Caught You Looking--What Captures Consumers' Attention When They Buy Ornamental and Food-Producing Plants?
FY 2011

New technology enables consumer researchers to literally see what consumers are looking at during real or computer-simulated shopping experiences. A 2009 FSMIP study showed that consumer demand for plastic and alternative material plant containers was heterogeneous and a 2011 FSMIP study investigated more holistic ornamental and food producing plant preferences. The objective of this study is to build on the prior work to determine the images and text that consumers view first and view longer when looking at a display of ornamental (woody and herbaceous) and food-producing (herb and vegetable) plants. Researchers will also identify how images and words are related to purchase intentions by tracking participant eye movements and relating that to their desire to make a purchase of some of the displayed plants.

It is expected that different market segments will emerge, depending upon the intended use of the plant (ornamental versus food-production), how the information is presented in the display, as well as consumer attitudes, behaviors, and demographic characteristics. The outcomes of the study will be profiles and descriptions of consumer segments. These profiles will be useful to production, wholesale, and retail businesses, as well as allied supply firms, to better understand consumer preferences and serve their current and future customers.

FINAL REPORT

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Caught You Looking! What Captures Consumers' Attention When They Buy Ornamental and Food-Producing Plants?

Final Report

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Work Plan

Objective A: To test stimuli (static images of plant displays) to determine what aspects of point-of-purchase stimuli lead to purchases of ornamental and food-producing transplants. Our hypothesis was that some information (e.g. plant production method, container, plant growing conditions) would be more attractive (literally eye-catching) to some customers and for certain types of plants. For example, production method may matter more for the consideration of food-producing plants (e.g. herbs and vegetables) but not for ornamental plants. Or, some consumers may focus on container type, regardless of the kind of plant (edible or ornamental) being purchased. We used input from the 2011 FSMIP study on preferences for production method (conventional, sustainable, or organic) and origin (local, regional, national, or imported) to develop display plans.

The team discussed the development of instruments, data collection, data analysis, and publication writing in twice-monthly conference calls. These calls were hosted by Dr. Charlie Hall using his license of Go-to-Meeting software. The team has been meeting at least twice monthly since 2010 to prepare, revise, and submit peer-reviewed publications from this and a prior FSMIP-funded study. We continue to meet as we develop manuscripts and conduct analyses on the data collected with these funds.

Dr. Hayk Khachatryan joined the team (even though funding for his participation was not part of the proposal). He identified separate funds which were used to collect data from Florida participants. Dr. Roberto Lopez has withdrawn from this project due to an over commitment of his time. Dr. Campbell is no longer at the Vineland Research Center but now is at the University of Connecticut. Dr. Behe brought an M.S. student, Allison Jones, onto the project. Her funding comes from a matching grant through MSU called Project GREEEN (with 3 e's). Allison's assistantship duties focused on data collection and some analysis and she is in the process of writing her thesis. Additionally, Dr. Behe hired Lynne Sage as a part-time technician. Lynne is funded from Project GREEEN and other funds. The group did not anticipate the substantial amount of time needed to extract and manipulate the eye-tracking data. Lynne has invested approximately 500 hours on the project, funded outside the FSMIP grant.

Researchers met at Michigan State University on November 17 and 18, 2011, to learn how to use the eye-tracking hardware. The training was conducted by Ian Christiansen, a representative of Tobii. The team learned how to operate the desktop model of the Tobii eye-tracking system and use some of the software in analysis. We spent the afternoon and into the evening discussing how to achieve data collection, tactically.

Figure 1. Tobii X1 Light Eye Tracking Device (seen mounted below computer monitor).

In February, 2012, Tobii introduced a new piece of hardware called the X1 Light (Figure 1). This more portable device cost $20,000 to purchase and use (software site license) for up to a year. The renewal of the software is $3500. Dr. Behe had some funds which could be used to purchase the device (rather than rent it for $4000 per month). The X1 Light was bought in February and used in a pilot study on the MSU campus on

February 16, 2012. This enabled the team to have a longer time period in which to collect data and greatly reduced the transportation issues. The original desktop unit was 24 cubic feet and weighed over 80 pounds. The X1 Light device measures 8” x 2” x 2” and weighs less than 2 pounds. The device is tethered to one laptop, since the software cannot be added at no-cost to other laptop devices. Due to the tie between the laptop, data-collection, and the Tobii device, one MSU researcher was needed to personally transport the equipment and assist with data collection. Since the fall of 2012, Drs. Ben Campbell and Hayk Khachatrayn have purchased identical Tobii eye-tracking units. This will permit the group to collect data faster and from our geographically dispersed locations. Those investments would most likely not have taken place without this grant.

Dr. Ben Campbell generated the conjoint plans (Appendix A). The conjoint design was 4 (plant types) x 4 (production practices) x 3 (prices). Three different plants (petunia { (Petunia × hybrida)}, mixed herbs, and assorted vegetable transplants were all in 16cm containers and were selected to represent transplants that were (a) food-producing, (b) edible, and (c) ornamental plants. Our goal in selecting three different types of plants was not to identify specific preferences for the plants shown but to better understand if preference varied by plant type. Three realistic price points in equal increments ($1.99, $2.49, and $2.99/plant) for a four-inch container with a transplant of each plant type were created. These price points were identified through a discussion among the researchers of the posted retail price of four-inch containers in the markets visited by and represented by the team of research investigators during spring, 2011. We photographed the plants with blank signs. Using Photoshop, we added information that the container was produced using one of four production practices (without additional explanations provided): conventional, water-saving, energy-saving, or sustainable as Behe et al. (2013b) did.

On March 20, 2012, team members met in Dallas, TX, to construct and photograph displays. Dr. Charlie Hall gained the cooperation of Calloway’s Nursery (http://www.calloways.com/) where we spent the morning photographing displays with blank signs (Figure 2). We developed displays as per the conjoint plan outlined above. We used Calloway’s fixtures and blank signs. This site visit permitted the interaction of the entire group for the construction and photographing of the images.

Figure 2. One display (vegetables) with blank signs.

After constructing displays and photographing them, we met in the afternoon and into the evening to learn how to use the X1 Light device, set it up, collect data, and trouble shoot. We also practiced data collection on each other, so as to improve our efficiency when real data collection time is imminent. We developed a schedule for data collection (Table 1). Our data collection protocol, consent form, and survey (Appendix C) were approved by Michigan State University IRB (lead) office and team members had identical instruments approved by their respective IRB offices.

Figure 3. Example image of herbs shown to study participants. Notice the three signs carry unique information about production (left) identification (center) and price (right).

Subjects were recruited to the study by various means (Craig's List, newspaper advertisements, and flyers posted proximate to the study locations) in six North American university or research center venues including Apopka, FL; College Station, TX; West Lafayette, IN; East Lansing, MI, St. Paul, MN, and Vineland, Ontario, Canada. After being informed about the study purpose and signing the consent form, subjects completed the demographic portion of the survey questionnaire. They were subsequently seated at the Tobii X1 Light eye-tracking device and their eye movements were calibrated to the equipment. Subjects viewed a sample display to become familiar with the study protocol. Verbal ratings on a 1 (not at all likely to buy) to 10 (very likely to buy) Likert scale were used. Subjects were encouraged to sit as still as possible during this portion of the study. Images were randomly presented to the study participants. After viewing 32 images, they completed supplemental questions with regard to the past plant purchases and other attitudinal and behavioral data.

