Lenzner et al. (2011) study. Participants that seemed to have agreement between their responds to the survey question and the amount of time spent of the sign. The high rating of willingness to conserve water could relate to understanding of the sign terminology leading to less total time spent on the sign. The reverse is true for participants who did not a high likeliness to conserve water and their time spent looking at the sign.

Hypothesis 3 tested the relationship between a participants' location and the impact that had on their viewing and purchasing habits. This hypothesis brings in an additional

variable, which is location. Location could work as a cue because it may cause participants to be more aware of certain issue that would impact their purchase decision. With the six different locations that data was collected, two of them, FL and TX, could be classified as areas affected by drought in the year or two prior to data collection. According to the National Drought Mitigation Center during April 2012, TX and FL were the only two locations under extreme to exceptional drought conditions. This is the same with April 2011, TX and FL were the only two locations to be under extreme drought conditions with TX being the worse of the two. Two years prior to the study in April 2010 none of the locations were under a drought condition.

Hypotheses 3 examined two drought exposed locations compared to four non-drought locations (MI, IN, MN, ON) to see how cues affected how the participants viewed the display. H3 was partially supported. Participants from FL had the shortest TVD, TFF, and FFD on attention to the sign. Participants from TX did not show the same differences though. Participants from the locations not affected by drought, MI, IN, MN, and ON, had longer TVD, TFF, and FFD. Even though participants in some of the no drought locations had longer viewing metrics some of them still had very high LTB. Participants form MN and ON had the highest LTB with FL participants right behind. This could show the differences in perception of water conservation of participants who live in drought locations and the impact it may have on their plant purchases.

There is a need for retailers to closely examine wording on signage and analyze if and how consumers are processing signage information. It is important to have a clear

understanding of consumers' basic prior understanding to terms such as sustainable and eco-friendly. Knowing the exposure to these terms will help store owners and marketers to create better signs and point of purchase material to encourage sales. From the study it can be seen that signs containing water conservation information do seem to resonate with consumers. The signs had more of an impact showing shorter TVD, TFF, and FFD with consumers who already practiced water conservation practices and who were exposed to drought conditions. By providing the water conservation information on the signs it will help consumers who may not practice water conservation or those who are not exposed to drought conditions an opportunity to become more familiar with the terminology and be become a part of their purchase decision. Consumers will be able to use the signs as additional cues to assist in their purchasing of horticulture products.

From this study, garden center retailers and marketers can see the importance of sign wording especially in relation to terms like sustainability. There needs to be more clarity on what exactly sustainable practices are. Retailers should analyze the working definition that Brklacich et al. (1991) created and highlight specific parts of the social, economic, or environmental impacts their plants are making and highlight these on signage. By specifying exactly what makes the plant sustainably grown consumers may be able to better understand what the growing practice means and the importance of it. By informing consumers about exactly what growing practices were used, such as water conservation, it leads to less misinterpretation of what was done and consumers can be made clearer what practices are considered sustainable. This could lead to garden centers attracting customers that are loyal to sustainable practices.

This study was not without limitations. There was no measure of participants' comprehension or understanding of water conservation and sustainable practices. The survey portion of the study also did not have questions that were directed to evaluate actual water conservation or sustainability practices. Future studies should create a survey and study that specifically focuses on consumers water conservation behaviors and if these consumers see these as sustainable practices. This would give a better idea of their understanding of the terminology and practices.

LITERATURE CITED

LITERATURE CITED

Behe, B., and S. Barton, 2000. Consumer Perceptions of Product and Service Quality. J. Env. Hort. 18(2): 71–78.

Behe, Bridget K., R.T. Fernandez, P. Huddleston, S. Minahan, K. Getter, L. Sage and A. Jones. 2013 (in press). Practical Field Use of Eye Tracking Devices for Consumer Research in the Retail Environment. HortTechnology.

Brklacichi, M., & Bryant, C. R. 1991. Review and Appraisal of Concept of Sustainable Food Production Systems. Environmental Management, 15(1): 1–14.

Campbell, B., B.K. Behe, H. Khachatryan, C. Hall, and J.H. Dennis. 2013 (in review). Consumer Perceptions and Misperceptions of Ecofriendly and Sustainable Terms. Ag. And Resource Economics Review.

Chandon, P., Hutchinson, J. W., Bradlow, E. T., & Young, S. H. 2009. Does In-Store Marketing Work? Effects of the Number and Position of Shelf Facings on Brand Attention and Evaluation at the Point of Purchase. J. of Marketing, 73(6): 1–17.

Cox, D.F. 1962. The Measurement of Information value: A study in consumer decision making, p 413-421. In: W.S. Decker, Emerging concepts in Marketing. Chicago: American Marketing Association.

Dodds, W. B., Monroe, K. B., & Grewal, D. 1991. Effects of Price, Brand, and Store Information on Buyers' Product Evaluations. J. of Marketing Res., 28(3): 307-319.

Laroche, M., Bergeron, J., & Barbaro-Forleo, G. 2001. Targeting consumers who are willing to pay more for environmentally friendly products. J. of Consumer Mktg., 18(6): 503–520.

Lenzner, T., Kaczmirek, L., & Galesic, M. 2011. Seeing Through the Eyes of the Respondent: An Eye-tracking Study on Survey Question Comprehension. Intl. J. of Public Opinion Res., 23(3): 361–373.

Maughan, L., Gutnikov, S., & Stevens, R. 2007. Like more, look more. Look more, like more: The evidence from eye-tracking. J. of Brand Management, 14(4): 335–342.

National Drought Mitigation Center. 2013. Drought Monitor Archives for 2010, 2011, & 2012. National Drought Mitigation Center, Lincoln, NE.

Olson, J. C. 1972. Cue Utilization in the Quality Perception Process: A cognitive model and an empirical test. Purdue University, West Lafayette, PhD Diss.

Olson, J. C. 1978. Inferential Belief Formation in the Cue Utilization Process. Advances in Consumer Res., 5: 706–713.

Pieters, R., & Wedel, M. 2004. Attention Capture and Transfer in Advertising: Brand, Pictoral, and Text-Size Effects. J. of Marketing, 68(2): 36–50.

Pieters, R., Wedel, M., & Zhang, J. 2007. Optimal Feature Advertising Desing Under Competitive Clutter. Management Science, 53(11): 1815–1828.

Stahlberg, M. and V. Malia. 2010. Shopper Marketing: How to Increase Purchase Decisions at the Point of Sale. Kogan Page Limited, London, UK.

Wedel, M., & Pieters, R. 2000. Eye Fixation on Advertisements and Memory for Brands: A Model and Findings. Marketing Science, 19(4): 297–312.

Yue, C., Dennis, J. H., Behe, B. K., Hall, C. R., Campbell, B. L., & Lopez, R. G. 2011. Investigating Consumer Preference for Organic, Local or Sustainable Plants. HortScienc, 46(4): 610–615.

