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Introduction

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Journal of Food Distribution Research
Special Issue

Innovations in Short Supply Chains for Horticultural Products

Introduction

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The papers included in this issue describe research activities of several university faculty members who participate in the multistate regional project S1050: Assessing the consumer behavior, market coordination and performance of the consumer-oriented fruit and vegetable sector (http://bit.ly/1iSrNjY). The concept for this Special Issue stems from a S1050 co-sponsored oral presentation session, "Innovations in short supply chains for horticultural products," held during the 2014 Western Education and Research Activities Committee on Agribusiness (WERA-72) annual meeting in Santa Clara, California.

The articles range in topics related to community supported agriculture (CSA) in examining, "Food Consumption Attitude and Behavioral Change among CSA Members" to a survey exploring trends occurring within the CSA movement in, "CSAs and the Battle for the Local Food Dollar." A third article examines the spending patterns of conumers in a four state survey of "Local Wine Expenditure Determinants in the Northern Appalachian States," while the fourth article guages the effectiveness of using Audience Response Systems (ARS) in Extension programs to assess knowledge gains and findings from workshops conducted with farmers in "Using Audience Response Systems for Extension Programming Impact Evaluation."

The articles represent some of the diverse research and extension efforts within S1050's general topics of consumer behavior, market coordination and performance of the consumer-oriented fruit and vegetable sectors. These issues address S1050's objectives, which consist of the following:

1. Develop demand and market valuation models for the produce sector that can be used to evaluate effects of increasingly complex product differentiation schemes (organic, enhanced health claims, biodynamic), trade, commodity marketing programs, labeling

programs (local, food miles, Fair Trade), traceability systems, and food safety events in the U.S. produce markets.

2. Analyze the relative benefits and costs, to producers and consumers, of government and industry-led marketing and policy programs (certifications, Leafy Greens marketing order, Country of origin labeling, farmers markets) using both theoretical approaches and empirical evidence from multi-state applied research projects.

3. Assess the changing coordination and supply chain management strategies being implemented in the fruit and vegetable sector and identify strategic organizational and marketing implications for a set of firms that are diverse in terms of commodity, marketing approach and size of operation (including small and mid-sized farms).

A key component of this multistate regional project is to help participants identify other faculty with similar interests and facilitate collaborations. With 26 official members representing a variety of universities and more than a dozen other researchers and extension specialists attending annual meetings and report activities, efforts have included submission of multi-state proposals resulting in funded research projects, co-sponsored oral presentation sessions, as well as special journal issues and extension publications.

One of our goals is to strengthen the S1050 membership by identifying potential participants who value interaction with group members while lending their expertise to others' projects and efforts. We welcome the opportunity to learn about others who would be a good fit for the S1050 multistate regional project and discuss their interest in joining our group. Whether they are new to academia, mid-career, or more senior in their tenure, the ability to interact with researchers and extension personal with similar interests is an immeasurable benefit for all involved.

We hope you enjoy reading the issue. Please contact us if you would like to learn more about our new multistate regional project, S-1067, Specialty Crops and Food Systems: Exploring Markets, Supply Chains and Policy Dimensions, which will replace S1050 in October 2015. You may also view the project outline, directory of participants, and other information at: http://www.nimss.org/lgu_v2/homepages/home.cfm?trackID=17616.

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Food Consumption, Attitude, and Behavioral Change Among CSA Members: A Northern Utah Case Study[1]

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Abstract

This study examines the impacts of Community Supported Agriculture (CSA) program participation on consumer attitudes and behaviors related to food consumption and preparation, among CSA members in Utah. Data were collected through a series of pre, post, and monthly program surveys, along with food purchase receipts and CSA basket contents. Results show a shift in participant dietary intake and food preparation attitudes and behaviors, namely increased consumption of fresh produce, decreased grain intake, and fewer meals consumed away from home. Participants also became more interested in cooking and canning/preserving. Increases in Vitamin C, Vitamin B, and folic acid availability among participants also resulted.

Keywords: Community Supported Agriculture (CSA), consumption patterns, dietary intake, food away from home (FAFH), fresh produce, obesity

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[1] This research was supported by the Utah Agricultural Experiment Station, Utah State University, and approved as journal paper number 8773.