Table 1. Data collection schedule, researchers involved in that data collection and sample size collected at each location.

Site of Data Collection	Data Collection Personnel	Dates	Sample size (n)
University of Florida	Hayk Khachatryan and Bridget Behe	May 4-5	51
Texas A&M University	Charlie Hall and Allison Jones	April 27-28	67
Purdue University	Jennifer Dennis and Bridget Behe	May 24-25	47
Vineland Research Centre	Ben Campbell and Allison Jones	May 10-11	89
Michigan State University	Bridget Behe and Allison Jones	June 14-15	72
University of Minnesota	Chengyan Yue and Allison Jones	June 29-30	52

Data Analysis

Tobii Studio-3.0.2.218 (Tobii) provided the basis to apply areas of interest (AOI's) and for visual metric calculation. Close fitting areas of interest (AOI) were drawn using the Tobii rectangle tool for the signs and the polygon tool for the foliage (Figure 4). An AOI is a section of the image that the researcher chooses to analyze. One image of each of the five plant types (fresh herbs,

Figure 4. Example of areas of interest (AOIs) for the three signs and the plant merchandise.

annual /petunia, vegetable seedlings, woody perennials, and woody shrubs) was used to draw four areas of interest (AOI's), one around each of the three signs and one around the foliage display. The AOI's were drawn to fit each image closely and labeled. To maintain consistency in AOI size and position between similar images, the AOI drawings were copied and pasted in place over each similar image in the test. The four metrics, Time to First Fixation (TFF), First Fixation Duration (FFD), Total Visit Duration (TVD)(all three measured in seconds to the millisecond) and Fixation Count (FC) (as a count), were calculated by the Tobii Studio Statistics tool. The output table of the participant values was exported to a .txt file which in turn was opened in Microsoft Excel 2007 and transformed from multiple columns per metric to a manageable single column per metric.

Time to first fixation (TTFF) is a metric indicating what element in the image captured attention first, so lower times indicate an element that commanded attention. Since the merchandise (plant) area was larger than any of the three equally sized signs. Thus, H_1 stated that TTFF on plants will be lowest among the four AOIs because it is the largest in size. However, Ataly et al.

(2012) demonstrated that the visual gaze would be more often central, regardless of horizontal or vertical presentation of the products. Thus, H_2 stated that the centrally located plant identification sign will have the lowest TTFF among the three signs. Total Visit Duration (TVD) is calculated by multiplying the fixation count (FC) on an AOI by the fixation duration (FD). The measure combines, per individual, glances multiplied by the length of the glance, so higher values indicate longer dwelling time and infer more cognition or thought. If area size were the sole predictor of thought then a larger AOI would command more thought. Simpler messages, such as a price, conveyed in five or six characters for example $2.99, should be captured faster than more complex messages such as product quality. Thus, H_3 , H_4, and H_5 stated that TVDprice < TVDplant identification sign < TVDproduction sign < TVDplants.

Results

Of the 378 participants, 330 had complete surveys and useful visual data. Not all participants completed all questions, nor were the researchers able to calibrate all individuals even after three successive attempts. As per Institutional Review Board requirements, we compensated all individuals, even those who did not complete the survey nor were able to be calibrated. Analyses were conducted on the 330 complete observations.

The data analysis for the conjoint portion of the study showed that the model was significant with R^2=0.76. This meant we explained ~76% of the variance in preference with the four variables (price, plant type, and production method). Because the variables were so effective in explaining the variability in likely to buy (LTB) rating, ee divided the sample into three groups. The groups were based on the attribute of the image on which they placed greater visual time or on which they focused. Of the 330 participants, 73% were categorized as merchandise (plant) focused, 10% as production method focused, and 16% were classified as price focused (Table 2).

In total, respondents placed half of the relative importance (RI) on the type of plant (or type of merchandise), 27% on production methods, and 23% on price. This was consistent with other findings where study participants ranked the RI of the plants highest (Hall et al., 2010 and Behe et al, 2013). However, the RI differed by segment. Members of the plant-focused segment placed 7% more RI on plants compared to the sample in total. Members of the production method segment placed 18% less RI on plant type, falling second to production method. For members of the price focused segment, RI of plant dropped 20% to second place whereas the RI of price increased 22% and ranked first.

Table 2. Conjoint analysis results for the total sample and by segment.

	Total	Plant-focused	Production method-focused [a]		Price-focused [a]	
Number	330	242	34		54	
Market share		73%	10%		16%	
Relative Importance (RI)						
Price	23%	19%	15%		45%	***
Production	27%	24%	53%	***	24%	
Plant type	50%	57%	32%	***	30%	***

Part-worth utilities						
Intercept	6.61	6.54	6.93		6.71	
Price						
1.99	-0.12	-0.15	0.10	***	-0.16	
2.49	0.30	0.17	0.17		1.00	***
2.99	-0.18	-0.02	-0.26	***	-0.84	***
Production label						
Conventional	-0.21	-0.06	-1.26	***	-0.22	**
Sustainable	0.04	0.00	0.29	***	0.07	
Energy-saving	0.07	0.01	0.52	***	0.06	
Water-saving	0.09	0.04	0.45	***	0.09	
Plant type						
Herb	0.05	0.04	0.38		-0.04	
Vegetable	-0.10	-0.13	-0.24		0.08	
Annual	0.05	0.09	-0.14		-0.04	
R squared	0.76	0.77	0.78		0.73	
Adj. R squared	0.73	0.74	0.75		0.69	

[a] T-tests were used to compare the relative importance and part-worth utilities associated the production and price segments to the main segment.
*, **, and *** represent significant differences at the 0.1, 0.05, and 0.01 levels.

In examining the part-worth utilities (PW), we observed that the moderately priced product ($2.49) was preferred over both lower and higher priced products. This was not consistent with prior studies. However, research has shown that consumers who are highly involved in a product category place less emphasis on the price cue than consumers who are less involved in the product category (Zaichkowsky 1988). Information on the production sign was substantially discounted for "conventional" production. This may have been due to no explanation of what "conventional" meant and many consumers may have felt uninformed as to conventional plant production practices. Modest price premiums ranging from four to nine cents were attributed to the non-conventional production practices listed (sustainable, energy-saving, and water-saving). The greatest price premium consumers were willing to pay was for water-saving production practices ($0.09), which was not consistent with the findings of Hall et al. (2010) where energy-saving production practices received the highest premium. This may indicate as shift in preference toward water-saving practices in light of more recent drought occurrences in areas where the data were collected.

Researchers also observed differences in price premiums consumers were willing to pay by segment. For example, the production-focused segment highly discounted conventional practices ($1.26) and was willing to pay more for the non-conventional practices. This segment was willing to pay a $0.52 premium for energy-saving practices, consistent with the findings of Hall et al. (2010). They were also willing to pay $.045 for water-saving practices, less for sustainable practices. While conventional production method was the least valued, those consumers in the production segment heavily discounted conventional production methods and placed substantial premiums on sustainable (7x), water-saving (5x), and energy-saving (7x) which was more consistent with prior findings. Interestingly, the price focused and plant focused segments were not willing to pay much more for the non-conventional practices.

Visual Data Analysis

Time to first fixation (TTFF) is a metric indicating what element in the image captured attention first, so lower times indicate elements that commanded attention. For the plant-focused segment, TTFF was fastest for plant and lower compared to TTFF on the plants for segments B and C, supporting H_1 (Table 3). However, this finding was not true for segments B and C. For the production-method focused segment, TTFF was lowest on the production sign, not on the plants or the central identification sign, not supporting H_1. Also for the price-focused segment, TTFF was lowest for production sign, supporting neither H_1 nor H_2.