Yue, C., Hall, C. R., Behe, B. K., Campbell, B. L., Dennis, J. H., & Lopez, R. G. 2010. Are Consumers Willing to Pay More for Biodegradable Containers Than for Plastic Ones? Evidence from Hypothetical Conjoint Analysis and Nonhypothetical Experimental Auctions. Journal Of Agricultural and Applied Economics, 42(4): 757–772.

CHAPTER 4

CONSUMERS' PERCEPTIONS AND UTILIZATION OF SUSTAINABLY AND CONVENTIONALLY GROWN VEGETABLES AND HERBS

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Key words: organic, production practices, produce

Abstract

Consuming organically- or sustainably-grown produce has become a popular trend in the recent decade. Consumers are becoming more aware of the food they eat. They are concerned about its source and how it was produced. With the demand for produce that is grown in a more environmentally friendly manner, producers and marketers need to be able to understand what differentiates their products, and making those products more appealing to consumers. With the use of eye-tracking technology, marketers can gain knowledge of what consumers are really looking at when they shop for produce. This study examines the visual activity for signage labeled with sustainable and conventional growing practices for herb and vegetable transplants. We found differences in the first fixation duration when comparing activity on two types of signs (conventional growing practices and sustainable growing practices) and in the first fixation duration and total visit duration for the conventional signs. The study also examined whether participants who had children living in their household affected the purchasing behavior and viewing habits on the informational sign showing the vegetable or herb transplant was grown using

sustainable production practices. We found a difference in mean first fixation duration and a slight difference with mean total visit duration.

Introduction

Since more than half of all purchasing decisions are spontaneous (Stahlberg and Maila, 2010), understanding how to better communicate with consumers in the store could greatly impact garden retail centers. Marketing communications can be counted among the various shopping cues retailers employ to stimulate purchasing. Cues can be various things from product price, brand name, descriptive signs, store quality; and store atmosphere, which includes smells and sounds. In horticulture, even the product itself is a cue because it is frequently not packaged beyond a plant container (Olson 1972). Understanding how consumers use cues while shopping can help retailers attain greater customer satisfaction and achieve greater cue utilization which will hopefully lead to greater sales. Being able to document consumers' eye movements can better help professionals to organize a retail garden center. This study focuses on plant sales in the retail garden center. Our goal is to use eye-tracking technology to identify which cues different consumers use to make a purchase decision. This information can assist producers, wholesalers, and retailers to create more effective cues to help increase consumers' willingness to purchase horticulture products.

Cue Utilization

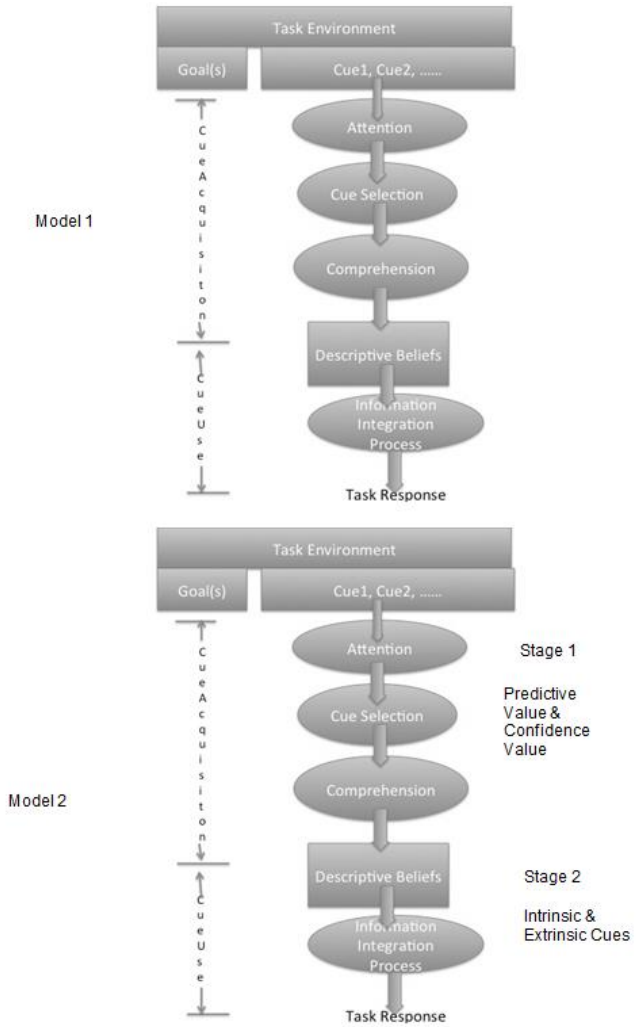
Consumers can use cues to help them better decide whether to make a purchase. Cue utilization is the cognitive processes that are involved in gathering information from the

external environment and using this information to make a decision to act in a particular way (Olson, 1978). As one of the pioneers in cue utilization, Cox (1962) concluded that consumers use what he called predictive value and confidence value cues. He explained predictive value cue as "a measure of the probability with which a cue seems associated with a specific product attribute" while a confidence value cue was "a measure of how certain the consumer is the cue is what she thinks it is" (pg. 416). Predictive value cues were stronger than confidence value cues. However, if a consumer did not a have strong confidence value then the predictive value cue would not have as strong of an impact. Olson (1972) expanded on Cox's work and reported that the strongest cues were found when predictive value and confidence value were high. Olson described two types of cues depending on their position to the product: intrinsic and extrinsic cues. Intrinsic cues are product ingredients, in this case flower color or leaf shape, while extrinsic cues lie outside the product, in this case signs and other point-of-purchase materials. Some consumers in horticulture may focus on the plant (intrinsic cue) while others focus on signage (extrinsic cues).

He also (1972) presented a model based on how consumers gather and use cues presented to them. Model 1 and 2 (Fig 6) shows Olson's model and a slight adjustment of the model showing how it could be divided in two stages. The adjusted model was created from an understanding of Olson's model and gathering terms and information from several different sources. Predictive and confidence value were ideas that Cox (1962) discussed as part of consumers using cues in the retail setting. Szybilllo & Jacoby (1974) discussed the differences of intrinsic and extrinsic cues and how consumers used these while making a purchase decision.

The first stage would involve the predictive and confidence value the consumer has in regard to the visual cues the product is giving off. The second stage brings in the intrinsic or extrinsic cues that the product processes to help make the purchase decision. These two stages together complete the task response or the ultimate willingness to purchase the product.