Introduction

Community Supported Agriculture (CSA) programs are rapidly expanding across the US and are now a primary direct-to-consumer marketing method for local foods, benefiting both farmers and consumers alike (Curtis 2011; Thilmany, Bond, and Bond 2008). CSA programs provide members weekly pre-paid baskets of fresh produce, meats, cheeses and value-added products, normally during the growing season. Farmers benefit from the guaranteed market for their products, as well as above wholesale level pricing. CSAs provide consumers with high quality, fresh local foods, commonly at lower prices than those at traditional grocery outlets (Cooley and Lass 1998; DeMuth 1993). In particular, they provide consumers the opportunity to experience new foods, develop new social networks and reconnect with the land and the traditional practices of agriculture (O'Hara and Stagl 2001). Consumer motivations for CSA program participation include concern for the environment, a desire for fresh safe food, the importance of supporting local growers, and a sense of community connectedness (Cooley and Lass 1998; Cone and Myhre 2000; O'Hara and Stagl 2001).

US residents do not consume the recommended amounts of fruits and vegetables, and intake has decreased in recent years (Lorson, Melgar-Quinonez, and Taylor 2009; Slining, Mathias, and Popkin 2013). This is concerning, as diets high in fruits and vegetables are naturally high in nutrients and low in energy, resulting in a reduced risk for obesity and related chronic diseases. In children, a diet high in fruits and vegetables is associated with lower risk for central obesity (Bradlee et al. 2010). Evidence from a randomized parent-child trial of dietary interventions for obesity found that increasing fruit and vegetable intake was more effective than decreasing fat and sugar (Epsteon et al. 2001). However, efforts to increase fruit and vegetable consumption in the US population have generally been unsuccessful. Consumer access to direct-to-consumer market channels such as farmers' markets, mobile produce trucks, community gardens, and Community Supported Agriculture (CSA) may provide solutions to overcome barriers, such as access and affordability. However, strong evidence to support the efficacy of such programs in increasing fresh produce consumption is lacking.

The majority of the research on the dietary and nutritional impacts of direct-to-consumer market purchases focus on the impacts of public programs on fresh produce consumption among low income individuals, such as the WIC (Women, Infant, and Children) and the Senior Farmers' Market Nutrition Programs (McCormack et al. 2010). Studies related to farmers' markets include one by Conrey et al. (2003), which investigated the changes in nutritional health resulting from the WIC program. They found that increased fruit and vegetable consumption was directly related to the nutritional information provided by the program, rather than the access to farmers' market produce. Another study examined the nutritional benefits of adding EBT machines to farmers' markets (Krokowski 2014), noting that the availability of EBT machines led to increased fruit and vegetable purchases among SNAP (Supplemental Nutrition Assistance Program) participants.

The study conducted by Zepeda, Reznickova, and Lohr (2014) examined the impact of mobile farmers' markets on food choice in areas considered food deserts or communities with little access to fresh food. Study results found that consumers who shopped at the mobile market ate significantly more fruits and vegetables. But, the authors noted the lack of cooking skills among residents, as well as affordability and mobile market hours as hindrances to expanded behavior changes.

Few studies assess changes in dietary choice and food preparation habits resulting from CSA program membership. One study by Johnson et al. (2004), where CSA baskets were delivered directly to home-bound seniors, found that participants increased their produce intake by a full serving per day, but they attributed this success to additional educational and policy efforts. In a study by Quandt et al. (2013), fifty low income women with children were provided a weekly CSA box for 16 weeks. Study results show that the participant household inventory of fruits and vegetables increased along with reported consumption of fresh produce, but consumption changes were not statistically significant. More importantly, participants picked up their box only 9.2 of 16 weeks due to transportation and scheduling challenges, indicating the need for home CSA box delivery.

A study by Perez, Allen, and Brown (2003) discovered that CSA members were likely to eat more fruits and vegetables and to cook more creatively and Ostrum (1997) found that eating habits were affected among CSA members. Russell and Zepeda (2007) state that member dietary changes along with increased consideration of food seasonality were the direct result of the CSA's educational components. Examples of specific changes included planning meals around available produce, exploring new foods, and freezing or storing excess vegetables.