Table 3. Time to first fixation (in seconds) by segment.

	Segment					
	Plant focused		Production method focused		Price focused	
			(seconds)			
Production sign	1.23	B	0.90	A,C	1.17	B
Plant ID sign	1.15	B,C	1.27	A,C	1.35	A,B
Plant material	0.79	B,C	1.21	A,C	1.36	A,B
Price sign	1.89	B,C	2.01	A,C	1.62	A,B

Note: A pair wise Kolmogorov Smirnov test was used to test for differences between the different segments. For example, a superscript of B,C in the "Plant focused" segment for the production sign indicates that 1.23 is significantly different at the 0.1 level or less compared to the "Production method" (0.90) and "Price" (1.17) segments.

TVD for each of the four AOIs appears in Table 4. Members of all three segments had the highest TVD on the plants, supporting H_5. Because the plant identification sign was centrally located on every slide, it should have had the most TVD given the central gaze theory. When comparing the TVD on each of the three signs, we saw that the TVD on the central sign (plant identification) was lower than the production sign for all three segments.

Table 4. Total visit duration (in seconds) by segment.

	Segment					
	Plant Type (A)		Production (B)		Price (C)	
			(seconds)			
Production sign	0.68	B,C	1.16	A,C	0.97	A,B
Plant ID sign	0.53	B,C	0.67	A,C	0.66	A,B
Plants	2.36	B,C	2.11	A,C	1.77	A,B
Price sign	0.43	B,C	0.63	A,C	0.89	A,B

Note: A pair wise Kolmogorov Smirnov test was used to test for

differences between the different segments. For example, a superscript of B,C in the "Plant Type" segment for the production sign indicates that 0.68 is significantly different at the 0.1 level or less compared to the "Production" (1.16) and "Price" (0.97) segments.

The group is still in the process of completing this data analysis, interpretation and writing of manuscripts. We expect these will be completed in 2013 and published late this year or early next year.

Contributions of Public or Private Agency Cooperators and Partners:

Calloway Nursery (TX): plant material, space for display creation/image taking
Tobii International: data collection problems/equipment issues
Master Tag (MI): paid for some of equipment training costs
Project GREEEN (MSU internal grant): graduate student assistantship for data anlaysis

Summary of Results, Conclusions, and Lessons Learned:

Eye-tracking hardware and software have tremendous learning curves. The team has developed new skills, in addition to the creation of new knowledge. Visual attention does depend on what is important to the consumer, as we discovered in connecting the conjoint analysis to the visual data. The project met its objectives, but we need more time to both analyze the data and prepare manuscripts. In terms of measurable results, our extensive literature search has uncovered no published studies that pertain to the holistic evaluation of displays. Most of the eye-tracking published studies pertain to the act of reading. To this end, the team has make a substantial contribution.

Current or future benefits to be derived from the project:

The team has a large data set from which we anticipate multiple manuscripts to be created and published. We strongly believe this investigation will be among the first studies published about visual activity on merchandised displays. Many retail outlets rely on impulse sales; this study will provide objective evidence about visual activity about merchandise on display that could be adapted for a wider variety of products (e.g. apparel, jewelry, etc.). Next steps will be to more fully analyze this data set before seeking additional grant funding to utilize the three eye-trackers the team has available.

Manuscripts in preparation:

Jones, Allison, Bridget K. Behe, R. Thomas Fernandez, and Patricia Huddleston.
Who uses sustainability sign cues for water usage?

Behe, Bridget K., Benjamin L. Campbell , Charles R. Hall , Hayk Khachatryan , and Jennifer H. Dennis. Can’t You Read the Sign? Eye Tracking Conjoint paper.

Khachatrayn, Hayk, Benjamin L. Campbell, Charles R. Hall, Bridget K. Behe, and Jennifer H. Dennis. The Relationship Between Current and Future Consequence Orientation and Visual Data.

Presentations Delivered:

Campbell, B.L., B. Behe, J. Dennis, C. Hall, H. Khachatryan, and C. Yue 2013. "What Really Captures Consumers' Eyes in the Retail Garden Center, Garden, and Landscape?" Perennial Plant Conference, University of Connecticut, Storrs, CT, March 21st. (Speaker) – about 50 attended

Campbell, B.L., B. Behe, J. Dennis, C. Hall, H. Khachatryan, and C. Yue 2013. "Applying Technology to Gauge Customer Marketing Preferences" Northern New England Nursery Conference, Portsmouth, NH, March 7th. (Speaker: Invited Presentation) – 24 participants, 20 white, 1 black, 3 American Indian

Campbell, B.L., B. Behe, J. Dennis, C. Hall, H. Khachatryan, and C. Yue. 2013. "Eye Tracking Technology: What Drives Consumer Purchasing of Plants." Connecticut Nursery and Landscape Association: Winter Symposium, Manchester, CT, Jan. 4th. (Speaker): about 50 attended

Campbell, B.L., B. Behe, J. Dennis, C. Hall, H. Khachatryan, and C. Yue. 2012. "Perception and Misperception of Local: A U.S. and Canadian Comparison." New York Produce Conference and Show, University of Connecticut, Dec. 5th. (Speaker): about 25 attended

Campbell, B.L. 2013. "Integrating New Technologies into Research: Exploring Eye Tracking Technology." Department of Agricultural and Resource Economics, University of Connecticut, Sept. 22nd. (Speaker)

Campbell, B.L., B. Behe, J. Dennis, C. Hall, H. Khachatryan, and C. Yue. 2012. "Perception and Misperception of Local: A U.S. and Canadian Comparison." Department of Allied Health Sciences, University of Connecticut, Dec. 3rd. (Speaker)

Campbell, B.L., B. Behe, J. Dennis, C. Hall, H. Khachatryan, and C. Yue. 2012. "Perception and Misperception of Local: A U.S. and Canadian Comparison." Department of Agricultural and Resource Economics, University of Connecticut, Sept. 7th. (Speaker)

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Appendix A

Conjoint design for herbs, vegetables, and annual plants

Card List

	Card ID	type	price	production
1	1	herb	p2	sustainable
2	2	herb	p1	water saving
3	3	annual	p1	sustainable
4	4	vegetable	p2	conventional
5	5	vegetable	p1	energy saving
6	6	annual	p3	sustainable
7	7	annual	p1	conventional
8	8	annual	p1	water saving
9	9	vegetable	p1	sustainable
10	10	annual	p2	energy saving
11	11	annual	p2	water saving
12	12	annual	p1	energy saving
13	13	herb	p1	conventional
14	14	vegetable	p3	water saving
15	15	annual	p3	conventional
16	16	herb	p3	energy saving

Conjoint design for perennials and woody shrubs

Card List

	Card ID	type	price	production
1	1	woodies	p1	conventional
2	2	woodies	p1	conventional
3	3	perennials	p1	sustainable
4	4	perennials	p1	energy saving
5	5	woodies	p2	energy saving
6	6	perennials	p2	conventional
7	7	woodies	p1	water saving
8	8	woodies	p1	water saving
9	9	perennials	p1	energy saving
10	10	woodies	p3	sustainable
11	11	perennials	p2	water saving
12	12	perennials	p3	conventional
13	13	woodies	p3	energy saving
14	14	perennials	p1	sustainable
15	15	perennials	p3	water saving
16	16	woodies	p2	sustainable