Figure 6. Olson's purposed cue utilization model and an adjusted model explaining the stages of consumer cue utilization



Consumers looking at plants can use predictive and confidence value cues to help make purchase decisions. In shopping for plants, display signs can be classified as predictive cues. These signs can convey specific features of the plants, including production methods. Confidence value cues will emerge as a consumer reads a sign and tries to interpret it or when s/he looks at plants or, after reading the sign, tries to evaluate the plant quality. If a consumer is unsure about the information presented on a sign, the lack of understanding could influence their confidence value and how comfortable they are with purchasing the product. Thus, our work uses Olson's model and Cox's findings on predictive value and confidence value to better understand how consumers shop for plants. Olson's model shows the steps a consumer goes through while shopping for a plant and the first stage of his model brings in Cox's understands of predictive and confidence values.

The Retail Environment

Shopping in retail garden centers and nurseries has a different flow compared to clothing or supermarket shopping experiences and creates a different store atmosphere. In a clothing store or supermarket, the shopping experience takes place inside a building with the retail items on racks or shelves. In supermarkets, usually the merchandise is displayed in aisles of vertical shelves. Typically in the retail garden center, the sales area is located in a greenhouse or a store front with a large warehouse-like area with plant material merchandised on benches. Other times, the plants are merchandised outside with a shade cloth covering the area or no covering at all. Customers can be exposed the weather making the shopping environment more challenging in inclement weather. Plant merchandise is displayed horizontally, rather than vertically, in standard rows of shelves.

Even still, a few retailers merchandise plants on the ground. Thus, the outdoor shopping environment of a garden center may have a substantially different atmosphere compared to indoor shopping experiences. This difference may influence cues that are used in the purchase decision.

Flowering and foliage plants are visually stimulating products with an array of foliage, flower colors, and forms. Every plant is going to be slightly different in its shape and size unlike a box of cereal that is always consistent. One research study showed that consumers placed plant health and condition as the highest priority when evaluating plant quality (Behe & Barton, 2000). Plants can be somewhat inconsistent in their health, vigor, and flowering as well.

Sustainability and its Influence on Purchasing

The word sustainability draws its definition from six different factors that fall under social, economic and environmental concepts (Brklacich et al., 1991). First sustainability should maintain or enhance environmental quality; second, it should provide adequate economic and social rewards to all individual and firms in the production system; and third, it should produce a sufficient and accessible food supply. Studies regarding sustainable practices have included one, two or all three of these components (Brkalcich et al., 1991). It is important for the farmer and the consumer to recognize that to fully encompass the sustainable practice that all three must be taken into consideration. What is hard to distinguish is if consumers perceive sustainable, organic, and environmentally friendly or eco-friendly terms interchangeable. One study showed that as consumers purchase local

products more frequently than they are more like to perceive "locally produced" as eco-friendly (Campbell et al., 2013). The same was true for consumers who purchased organically-grown products more frequently. They were more likely to relate to the term organic with eco-friendly and sustainable (Campbell et al., 2013).

Consumer Research with Sustainable Products

Observing consumers' willingness to pay for environmentally friendly products is not new. Laroche et al. (2001) identified environmentally friendly consumers and suggested different marketing strategies that could more effectively reach them. They focused on consumers' knowledge, values, attitudes, and behaviors to understand what influenced the way consumers felt about green products. Consumers who were "green" and were willing to pay more for green products tended to not see acting in an environmentally-friendly way as any type of inconvenience. These consumers' life values were based on areas of collectivism and security, and they recognized the impact that non-green companies had on the environment and refused to buy from them (Laroche et al., 2001). Laroche found that the reverse cannot always be said about consumers unwilling to pay premiums for sustainable products. This makes it difficult for marketers to create categories of consumers based on willingness to pay for sustainable products. It does give a baseline framework of environmentally-friendly behaviors and values to recognize and track.

Some consumers have specific preferences when they shop for horticulture products, especially edible products such as vegetables and herbs. Organically-grown plants are not as interesting unless buyers plan to eat them (Yue, et. al 2011). The increasing demand for

sustainably-, organically-, or local-grown plants could alter how consumers shop for their products. According to Hall et al. (2010) sustainability is very important to consumers when purchasing horticulture products. Some consumers are even concerned with the pot that the plant is grown in and the impact the container can have on their perception of sustainability. Laroche et al. (2001) also discusses the importance of environmentally friendly products and consumers' willingness to pay for these products. Consumers WTP for environmentally-friendly products were found to see behaving in an environmentally friendly behavior as important and not an inconvenience at all.

Younger consumers showed a higher interest level in organically-grown plants (Yue, et al., 2011) but consumers with higher income levels had a lower interest in plants grown under energy-efficient methods, which could be considered a part of a sustainable practice. They also showed that women were more interested in locally-grown plants, plants that were grown under energy efficient conditions, and plants in containers that could be considered environmentally friendly.

Another demographic characteristic that can have an impact on purchase decisions is the household number or more specifically the number of individuals under the age of 18. Multiple studies have found that households that contain children have a greater tendency to purchase organic products (Huang, 1996; Thompson and Kidwell, 1998). Huang (1996) found that participants that had families with children where more willing to accept sensory defects on their produce if it was organically grown. Huang (1996) attributes this relationship to parents with children being more sensitive to the food their children are

consuming that the food being organic is more important than the blemishes. Thompson and Kidwell (1998) then support Huang's findings with their study findings showing that again household with children are more willing to purchase organic produce. They also find that the more individuals under the age of 18 the more likely the purchase of organic produce.

Eye Tracking Technology

Eye movement is not random and consists of two phases; eye fixation occurs when the eye is almost completely still and saccades occur when the eye is moving between fixations and redirecting its gaze (Pieters, et al., 2007). By tracking fixations and saccades, researchers are able to tell at what consumers are looking. These fixations indicate the thought process and are an indication of what the consumer is trying to understand. The locus of a fixation is the point where the consumer is learning the most information about the product. It is important to create targets for possible fixations so consumers are able to process thoughts about the product, gaining information to help them make a purchase.

If retailers want consumers to utilize information presented on signs, they must first have the sign capture consumers' attention. The more areas on signs that increase fixations, the more information a consumer will be able to extract. Subjects have longer fixation duration when viewing features that can be more informative (e.g. complex text and images) because the areas are more complex (Wedel and Pieters 2000). By knowing how consumers view different sign features based on their fixations, managers can better design advertisements to carry either product information or brand identity.

Eye-tracking technology (ETT) can assist researchers in identifying what consumers are looking at while shopping, especially in the retail garden center. This technology records where the participant is looking. Results can have a large impact at multiple levels of the horticulture supply chain. The grower will be able to see what colors or varieties are attracting the most attention. The wholesaler will be able to see the popularity of different plants and suggest these plants to retailers because both will know which items are selling well. Wholesalers will also be able to coordinate their plants' pots or tags with the ideas and signs that a retailer may have. Retailers will be able to improve their signs and displays to fit what consumers find most attractive and what consumers are able to understand. This coordination between retailers and wholesalers and improved signage by retailers will hopefully encourage customers to either purchase more plants or plants that they would not normally purchase. Customers' overall shopping experience will improve because the signage is focused towards them because retailers will be able to know exactly at what customers are looking.