The objective of this study is to examine the impacts of CSA program participation on consumer attitudes and behaviors related to food consumption, preparation, storage, and dining out practices, specifically behavior and attitudes toward fresh produce consumption, preparation of nutritionally enhanced meals, and food consumption away from home. Food away from home (FAFH) consumption is important as research shows that the prevalence of obesity is influenced by the number of meals consumed away from home (French, Story, and Jeffery 2001), likely due to the larger portion sizes offered (Rolls, Morris, and Roe 2002).

If CSA membership does indeed improve consumer dietary intake and food preparation and consumption attitudes, public policy encouraging and/or providing CSA program memberships would provide another vehicle for fostering dietary improvements among SNAP, WIC, and other federal program participants. This may be especially important in areas where farmers' markets may not be available or accessible for targeted populations, as was the case in Dollahite et al. (2005), which found that farmers' market access for low-income families was a barrier to the WIC program. Agricultural producers may also be affected by study results in terms of the opportunity to expand markets for their CSA programs to currently untapped consumers through government programs, and/or through increased participation of consumers looking to improve their health. The use of longitudinal data, including both participant survey responses and actual consumption information in the current study distinguishes it from previous studies.

Survey Data and Results

A total of 14 families (28 adults and 5 children) from four separate CSA programs operating in Cache Valley, Utah took part in this pilot longitudinal study conducted in 2012. Participants were recruited through email invitations distributed by CSA program managers to CSA program subscribers. Pre-program, monthly, and post-program web-based surveys were administered to the participants from June through December of 2012. The CSA programs began in June and ended in late September, but the high season for fresh produce in northern Utah is mid-July to

mid-September. The surveys provided stated data on participant food consumption habits and attitudes, as well as lifestyle preferences. Surveys' focused on changes in consumption and food preparation behavior, such as the use of new, unfamiliar food or varieties, changes in the quantity of meals consumed outside the home, the percentage of CSA basket contents consumed, the storage (canning, freezing or drying) of excess produce, and the use of CSA provided recipes. Study participants were provided a $100 fee for completing all aspects of the study.

Pre-program survey results show that 81% of study participants were female and 75% married, 28.6% had children under the age of 18, and study participants were primarily Caucasian (78.6%). Seventy-seven percent had at least a four-year degree, 65% were employed, and 42.7% reported an annual income above $50,000. Many learned about their CSA program from friends and family (53%), followed by CSA program websites (11%). Participants joined the CSA program primarily for access to fresh local produce and to support local farmers (see Figure 1) and they paid on average $16.50 weekly for their CSA share. Less than one-third (27%) had participated in the CSA program the previous year. Those that hadn't participated noted the following reasons; unfamiliar with CSA program (40%), did not live in the area (27%), financial reasons (13%), needed to find others to split share (6.6%), couldn't find good quality (6.7%), and the CSA was full (6.7%).