Appendix B: Consumer Survey for FSMIP study

Section A (Demographic Questions to be answered prior to viewing displays)

1. In what year were you born? _____

2. What is your gender? □ Male □ Female

3. Not counting yourself, how many other adults (age 19 years and older) live in your household? _____

4. How many children (age 18 years and younger) live in your household? _____

5. What is your ethnic heritage (please check all that apply)?

   □ Caucasian □ Hispanic/Latino □ Asian

   □ African-American □ Native American □ Prefer not to respond

6. What is the highest level of education you have completed (please choose only one)?

   □ less than high school □ high school or GED □ some college completed

   □ 2 year college degree □ 4 year college degree □ Master's degree

   □ Doctoral degree □ Professional degree (J.D., M.D.) □ Prefer not to respond

7. Do you live in a metropolitan, suburban, or rural region?

   □ metropolitan □ suburban □ rural

8. What was your approximately family or household income in 2011 (please choose one)?

   □ less than $19,000 □ $80,000 to $99,999 □ $160,000 to $179,999

   □ $20,000 to $39,999 □ $100,000 to $119,999 □ $180,000 to $199,999

   □ $40,000 to $59,999 □ $120,000 to $139,999 □ $200,000 or more

   □ $60,000 to $79,999 □ $140,000 to $159,999 □ Prefer not to respond

Section B (viewing plant displays using eye-tracking hardware)

Section C (Consideration of Future Consequences to be answered after viewing eye-tracking displays)

For each of the statements below, please indicate whether or not the statement is characteristic of you using the scale shown below. Please write your answer in the space provided to the left of each statement.

1	**2**	**3**	**4**	**5**	**6**	**7**
Extremely Uncharacteristic	Moderately Uncharacteristic	Slightly Uncharacteristic	Uncertain	Slightly Characteristic	Moderately Characteristic	Extremely Characteristic

_____ 1. I consider how things might be in the future, and try to influence those things with my day to day behavior.

_____ 2. Often I engage in a particular behavior in order to achieve outcomes that may not result for many years.

_____ 3. I only act to satisfy immediate concerns, figuring the future will take care of itself.

_____ 4. My behavior is only influenced by the immediate (i.e., a matter of days or weeks) outcomes of my actions.

_____ 5. My convenience is a big factor in the decisions I make or the actions I take.

_____ 6. I am willing to sacrifice my immediate happiness or well-being in order to achieve future outcomes.

_____ 7. I think it is important to take warnings about negative outcomes seriously even if the negative outcome will not occur for many years.

_____ 8. I think it is more important to perform a behavior with important distant consequences than a behavior with less important immediate consequences.

_____ 9. I generally ignore warnings about possible future problems because I think the problems will be resolved before they reach crisis level.

_____ 10. I think that sacrificing now is usually unnecessary since future outcomes can be dealt with at a later time.

_____ 11. I only act to satisfy immediate concerns, figuring that I will take care of future problems that may occur at a later date.

_____ 12. Since my day to day work has specific outcomes, it is more important to me than behavior that has distant outcomes.

_____ 13. When I make a decision, I think about how it might affect me in the future.

_____ 14. My behavior is generally influenced by future consequences.

Section D (Plant purchases to be completed after section C)

1. Thinking back over the plants and gardening supplies you purchased over the past six months, approximately how much did you spend (in total) on gardening supplies and plants (excluding mechanical equipment like lawn mower and tillers)?

□ $0	□ $100 to $149	□ $300 to $349
□ $1 to $24	□ $150 to $199	□ $350 to $399
□ $25 to $49	□ $200 to $249	□ $400 to $499
□ $50 to $99	□ $250 to $299	□ $500 or more

2. From which type(s) of stores did you purchase plants and gardening supplies over the past six months? Please check all that apply.

□ Independent, free-standing garden center	□ Internet
□ Home improvement or hardware store	□ Print catalog
□ Supermarket or grocery store	□ none of the above
□ Mass-merchandiser	□ prefer not to respond

3. From which one type of stores did you purchase **MOST** of your plants and gardening supplies over the past six months? Please check one.

□ Independent, free-standing garden center	□ Internet
□ Home improvement or hardware store	□ Print catalog
□ Supermarket or grocery store	□ none of the above
□ Mass-merchandiser	□ prefer not to respond

Section E (Buying impulsiveness scale to be answered after Section D)

For each of the statements below, please indicate whether or not the statement is characteristic of you using the scale shown below. Please write your answer in the space provided to the left of each statement.

1	**2**	**3**	**4**	**5**	**6**	**7**
Extremely Uncharacteristic	Moderately Uncharacteristic	Slightly Uncharacteristic	Uncertain	Slightly Characteristic	Moderately Characteristic	Extremely Characteristic

_____ 1. I often buy things spontaneously.

_____ 2. "Just do it" describes the way I buy things.

_____ 3. I often buy things without thinking.

_____ 4. "I see it, I buy it" describes me.

_____ 5. "Buy now, think about it later" describes me.

_____ 6. Sometimes I feel like buying things on the spur-of-the-moment.

_____ 7. I buy things according to how I feel at the moment.

_____ 8. I carefully plan most of my purchases.*

_____ 9. Sometimes I am a bit reckless about what I buy.

Thank you for your participation in our study.

We appreciate your assistance!

Appendix C Consent Form

Dear Participant: May 2012

University researchers are conducting a study that investigates consumer shopping in garden centers. This research study is entitled "See and Sell: What do consumers look at and what do they buy?" The purpose of the research is to better understand how people select and purchase plants. The total length of time we would like you to take is approximately 15 minutes, which includes the time you spend reading this page, to help us evaluate consumer shopping and purchasing habits in garden centers. We want you to look at a computer screen with an eye-tracking device mounted on the bottom of the display to look at 32 photographs of plant displays, answering one question (how likely would you be to purchase something from that display). The glasses record the images, plants, and items you look but do not photograph you or anything about you.

The risks to you are very low. Participation is voluntary. You may choose not to participate at all, or you may refuse to participate in certain procedures or answer certain questions or discontinue your participation at any time without consequence. Your participation benefits the research and the retail garden industry by providing feedback on how people look at, select, and purchase (or not purchase) plants and garden supplies. The eye-tracker device only records what you view or look at. We will NOT be able to see you on the video tape or identify you in any way. This video will allow researchers to understand the context of the shopping process (i.e. – what you spend time looking at and what interests you in the garden center).

If you agree to participate in the research study, please sign below to indicate your voluntary consent. Your response is anonymous and your confidentiality will be protected to the maximum extent allowable by law. You are free to withdraw from the research study at any time. Consent forms and data entered into electronic spreadsheets will be kept only in filing cabinets and on computers in locked university faculty offices (addresses below), including the Institutional Review Board. Consent forms and data will be kept a minimum of three years after the completion of this research project. Only personnel directly involved with this study will have access to the data. We have no way to connect you, as an individual, to this completed survey form. In return for your voluntary participation, we will give you a $25 garden center gift card/certificate, for which we will ask you to sign a receipt. You will receive the incentive even if you discontinue your participation before completion of the study.