Reading Sign Cues

It is important for retailers to know what information and cues consumers use while they shop for products, but the lack of consumer research in horticulture combined with the differences in merchandising exacerbate the retail merchandising challenges. Finding correct wording, whether it is on a survey or a sign, is essential when trying to engage consumers. If consumers are unable to understand a word or phrase it can lead to longer time spent looking at these words. This can lead to confusion and the inability to connect

with the consumer. In an eye-tracking study, researchers looked at the visual attraction activity of participants for different types of survey questions (Lenzner, et al., 2011). Findings showed that there was more visual attraction to low frequency words, vague or imprecise relative terms, vague or ambiguous noun phrases, complex syntax, complex logical structures, and low syntactic redundancy phrases. These results show that with these increased fixations that participants were confused by the message that was being presented. This has important managerial impact for in store signage. Retailers want to make sure they avoid these confusing terms so consumers are able to focus in on the information and quickly gain information from it.

There could be a lot of confusion on terms or words on informational signs for plants. There are differences between different names of plants, scientific versus common names, or even how the plant is grown. Plants that are grown sustainably could cause confusion amongst consumers because of the lack of clarity of the word (Campbell et al., 2013). Consumers may not fully understand all of the sustainability components and how the components affect how plants are grown sustainably. With the use of ETT it becomes possible to see which consumers, if any, are paying attention to information regarding sustainable production practices printed on signs. We may also be able to draw conclusions from the amount of time consumers spend reading signs and the elements they read or ignore. The information on sustainability could have a very similar affect as low frequency words. Consumers may have to spend more time reading signs if they do not clearly understand the meaning or have not been exposed to it (Lenzner et al., 2011).

In-store marketing communications and merchandising can have a large impact on consumer purchase decisions towards specific brands. Consumers will only consider brands that they prefer (Dodds, Monroe, & Grewal, 1991). Research showed that participants don't necessarily recall the brand after viewing it (Chandon, et. al, 2009). In that study, researchers used eye-tracking technology (ETT) to relate eye movement with the ability to recall brands and whether in-store marketing or out-of-store marketing contributed to brand recall. Chandon, (2009) used ETT to show that consumers' brand consideration will rise because of in store advertisements and cause increased visual attention. In-store attention is limited, but it can make a difference with some consumers especially when they are making a decision on a higher involvement product. The attention that is gained by in-store marketing can help complete a sale of a consumer who is making a decision between multiple products.

Signage in the retail garden center may be different from other retailers with indoor sales areas. Retail garden centers may use hand written signs that can give a more casual image; or not use any signage at all. This lack of signage may eliminate a very important opportunity for the retailer to provide the consumer with extrinsic cues and also puts the burden on the plants to be the only cue the consumer has to use.

A Minnesota study focusing on shelf signage in retail grocery stores (Reicks et al., 1997) found that signage with organic information did make an impact on customers purchasing decisions. The study compared situations of no signs, moderate level signs, and high level signage and found that have the signage in the stores as POP displays made an impact.

They found that if customers did notice the signs that 20% stated that the signage information made an impact on their shopping behavior. The informational signage influenced consumers in this study to examine the product or actually purchase it (Riecks et al., 1997)

An eye-tracking study specifically relating the different eye measures and the participant's ability to recall and recognize information from a sign showed that first fixation (FF), fixation count (FC), and percentage of total fixation durations (TVD) on the sign were correlated with recall and recognition (Maughan et al., 2007). Overall they were able to show that as FF, FC, and % TVD increased for the specific area of interest, the sign, recall and recognition also increased (Maughan et al., 2007). These findings can make an impact on how marketing signs are made. Managers can focus their advertisements on areas that showed increase recall and recognition and save on money by not creating advertisements that do not. The researchers also discussed that there could be issues in whether the participant is looking because they like the message or because they have seen it more often and are just more familiar with it. These are important distinctions.

Researchers can investigate on which dimensions of the image customers are focusing first or most and which areas get less attention. Investigators can draw areas of interest in displays or images to create them. Areas of interest are polygon shapes that separate elements (Pieters, Wedel, and Zhang 2007). With eye tracking devices, researchers can calculate where the consumers' eyes are tracking most. Measuring fixations can give great insight and new knowledge as to the importance of elements of the advertisements.

With the understanding that green products are important to consumers and that there can be confusion with terminology it is important understand how consumers read signage containing green information. This study aims to discover what types of relationships can be found when participants' eye movements on signs of vegetables and herbs are measured and compared to their purchase behaviors of organic produce and products. The following hypotheses are proposed.

H1a: Participants who never purchased organic vegetables, herbs, or produce in the year prior to the study will spend less time viewing (FC, TVD) informational signs which display the method of plant production (e.g. sustainably-grown, conventional, grown using water-conserving practices) compared to participants who have purchased this merchandise.

H1b: Participants who spend the highest amount of time (TVD, FC) on informational signs will have a lower likely to purchase rating. We hypothesize this may be a result of confusion or unfamiliarity with the terminology depicted on the sign.

H2a: Participants who spend over 25% of their weekly budget on organic products and produce will spend the most time (TVD) looking at the plant information signs for the vegetables and herbs.

H2b: Participants who spent over 25% of their weekly budget on organic products and produce, will have a lower TFF and TVD but higher FC to an optimum point and their likeliness to buy will increase.

H3a: Participants that have > 0 children in their household will spend more time looking at (TVD) the informational sign describing growing practices of vegetables and herb transplants.

H3b: Participants who have no children in their household will be less likely to purchase sustainably grown vegetables and herbs.