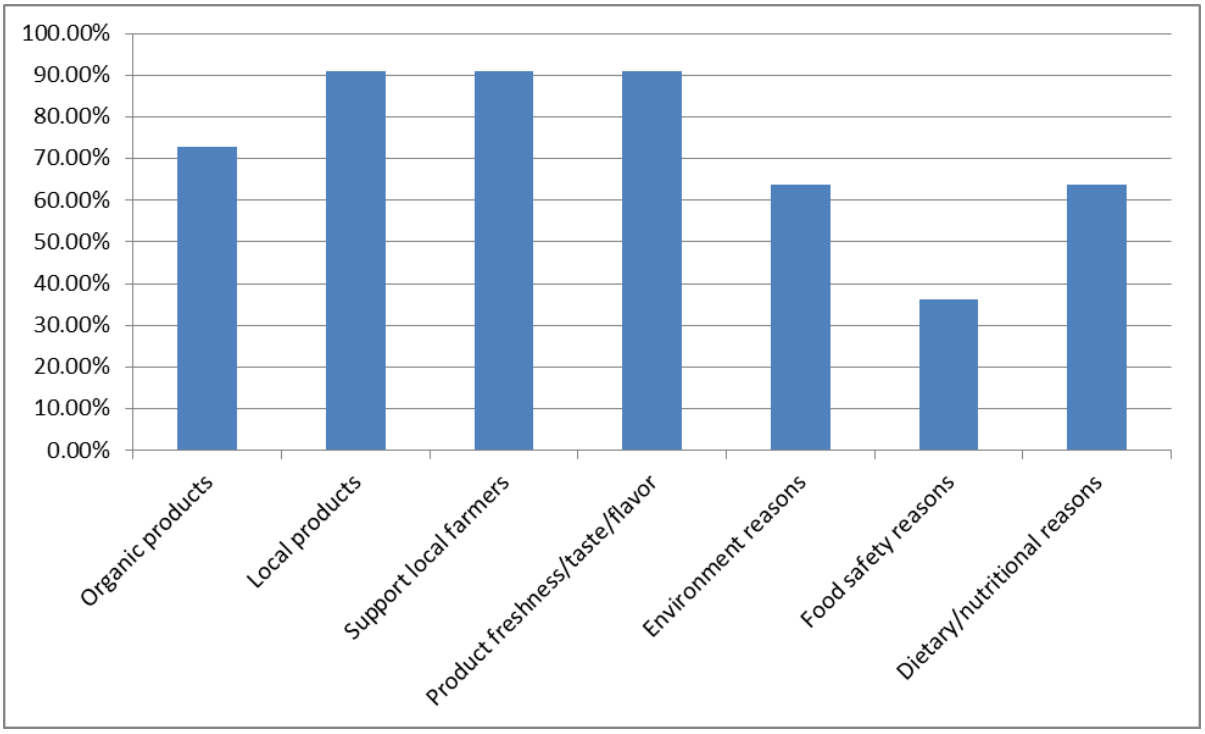

Figure 1. Respondent Rational for CSA Program Participation (Percentage)

At program start (see Table 1), respondents indicated that they preferred a CSA basket for 2-3 people (57.1%), followed by 1-2 people (35.7%). Also, they noted that information on food preparation and recipes (92.9%) would be most valuable, followed by canning and preserving (57%), and farms visits/tours (57%). When asked to rate geographic origin and production practice labeling, produced in the USA (38.5%) and certified organic (23.1%) were the two most

important labels. Participants ranked product quality as more important than origin or price. Study participants were asked to rate on a scale of 1 (not important) to 5 (very important) eleven separate fresh produce features. Product taste and quality were rated the highest (4.5 and 4.3, respectively), followed by product freshness and value. Local origin and organic produce were also important (rated at 3.5 out of 5). Knowledge of the produce grower and specialty item were rated lowest.

Table 1. Respondent Preferences Pre and Post-CSA Program

	Description	Pre Program Percentage/ Mean	Post Program Percentage/ Mean
What is your preferred basket size?	Serving 1-2 people	35.7%	57.1%
	Serving 2-3 people	57.1%	42.9%
	Serving 3-4 people	7.1%	0.0%
Which educational programs would be of interest to you?	Cooking classes	50.0%	57.1%
	Preparation ideas/recipes	92.9%	78.6%
	Canning/preserving	57.1%	71.4%
	Wine pairing	42.9%	50.0%
	Food pairing	35.7%	35.7%
	Food safety	21.4%	14.3%
	Farm visits/tours	57.1%	35.7%
When purchasing food products, which label is most important?	A product of your state (Utah)	15.4%	8.3%
	A product of the USA	38.5%	41.7%
	A product from outside of the USA	0.0%	0.0%
	A product identified as “organic”	23.1%	25.0%
	A product identified as “natural”	15.4%	16.7%
When purchasing food products, which of the following is most important?	The quality of the product	64.3%	78.6%
	The product origin (place of production)	7.1%	14.3%
	The product with the lowest price	21.4%	7.1%
When making produce purchases, how important are the following features? (Scale of 1 to 5)	Product variety	3.36	3.21
	Product quality	4.36	4.21
	Product value	3.86	3.64
	Product appearance	3.36	3.00
	Produced locally (in State)	3.43	3.21
	Specialty item	2.36	1.77
	Product pricing	3.36	3.43
	Organic production	3.07	2.79
	Product freshness	4.07	4.14
	Product taste	4.57	4.29
	Know grower/farmer	2.79	2.43

In order to achieve a better understanding of study participant attitudes and lifestyle preferences, they were asked to indicate their level of agreement on a scale of 1 (strongly disagree) to 5 (strongly agree) for ten statements. Concerns over health/diet were rated highest (4.5), followed by food safety concerns (4.35), and the desire to support local farmers (4.28). Concerns about food origin, as well as the importance of agricultural open space and physical activity were also rated highly. Eating outside the home and agreement with being a vegetarian or vegan rated the lowest. Over 80% of the participants supplemented their CSA membership with trips to the local

farmers' market, and averaged three trips monthly to their local grocery store, spending $92 per trip on average.