If you have any concerns or questions about this research study, such as scientific issues, how to do any part of it, or to report an injury (i.e. physical, psychological, social, financial, or otherwise) please contact the researcher (Dr. Bridget Behe at 517-355-5191 x 1346 or behe@msu.edu or at A238 Plant and Soil Sciences Building, Department of Horticulture, East Lansing, MI 48824). If you have questions or concerns about your role and rights as a research participant, would like to obtain information or offer input, or would like to register a complaint about this study, you may contact, anonymously if you wish, the Michigan State University's Human Research Protection Program at 517-355-2180, Fax 517-432-4503, or e-mail irb@msu.edu or regular mail at 408 W. Circle Dr., Room 207, Michigan State University, East Lansing, MI 48824.

( ) I agree to voluntarily participate in this study.

Signature: _____ Date_____

( ) I received a $25 gift card or certificate to the garden center at which I participated in this study

Signature: _____ Date_____

Eye-Tracking Tech: What Drives Consumer Purchasing of Plants

Connecticut Nursery & Landscape Association

Connecticut Greenhouse Growers Association

Winter Symposium & Expo

Ben Campbell

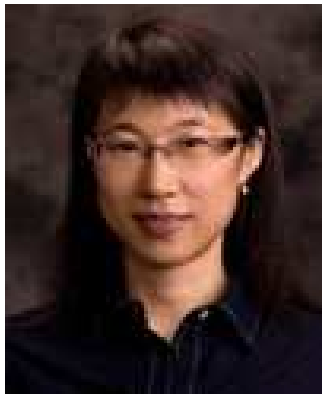
Thank you, colleagues!

Jennifer Dennis
Purdue Univ.

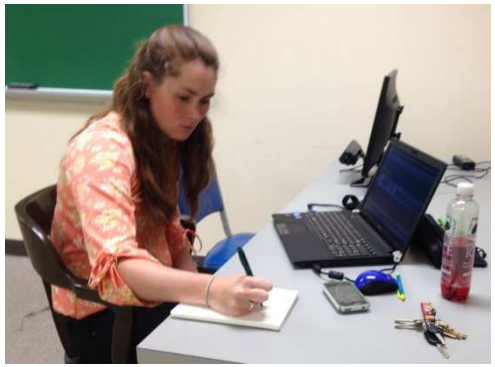
Charlie Hall
TAMU

Bridget Behe
Michigan State

Hayk Khachatrayn
Univ. of Florida



Chengyan Yue
Univ. of MN



Allison Jones
Michigan State

Granting Agencies

- Thanks
  - USDA-Federal State Marketing Improvement Program
  - Vineland Research and Innovation Centre (Ontario, Canada)

  - Keep in mind the Ontario Ministry of Agriculture is spending about $2 million annually on horticulture and specialty product consumer research!

Goals

- Stress over and over, KNOW your consumer
- Discuss how consumer makes their decision
- Introduce you to eye tracking technology
  - Technology had better be your friend
- Discuss how production and price labeling can effect consumers differently

Progression of Talk

- The consumer question
- New technologies
- Study results
- Working together
- Conclusions

The Consumer Question

- Consumer
  - "What *affordable* combination of goods and services gives me the most *value (e.g. happiness)*?"

- Economics
  - People act in a way to maximize their total utility (value)
    - So purchase a set of goods or services (made up of attributes) that gives the highest utility
    - But must satisfy their budget constraint

The Consumer Question

- I want to purchase a car, which one…..