Methods

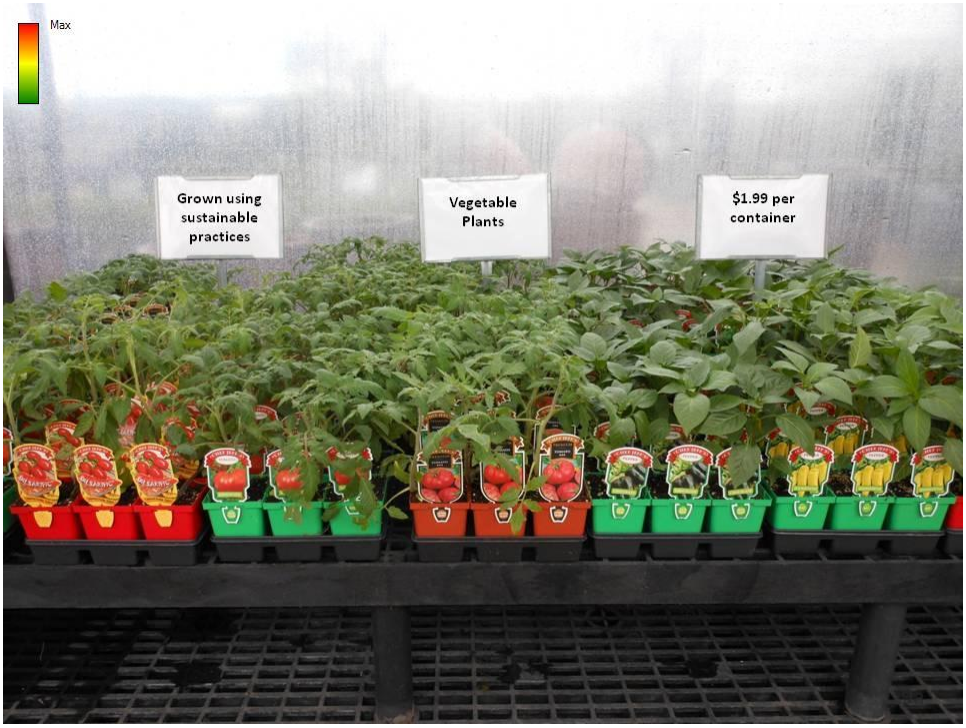
To test these hypotheses, our study consisted of two parts: a written survey and an eye-tracking portion. The written survey was completed in two sections. The first section consisted demographic questions including age, income, education level, and number of adults/children in the household. The second section was composed of 4 different parts. One part was comprised of personal behavior questions (e.g. "I consider how things might be in the future, and try to influence those things with my day to day behavior") answered using a 7 point Likert scale with 1= extremely uncharacteristic and 7 = extremely characteristic. The next two parts focused on current and past purchases of horticultural products. The final part covered basic purchasing behavior (e.g. "How often do you buy locally-grown fresh produce when locally-grown options are available?") and questions were answered using a 7 point Likert scale with 1=extremely uncharacteristic and 7= extremely characteristic.

Displays

Single level horizontal displays were created from each of two types of annual plants (vegetables and herbs). Pictures were taken of each display with three blank signs; one

sign on the right, middle and left (Figure 7). Images of plant displays were created and taken in Dallas, TX, in March 2012.

Figure 7. Retail garden display of vegetable transplants with signs



In each display three signs were visible using the same fixture type, same size, and type font and size. Initially all signs were blank but were digitally altered to convey plant identification, price, and production practice. The signs were at equal levels and in consistent positions through the displays. The price and identifications signs were rotated between the two end spots and the identification sign was always in the middle. For each category of plants there were three different price points. The vegetable and herb transplants were priced at $1.99, $2.49, or $2.99. For the vegetables and herbs, the price was on the right side of the display. The third sign indicated how the plant was grown: using either conventional practices, grown using energy saving practices, grown using

water saving practices, or sustainably grown. This sign was always left side of the display for the vegetables and herbs plants.

Once sign text was digitally added to the, images in PowerPoint, they were uploaded into the Tobii software, version 3.0.2.218, to create an eye-tracking test. The 16 images for each plant type were randomized between data collection sites. For each image, the participant was asked to give a verbal rating for likeliness to buy on a Likert scale from 1 to 10. Once the rating was given the researcher or assistant would advance to the next image in the test.

The eye-tracking portion consisted of participants viewing a series of 32 images of plant displays on a desktop computer monitor. During this each participant's eye movements were tracked and recorded by the eye-tracking device.

Data Collection Sites

Six different locations were chosen for data collection: College Station TX, April 27 and 28, 2012; Apopka, Florida, May 4 and 5, 2012; Ontario, Canada, May 10, 11, and 12, 2012; East Lansing, MI, May 18 and 19, 2012; Columbia City, IN, May 24 and 25, 2012; and Minneapolis, MN, June 28, 29, and 30, 2012. Participants were recruited at each data location by different methods including use of a list serve from previous studies, Craigslist advertisement, colleagues and cohorts, or email blast through the academic colleges. Each location recruited at least 50 different participants. Participants were scheduled at 15-minute intervals over a two to three day span.

Data Collection

When participants were introduced to the study, the eye-tracking equipment was briefly explained and the participant signed an IRB approved consent form (IRB #11-404). Participants were compensated $25 cash. Each participant was instructed to complete the first page of the survey (demographic information) then they were taken to the computer monitor where the eye-tracking portion of the study was conducted.

The Tobii Eye-Tracker Lite was used for the study, which, was attached to a LG Flatron 56 cm monitor and Toshiba laptop. Each participant was calibrated to an acceptable level (Behe et al., 2013). Every participant was asked to remain as still as possible for the eye-tracking portion. An introduction and instruction slide was shown and read at the beginning of each visual data collection test. One practice image was shown to familiarize participants with the study flow. Participants gave their ratings verbally, to decrease body movement and to standardize each participant's viewing experience.

After all data was collected, four specific areas of interest were drawn on each image, which included the three signs and the entire foliage and flowering portion of the display. AOIs were drawn on images that were identical areas in size and copied to each image (Fig 2).

Data Analysis

Data analysis was conducted using SAS 17.2 (Cary, NC) and SPSS Statistics Version 19 (Armonk, New York). A paired mean comparison GLMMIX procedure was run in SAS and a paired t-test was run in SPSS Statistics.

The four visual measures of interest extracted for each AOI were TFF, FFD, TVD, and FC. TFF measured what initially caught the participants' attention and the order in which their attention was captured. FFD showed how long their attention was kept at the first glance. FC showed how often they visually returned to an AOI. TVD indicated how long a participant spent looking a particular AOI and was the product of FC x FD. We exported these four measures and added the written survey information data first into Microsoft Excel Version 14.3.4 and then SAS version 9.3 and SPSS Statistics version 19.

Results

A total of 344 participants completed the survey. Of these, there were 307 usable responses. Participants were omitted from the study if ETT calibration was unsuccessful. Some reasons for incorrect calibration were light colored eyes, saggy eyelids, or corrective lenses including transitional, bifocal, or trifocal lenses. From the six different locations there were 46 (14.9%) participants from Florida, 41 (13.3%) participants from Indiana, 66 (21.4%) participants from Michigan, 47 (15%) participants from Minnesota, 58 (18.8%) participants form Ontario, Canada, and 51 (16.6%) participants from Texas. The majority of participants were female (72.3%). Participants' ages ranged from 20 to 91 years old, with a mean age of 49 years. One third of participants were college educated (34.4%) and 58.3% of participants lived in a suburban region. Participants were 90.2% Caucasian. The mode for income fell in the category of $70,000 (19.5%) and $90,000 (18.9%). A majority of participants, 62.5%, had one other adult living in their household and a majority, 69.7%, also had no children, 18 years or younger, living in their household.