The Consumer Question

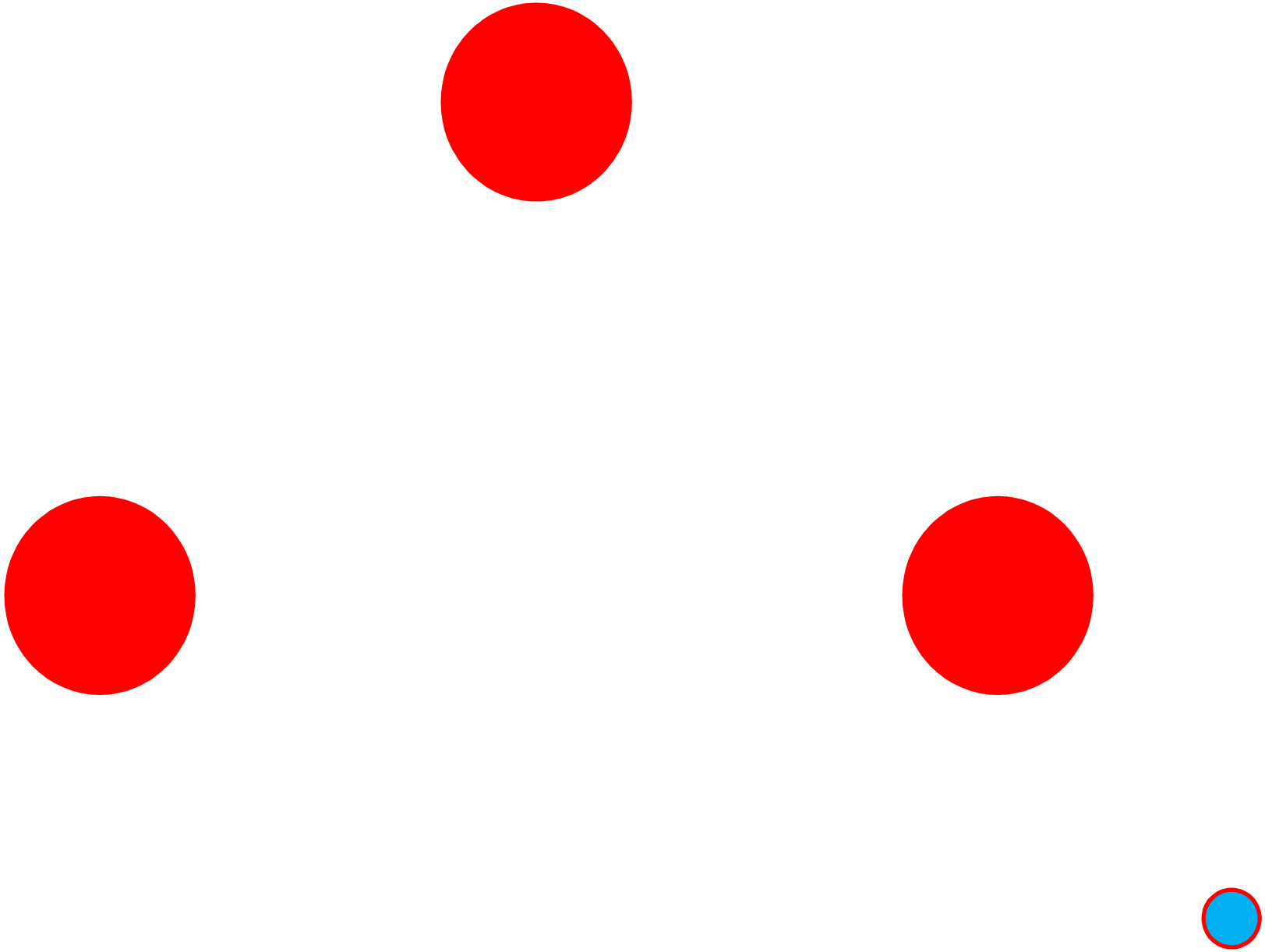
The Consumer Question

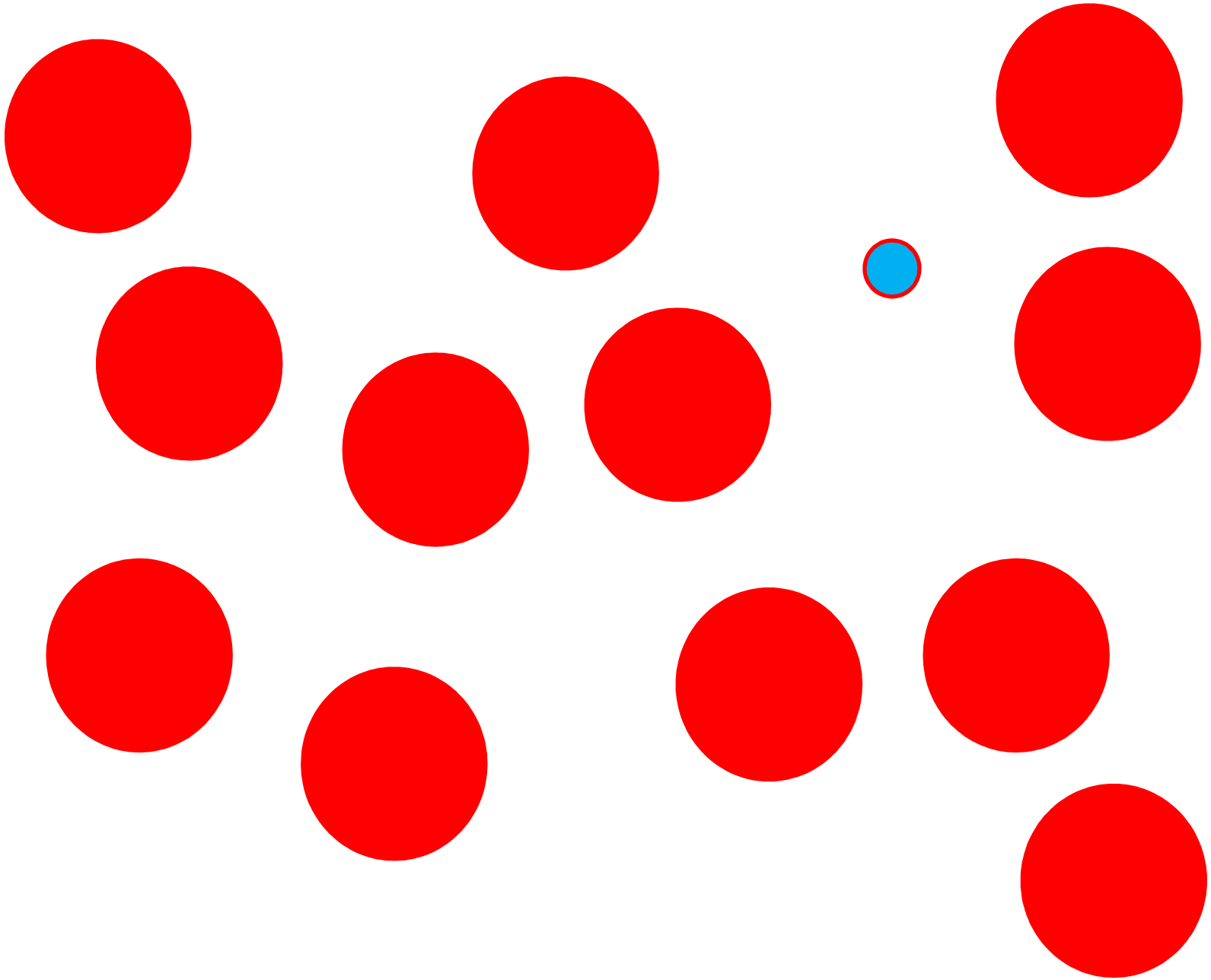
The Consumer Question

The Consumer Question

New Technologies

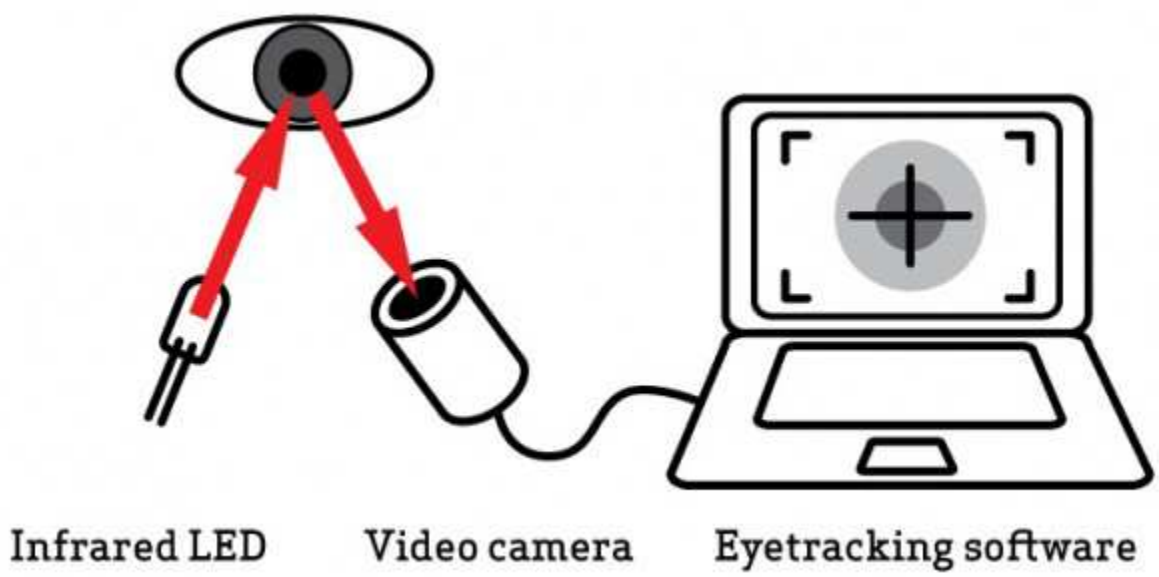
- Surveying
  - Formal: Designed questionnaire, followed some collection protocol
  - Informal: Asked quick questions to elicit responses
- Problems with
  - Respondents tell you what they think you want to hear
  - Respondents do not act in a way that is consistent with how they behave





New Technologies

- As technology improves, so to does our ability to see inside the consumer's eyes as they make their decision



Eyes move

- The fastest movement the human body makes is eye-movement.
- Our eyes move (sacaddes) and stop (fixations).
- Stopping focuses our attention.
- Attention enhances mental processing of the meaning of an object (thought).
- Measuring eye movement (stops and starts) can be a measure of attention.
- Eye movement can be measured with eye tracking devices.

Attention is reflected in eye movements

- Optic nerve transmits more information than the brain can process
- Fixations compensate by focusing attention and ignoring the background “noise” to enhance meaning

New Technologies

- Several types and their costs

$70,000 to purchase

Desktop model costs $40,000

Tobii X1 Lite cost $20,000 (but site license runs one year; $3500 renewal for second year).

New Technologies

- Who is using?
  - Kraft Foods
  - Pepsi Co.
  - Pfizer
  - Proctor & Gamble
  - Unilever
  - Perception Research Services
  - Verify International

New Technologies

New Technologies

- Spending time on signs

http://www.usercentric.com/applications/eye-tracking-package-design

New Technologies

Study Results

- Want to look at impact of various attributes on purchase
  - Attributes: price and production practice
  - What signs capture attention and by whom?

Several years worth of studies devoted to better understanding the ornamental consumer!

Results – 2010 study

Product Attributes	Experimental Auction Mixed Linear
Rice Hull	0.583***
	[0.454, 0.712][a]
Straw	0.366***
	[0.230, 0.501]
Wheat Starch	0.226***
	[0.097, 0.355]
Waste 1–49%	0.159***
	[0.049, 0.269]
Waste 50–100%	0.231***
	[0.121, 0.341]
Carbon-saving	0.166***
	[0.057, 0.276]
Carbon-intense	–0.432***
	[–0.549, –0.314]

[a] Ninety-five percent confidence intervals.

Results – 2011 study

	Aggregate	Segment 1 Import-liking Consumers (8%)	Segment 2 Mainstream Consumers (78%)	Segment 3 Eco-local Consumers (14%)
Variables	Coeff.	Coeff.	Coeff.	Coeff.
Sustainable	0.087**	0.165	0.061*	0.183**
Energy-saving	0.146***	-0.064	0.111***	0.460***
Water-saving	0.121***	0.049	0.110***	0.224***
Compostable	0.139***	0.074	0.104***	0.371***
Plantable	0.158***	0.384***	0.086**	0.427***
Recyclable	0.070*	0.472***	0.015	0.142*
Local	0.496***	-0.908***	0.374***	1.990***
Domestic	0.351***	-1.127***	0.257***	1.727***
Tomato	0.107**	-0.115	0.096*	0.298**
Mum	0.848***	1.425***	0.818***	0.686**
Intercept	1.216***	3.462***	1.196***	0.030

Results – 2011 study

Variables	Segment 1 Import-liking Consumers (8%) Coeff.	Segment 2 Mainstream Consumers (78%) Coeff.	Segment 3 Eco-local Consumers (14%) Coeff.
Age	-	-	
Gender		-	
Edumedium	-		
Eduhigh			
Income	-	-	
Caucasian	+	+	
Country			
Metro			
Buyherb		-	
Organicbudget			
Plantwater	-		

Results from Study

- Surveyed 344 consumers
  - Florida (50)
  - Indiana (48)
  - Michigan (69)
  - Minnesota (47)
  - Ontario (67)
  - Texas (63)

Plant type	Price	Production Signs
Annual	$1.99	Conventional
Vegetable	$2.49	Water-saving
Herb	$2.99	Energy-saving
		Sustainable

Grown using water-saving practices
Assorted Fresh Herb Plants
$1.99 per container

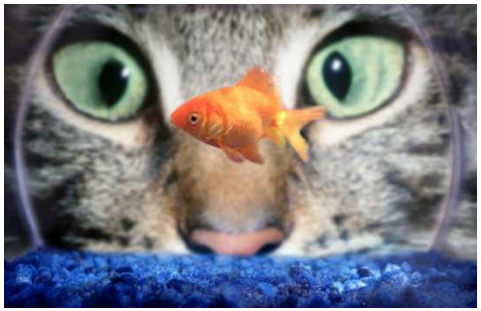
Grown using conventional practices
Annual Petunias Assorted Colors
$1.99 per container

Max
Grown using sustainable practices
Vegetable Plants
$1.99 per container

Max

Results from Study

- What are we capturing?
  - Identify what people see first
  - Measure how long they view it (milliseconds)
  - Record the path their eye travels
  - Quantify how long they view “areas of interest”
  - Capture what they don’t see (or read)



Results from Study

- Time to first fixation (what grabs attention?)

Average blink of eye speed is 3/10 to ½ second

	Segments		
	Plant material	Production practice	Price
Production Sign	1.23	**0.90**	1.17
Plant ID sign	1.15	1.27	1.35
Plants	**0.79**	1.21	1.36
Price Sign	1.89	2.01	**1.62**

What does this mean?

- Consumers that care about an attribute (e.g. sign) will find it quickly.

- The longer time to see price most likely the result of price sign always on right side of display

Results from Study

- Fixation Count (how <u>many times</u> look at area)

	Segments		
	Plant material	Production practice	Price
Production Sign	1.79	**3.10**	2.59
Plant ID sign	1.93	2.44	2.32
Plants	**7.80**	7.18	6.18
Price Sign	1.26	1.82	**2.49**

What does this mean?

- No matter consumer, display is important (see high number of times look at plants across segments)

- Consumers will return for another look at those drivers that are important

Results from Study

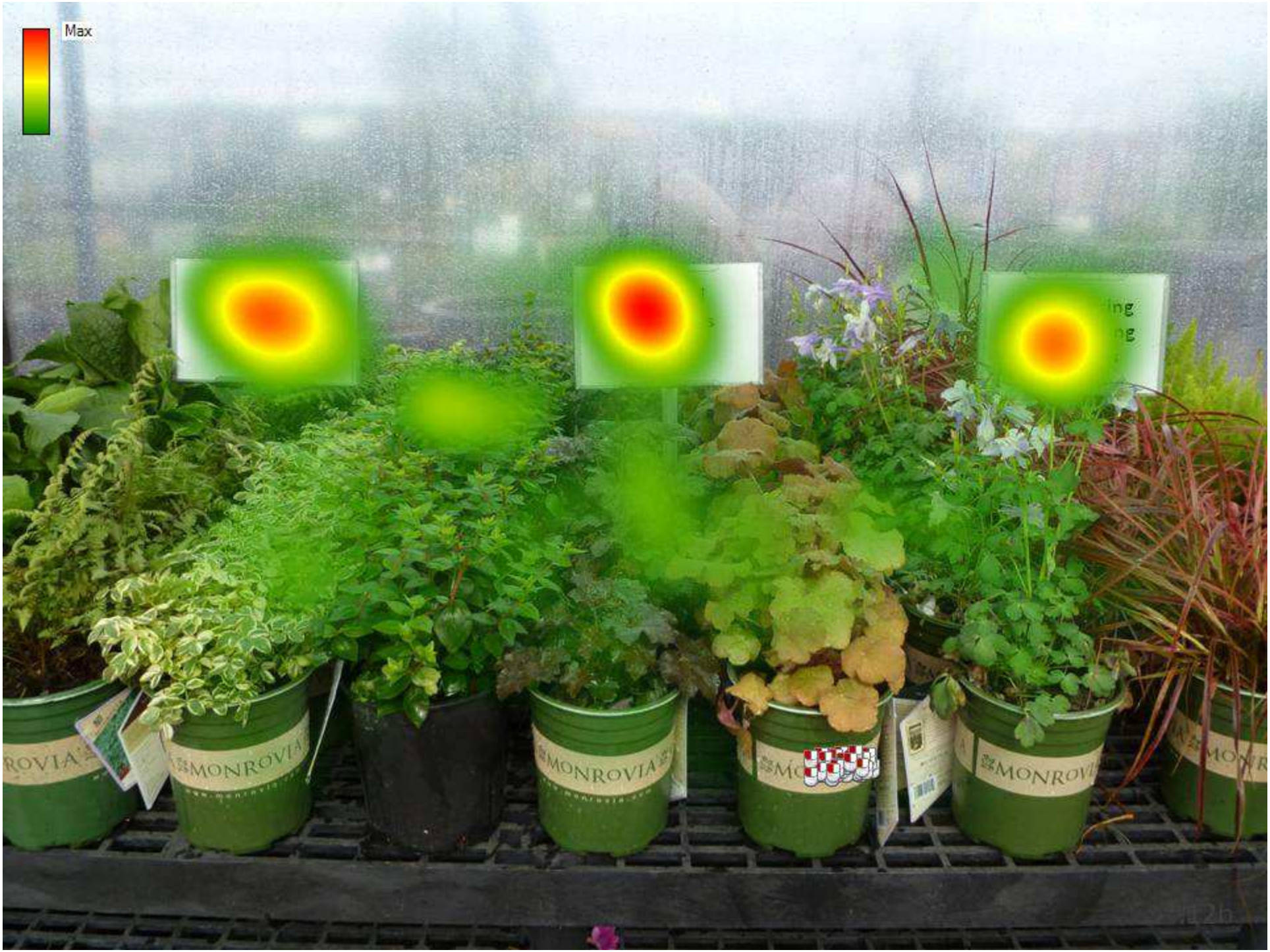
- Total visit duration (total length of time look at area)

	Segments		
	Plant material	Production practice	Price
Production Sign	0.68	**1.16**	0.97
Plant ID sign	0.53	0.67	0.66
Plants	**2.36**	2.11	1.77
Price Sign	0.43	0.63	**0.89**

What does this mean?