Hypothesis 1 poised that participants who never purchased organic vegetables, herbs, or produce in the year prior to the study will spend less time viewing (FC, TVD) informational signs which display the method of plant production (e.g. sustainably-grown, conventional, grown using water-conserving practices) compared to participants who have purchased this merchandise. To test hypothesis 1, we first divided subjects into four categories based on the amount of their weekly food budget spent on organic products (omitting the 7 participants who did not know how much they spent on organic products). We then compared the mean likeness to buy (LTB) rating, TVD, TFF, FFD, and FC for each group when they viewed displays with herbs and (separately) vegetables with an informational sign that said, "grown under sustainable practices". When we compared the four groups on LTB, TVD, TFF, and FC we found no differences. This means that all the groups expressed a similar likeliness to buy the plants and spent the same amount of time viewing the production sign. All of the groups took the same time to reach the production sign, and all the groups returned to the production sign the same number of times. However, we found a difference in comparing the four groups on FFD (Table 5). Participants who spent 0% of their budget on organic products had a 2.5x lower FFD compared to participants who spent 76% to 99% of their budget on organic produce. This means that participants who purchased no organic products found the sign as fast as other groups but did not utilize that visual cue as long as the other groups. This relates back to Olson's cue utilization model and the participants ability to use both confidence and predictive values. The participants that did not purchase organic products may not have had as strong of a

confidence value in the sign (or cue) that was provided. This partially supports hypothesis 1.

Table 4. Mean likeness to buy (LTB), total visit duration (TVD), time to first fixation (TFF), first fixation duration (FFD), and fixation count (FC) by response to percentage of weekly budget spent on organic products for only the sustainably grown sign AOIs of vegetables and herbs

Self-reported amount of weekly budget spent on organic products	n	Mean LTB (Std Dev)	Mean TVD (Std Dev)	TFF Mean (Std Dev)	FFD Mean (Std Dev)	FC Mean (Std Dev)
0%	47	6.02 (2.98)	0.65 (0.91)	1.81 (2.82)	0.29 (0.20)	1.83 (2.36)
1% to 25%	181	6.77 (2.24)	0.69 (0.89)	1.30 (1.50)	0.33 (0.26)	2.02 (2.38)
26% to 50%	72	6.85 (2.11)	0.81 (1.81)	1.19 (1.09)	0.38 (0.32)	2.11 (2.38)
51% to 75%	12	6.70 (2.65)	0.93 (0.99)	1.44 (1.35)	0.34 (0.23)	2.67 (2.31)
76% to 99%	7	7.70 (2.41)	1.22 (0.73)	0.94 (1.19)	0.72 (0.71)	1.80 (0.79)
100%	1	9.00 (0.00)	0.65 (0.33)	1.02 (0.84)	0.51 (0.48)	2.00 (0.00)
Do not know	7	6.53 (2.91)	0.53 (0.78)	2.11 (2.23)	0.51 (0.48)	1.27 (1.87)

Table 5. Comparison of first fixation duration (FFD) times between different responses of weekly budget spent of organic products for only the sustainably grown sign AOIs of vegetables and herbs

Comparison	FFD p-value
0% and 76% to 99%	0.0004
1% to 25% and 76% to 99%	0.0007
26% to 50% and 76% to 99%	0.0100
51% to 75% and 76% to 99%	0.0094

Analysis performed with SAS Version 9.3 Mean comparison GLIMMIX Procedure where $p < .05$

Hypothesis 2 stated that participants who spend over 25% of their weekly budget on organic products and produce will spend the most time (TVD) looking at the plant information signs for the vegetables and herbs. Table 6 shows the mean LTB, TVD, TFF, FFD, and FC of participants when they viewed informational sign stating the vegetable and herb transplants were grown under sustainable practices based on their weekly purchases of organic produce. When these mean values were compared no differences were found. This shows that all different categories of participants had similar visual interest in the visual cues, regardless of the amount they spent on organic products. This relates back to Olson's model of cue utilization by indicating that the cues that were presented to the participants may not have been strong enough. There could have been confusion on the wording of the signs making it hard for the participants to understand the meanings of the sign. This would have an impact on the confidence value of the participants and their decision-making. All of the participants may have looked at the signage the same regardless of purchasing behavior because there was not a clear message in the signage. The results of table three do not confirm hypothesis H2 a and b.

Table 6. Mean likeness to buy (LTB), total visit duration (TVD), time to first fixation (TFF), first fixation duration (FFD), and fixation count (FC) by response to percentage of weekly budget spent on organic produce for only the sustainably grown sign of vegetables and herbs

Weekly budget spent on organic produce	n	Mean LTB (Std Dev)	Mean TVD (Std Dev)	TFF Mean (Std Dev)	FFD Mean (Std Dev)	FC Mean (Std Dev)
0%	47	5.96 (2.91)	0.69 (0.89)	1.94 (2.86)	0.34 (0.26)	1.89 (2.28)
1% to 25%	181	6.78 (2.21)	0.68 (0.88)	1.27 (1.47)	0.33 (0.28)	1.99 (2.37)
26% to 50%	72	6.76 (2.44)	0.79 (1.12)	1.22 (1.03)	0.39 (0.37)	2.02 (2.38)
51% to 75%	12	6.25 (2.05)	0.69 (0.87)	1.67 (1.57)	0.39 (0.23)	1.83 (2.08)
76% to 99%	7	7.36 (2.13)	0.94 (0.74)	0.99 (1.12)	0.36 (0.26)	2.57 (2.50)
100%	1	9.00 (0.00)	0.65 (0.33)	1.02 (0.84)	0.44 (0.34)	2.00 (0.00)
Do not know	7	8.00 (2.54)	1.11 (0.96)	1.55 (1.82)	0.43 (0.38)	2.36 (2.13)

No differences found when GLIMMIX Procedure was run with a minimum p-level of .05 in SAS Version 17.2

Table 7 shows mean LTB, TVD, TFF, FFD, and FC when viewing the information sign showing “grown conventionally" by their response to the percentage of their weekly budget spent on organic products. Mean LTB, TFF, and FC were similar across all groups. All groups similarly liked the plants on display, first viewed the sign similarly, and gazed at (FC) the sign similarly. However, we did find differences among the groups with regard to TVD and FFD (Table 8). When we compared mean TVD for the group that spent 76% to 99% of their weekly budget on organic products to all other groups we observed that they had the longest TVD. They spent 3.5x longer thinking about the sign compared to

participants who spent 0% of their budgets on organic products. All other participants had much shorter mean TVD compared to the group who spent 76% to 99% of their weekly budget on organic products. When comparing participants who fall into the 4 different categories below the 76% to 99% budget they all have similar TVD habits. No other differences were found between categories of participants.