- Display matters, but…
- Consumers that care about an attribute (e.g. sign) will spend more time looking at it.

Max
$19.99 per container
Assorted Perennials
Grown using water-saving practices
MONROVIA


Max
MONROVIA
MONROVIA
MONROVIA

Results from Study

You can blunt the impacts of your messaging through your display!

Results from Study

- What about the display?
  - What draws attention?
  - What is the flow?

Coleus
$7.99

Media: Slide2.JPG
Time: 00:00:00.000 - 00:00:41.436
Participant filter: All
Max

Plants For People On the Go!
Container Garden Cafe
Container Garden Cafe
PLANTS FOR people ON THE go!

6 counts
Container Garden Cafe
Container Garden Cafe
PLANTS FOR people ON THE go!

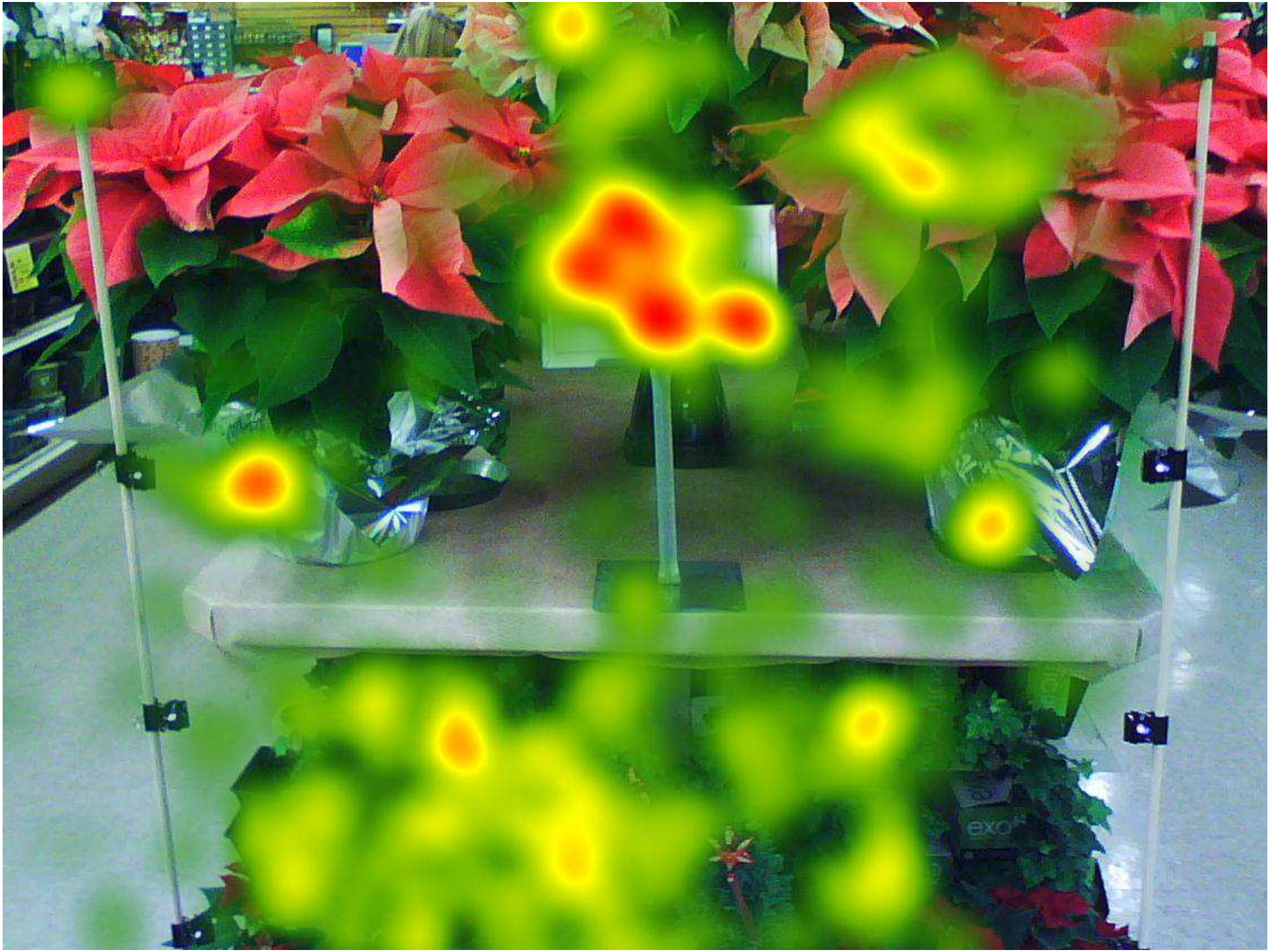
Plants For People On the Go!
Container Garden Cafe

Media: sn_4.raw
Time: 00:00:00.000 - 00:01:25.300
Participant filter: All
Max

Media: sn_4.raw
Time: 00:00:00.000 - 00:01:25.300
Participant filter: All
Max

Media: sn_4.raw
Time: 00:00:00.000 - 00:01:25.300
Participant filter: All
Max

Premium Poinsettia
Includes Custom Wrap & Bow
Starting At
$49.99
SALE
33% Off



Media: sn_3.raw
Time: 00:00:00.000 - 00:01:34.133
Participant filter: All
Max
Premium Poinsettia
Includes Custom Wrap & Bow
Starting At $34.99

Media: sn_3.raw
Time: 00:00:00.000 - 00:01:34.133
Participant filter: All
Max
Premium Poinsettia
Starting At
$34.99

Results from Study

- What about landscapes?

Base yard

Base yard - aggregate

Base yard – person 1

Base yard – person 2

Base yard – person 3

Yard 1

Yard 1 – aggregate

Yard 1 – person 1

Yard 1 – person 2

Yard 2

Yard 2 - aggregate

Yard 2 – person 1

Yard 2 – person 2

Working Together

- Technology is (or should be) our friend!
  - It can be a mechanism to give the right message to the right consumer
    - Facebook
    - Twitter
    - Eye tracking

Working Together

- Eye tracking is costly, but we can work together as industry….

- Example…
  - Eye tracking system: provided by university
  - Garden Center:
    - 25 people
    - Gave $25 gift card

Conclusions

- New technologies can be beneficial
  - Reason large companies are using them
- Labeling can make a difference
  - Impact of labeling depends on the consumer; not all are the same

Conclusions

- Future endeavors
  - Impact of bad quality: can one bad product within a display ruin a display
  - Effects of different labeling schemes