Table 7. Mean likeness to buy (LTB), total visit duration (TVD), time to first fixation (TFF), first fixation duration (FFD), and fixation count (FC) by response to percentage of weekly budget spent on organic products for only the conventionally grown sign of vegetables and herbs

Weekly budget spent on organic produce	n	Mean LTB (Std Dev)	Mean TVD (Std Dev)	TFF Mean (Std Dev)	FFD Mean (Std Dev)	FC Mean (Std Dev)
0%	47	6.01 (2.95)	0.67 (0.81)	0.97 (1.08)	0.35 (0.32)	1.86 (1.99)
1% to 25%	181	6.49 (2.24)	0.68 (0.84)	1.15 (1.36)	0.37 (0.29)	1.91 (2.15)
26% to 50%	72	6.51 (2.00)	0.75 (0.89)	1.06 (1.66)	0.43 (0.41)	1.86 (2.09)
51% to 75%	12	5.73 (2.64)	0.86 (0.80)	0.61 (0.56)	0.38 (0.28)	2.37 (2.09)
76% to 99%	7	7.00 (2.05)	2.33 (2.89)	0.74 (0.36)	0.77 (1.01)	3.80 (2.39)
100%	1	8.50 (0.71)	1.37 (0.41)	0.22 (0.31)	0.37 (0.19)	3.00 (0.00)
Do not know	7	6.50 (2.97)	0.53 (0.73)	0.83 (0.57)	0.31 (0.17)	1.47 (1.98)

Table 8. Comparison of total visit duration (TVD) and first fixation duration (FFD) times between different responses of weekly budget spent of organic products for only the conventionally grown sign AOIs of vegetables and herb

Comparison	TVD p-value	FFD p-value
0% and 76% to 99%	<.0001	0.0078
1% to 25% and 76% to 99%	<.0001	0.0072
26% to 50% and 76% to 99%	<.0001	0.0521
51% to 75% and 76% to 99%	0.0002	0.0488
76% to 99% and Do not know	<.0001	0.0176

Run using SAS version 17.2 Mean comparison GLIMMIX Procedure where p <.05

We saw a similar pattern for participants who viewed the "conventionally grown" sign and their FFD when viewing the vegetable and herb transplants. Again, we saw that the participants in the category of spending 76% to 99% on organic products had the longest FFD compared to the other groups. The four groups of participants, 0%, 1% to 25%, 26% to 50% and 51% to 75%, have FFDs that are relatively close in duration. The shortest is the 0% participants and their FFD is slightly more than half the time of the 76% to 99%. The differences that show up with the sign that states the plants are "conventionally grown" compared having no differences found when the sign states the plants are "sustainably grown" could be because of word familiarity and the possible understanding of that word. These all tie to the usage of each participants confidence and predictive values.

The mean LTB and viewing habits of participants who had no children and participants who had at least one child are shown in Table 9. These mean visual values are from when the participants were viewing the grow sign that included the wording "grown under sustainably practices". The results of a t-test comparing LTB, TVD, TFF, and FFD are shown

in Table 10. Like when comparing weekly budget expenses with relation to viewing habits there is a difference in participants who have no children and participants who have at least one for FFD. Here participants who have children have a shorter FFD than participants who do not have children. The p-value of TVD is relatively close to being significant on a significance level of <.05. The difference in TVD between participants with children compared to those with no children shows that participants who had children spent more total time viewing the sign than participants who had no children. There is a 20% difference in time between the two categories of participants.

Table 9. Mean likeliness to buy (LTB), total visit duration (TVD), time to first fixation (TFF), and first fixation duration (FFD) of participants with no children and participants with one or more children for sustainable grown sign AOI of vegetables and herbs

Number of children	Mean LTB (SD)	Mean TVD (SD)	Mean TFF (SD)	Mean FFD (SD)
0	6.88 (2.23)	0.58 (0.06)	1.53 (0.17)	0.43 (0.04)
≥ 1	6.87 (2.14)	0.72 (0.06)	1.44 (0.29)	0.31 (0.03)

Table 10. Paired mean t-test of likeliness to buy (LTB), total visit duration (TVD), time to first fixation (TFF), and first fixation duration (FFD) of participants with no children and participants with one or more children for sustainable grown sign AOI of vegetables and herbs

Comparison	p-value
LTB of participants with no children to LTB of participants with children	.982
TVD of participants with 0 children to TVD of participants with children	**.085**
TFF of participants with no children to TFF of participants with children	.776
FFD of participants with no children to FFD of participants with children	**0.026**

Paired t-test run using SPSS Statistics Version 19

Conclusions and Discussion

Based on H1 and H2 there does not seem to be strong support for participants' viewing behavior correlating with their organic product purchases. FFD does seem show some signs of differences but the other viewing metrics do not seem to show any differences. The participants in the 76% to 99% seem to be the most aware of the signage when looking at their FFD. This group seem to carry an interest in sustainable products but may not fully be convinced on the product or if they should purchase it. They are not 100% committed to purchasing organic products but they are still highly invested in it.

When comparing the sustainable signs to the conventional signs there are more notable differences with the conventional signage. This could be because the wording is not as

familiar and the participants have to spend more time concentrating on the wording and what the terminology means. This would follow with findings found by Lenzner et al. (2000) where more complex words cause more visual activity because of confusing rather than interest and understanding. This confusion could be the same for the word sustainable. Participants who did not spend long periods of time or had shorter FFD could be this way because they are not familiar with the term or it does not have a strong value to them.

There does not seem to be a large difference between participants with children compared to those without children. The difference between FFD does show that participants with children may be slightly more sensitive to the signage at first than those without. This could be linked to the previous literature found related to household purchases of organic products with children under 18. Parents who had children were more likely to purchase organic produce than those who did not have children (Huang, 1996 and Thompson and Kidwell, 1998). The TVD could also be sign of this difference between the two categories. There is no strong difference in relation to the actual purchasing behavior of the two groups, which means that H3 cannot be fully supported.

This study's results shows the importance of looking further into signage related to edible produce. There are signs that there may be more that needs to be looked into but that the experiment may need to be set up in a more specific way. This study has a strong limitation that it does not focus just on edible produce. During the study participants were asked about all type of horticulture products and were shown images of several different plant

types. This could have diluted the results because the participants were not focused on one area. To improve on this it may be helpful to run study that just focuses on edible produce and have a corresponding survey that has scaled questions relating to organic or sustainable purchases.

This study does not come without implications to marketers and retailers though. It is important for marketers and garden center retailers to note that the signage did seem to draw attention by the participants. This shows the importance of having appropriate signage that caters to the customer. In another similar study Jones et al. (2013) found that specific wording seems to make an impact on participants visual activity in relation to water saving practices. This could also be applicable for sustainably or organically grown edibles. Consumers may pay more attention to signs that give more exact information on how a plant is grown or specifically how it achieves sustainable or organic. Marketers and retailers should create signs and POP that focus on specific aspects such as herbicide free or grown under natural fertilizers.

LITERATURE CITED

LITERATURE CITIED

Behe, B., and S. Barton, 2000. Consumer Perceptions of Product and Service Quality. J. Environmental Hort. 18(2): 71–78.

Behe, Bridget K., R.T. Fernandez, P. Huddleston, S. Minahan, K. Getter, L. Sage and A. Jones. 2013 (accepted). Practical Field Use of Eye Tracking Devices for Consumer Research in the Retail Environment. HortTechnology.

Brklacichi, M., & Bryant, C. R. 1991. Review and Appraisal of Concept of Sustainable Food Production Systems *. Environmental Management, 15(1): 1–14.

Campbell, B., B.K. Behe, H. Khachatryan, C. Hall, and J.H. Dennis. 2013 (in review). Consumer Perceptions and Misperceptions of Ecofriendly and Sustainable Terms. Ag. And Resource Economics Review.

Chandon, P., Hutchinson, J. W., Bradlow, E. T., & Young, S. H. 2009. Does In-Store Marketing Work? Effects of the Number and Position of Shelf Facings on Brand Attention and Evaluation at the Point of Purchase. Journal of Marketing, 73(6): 1–17.

Cox, D.F. 1962. The Measurement of Information value: A study in consumer decision making, p 413-421. In: W.S. Decker, Emerging concepts in Marketing. Chicago: American Marketing Association.

Dodds, W. B., Monroe, K. B., & Grewal, D. 1991. Effects of Price, Brand, and Store Information on Buyers' Product Evaluations. J. of Marketing Res., 28(3): 307-319.

Huang, C. L. (1996). Consumer preferences and attitudes towards organically grown produce. European Review of Agricultural Economics, 23(1996), 331–342.

Laroche, M., Bergeron, J., & Barbaro-Forleo, G. 2001. Targeting consumers who are willing to pay more for environmentally friendly products. Journal of Consumer Marketing, 18(6): 503–520.

Lenzner, T., Kaczmirek, L., & Galesic, M. 2011. Seeing Through the Eyes of the Respondent: An Eye-tracking Study on Survey Question Comprehension. International Journal of Public Opinion Research, 23(3): 361–373.

Maughan, L., Gutnikov, S., & Stevens, R. 2007. Like more, look more. Look more, like more: The evidence from eye-tracking. Journal of Brand Management, 14(4): 335–342.

National Drought Mitigation Center. 2013. Drought Monitor Archives for 2010, 2011, & 2012. National Drought Mitigation Center, Lincoln, NE.

Olson, J. C. 1972. Cue Utilization in the Quality Perception Process: A cognitive model and an empirical test. Purdue University, West Lafayette, PhD Diss

Olson, J. C. 1978. Inferential Belief Formation in the Cue Utilization Process. Advances in Consumer Research, 5: 706–713.

Pieters, R., & Wedel, M. 2004. Attention Capture and Transfer in Advertising: Brand, Pictoral, and Text-Size Effects. Journal of Marketing, 68(2): 36–50.

Pieters, R., Wedel, M., & Zhang, J. 2007. Optimal Feature Advertising Designing Under Competitive Clutter. Management Science, 53(11): 1815–1828.

Reicks, M., Splett, P., & Fishman, A. 1997. Shelf Labeling of Organic Foods: Effects on Customer Perceptions and Sales.

Stahlberg, M. and V. Malia. 2010. Shopper Marketing: How to Increase Purchase Decisions at the Point of Sale. Kogan Page Limited, London, UK.

Thompson, G. D., & Kidwell, J. 1998. Explaining the Choice of Organic Produce: Cosmetic Defects, Prices, and Consumer Preferences. American Journal of Agricultural Economics, 80(2), 277–287.

Wedel, M., & Pieters, R. 2000. Eye Fixation on Advertisments and Memory for Brands: A Model and Findings. Marketing Science, 19(4): 297–312.

Yue, C., Dennis, J. H., Behe, B. K., Hall, C. R., Campbell, B. L., & Lopez, R. G. 2011. Investigating Consumer Preference for Organic , Local , or Sustainable Plants, 46(4): 610–615.

CHAPTER 5

CONCLUSIONS

The data collected during this experiment was separated out into two different projects with one focusing on the viewing habits of participants related to water conservation and the second project focused on sustainably grown edibles and participants' viewing habits that might related to that. Each project worked from the same data set but different information was extracted.

The results from the first project showed many strong relationships. Key areas of interest were between participants who may have a high affinity to conserve water and their viewing habits compared to participants who were not likely to conserve water and their viewing habit. Along with this comparison it was also of interest if there was a notable difference between participants from locations that experience drought compared to those who had not experience heavy drought conditions.

There proved to be a difference in viewing behavior and likeliness to buy for participants who were more likely to conserve water. The viewing data tend to behave in a quadratic relation. People who seemed to be the surest of their response to the survey question also seemed to have the shortest times on multiple viewing habits. This could be because of a relationship between familiarity with a term and viewing time. Participants who were possibly more familiar with the water conservation terminology may take less viewing time because they are able to understand and process it quicker than those who are not familiar with the terminology. Similar findings were observed when comparing

participants between drought exposure locations. Participants who are known to have more exposure to drought conditions seem to be more sensitive to the water conservation terminology because of the decreased time spent on signage containing water information. A quadratic relationship was also shown here with participants who had not been exposed to harsh drought conditions have longer viewing times possibly related to lack of familiarity with the terminology.

The results from the second project showed some significant findings but the results were not as strong as the first project. The key areas of interest with this project were the relationships between consumers' purchases of organic products and how this would affect their viewing behavior. All participants were looked at and broken down into groups based on their response to past purchasing behaviors. There was also an additional examination of the differences between participants who had children and those who had no children and if this made an impact on their viewing behavior.

The strongest viewing metric for this project was first fixation duration (FFD). It was with this metric that significant differences were found between comparing participants who are likely to buy organic products and their viewing habits on the grow sign containing the word sustainable. This metric tells us that participants who spent more of their weekly budget on organic products had a shorter FFD. This could be because they recognized the signage quicker and possibly understood it faster because they buy more organic products during the week. This difference was also found to be true when comparing participants who had children to those who had none. The participants who had children had a shorter

FFD maybe also showing that these participants are more familiar with the signs because they are purchasing for children.

The overall experiment drew interesting conclusions from both projects. A challenge of the experiment is that the survey was not specifically design for either project. This caused issues with the broadness of questions that were asked on the survey. If the questions could have been more tailored towards very specific water conservation practices and more specific purchasing behaviors towards organic products and produce participants may have been more geared in the right direction or better data may have been able to be drawn. It might also have been helpful to focus the images one particular plant product instead of showing participants a wide variety of images. This concentration would keep participants minds focused and possibly help keep viewing results consistent. For this experiment being one of the first of its kind using eye-tracking technology in such a unique product such as horticulture the results told an interesting study that offer insight to consumer behaviors and provide opportunity for future research of this kind.