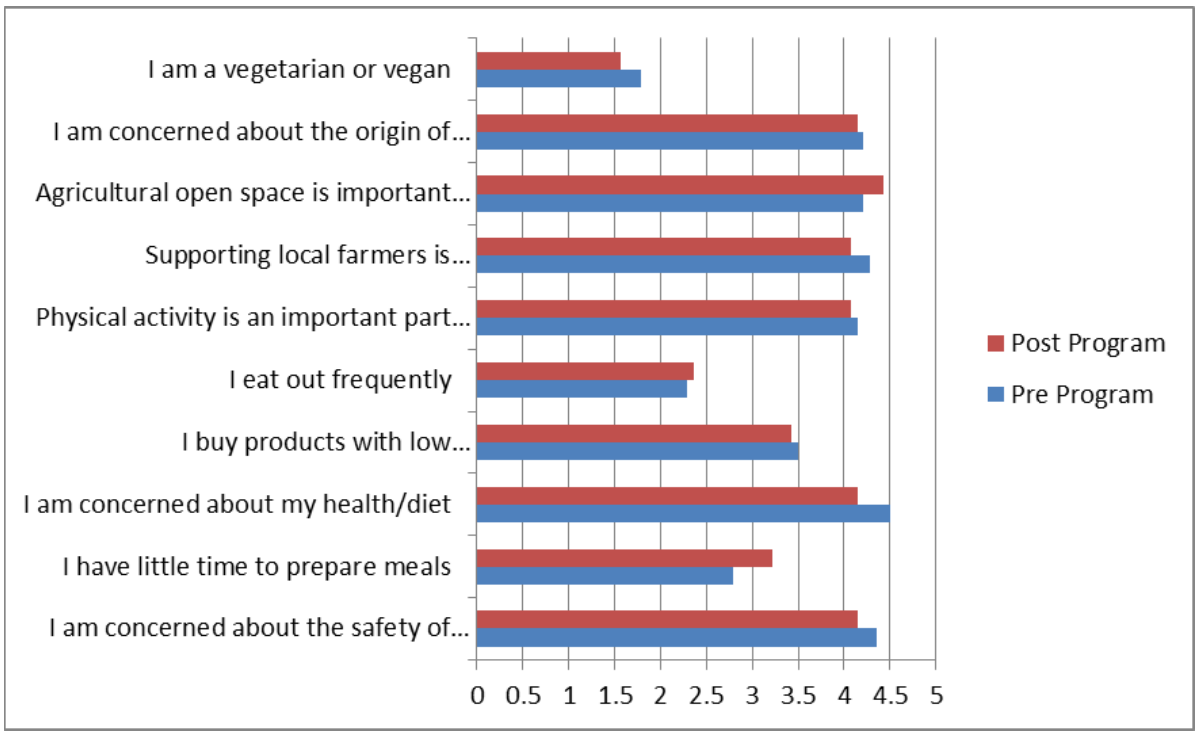

Figure 2. Respondent Attitude and Lifestyle Preferences Pre and Post-Program
(Scale of 1- 5, 1 is Strongly Disagree and 5 is Strongly Agree)

The monthly participant survey responses indicated that participant CSA basket usage hovered around 90% throughout most of the season (see Figure 3). The primary reason given for not using all of the baskets' items was the inability to prepare unfamiliar items (27%). Basket usage also indicates that on average only about 10% of the food items were wasted. During the first three months, participants were preparing around 72% of the unfamiliar items. In September, there was a steep decline (45%), implying that participants became more familiar with the basket selections. This was also evidenced by the decrease in recipe usage across the season from 50% in July to 27% in the fall. The storage or canning of produce peaked in August at 82% then declined throughout the fall reaching 27% in November. The number of meals participants consumed at home increased from 75% to 80% in August and September at the height of the season, then fell back to 76% in October and November after the CSA program ended (see Figure 4).

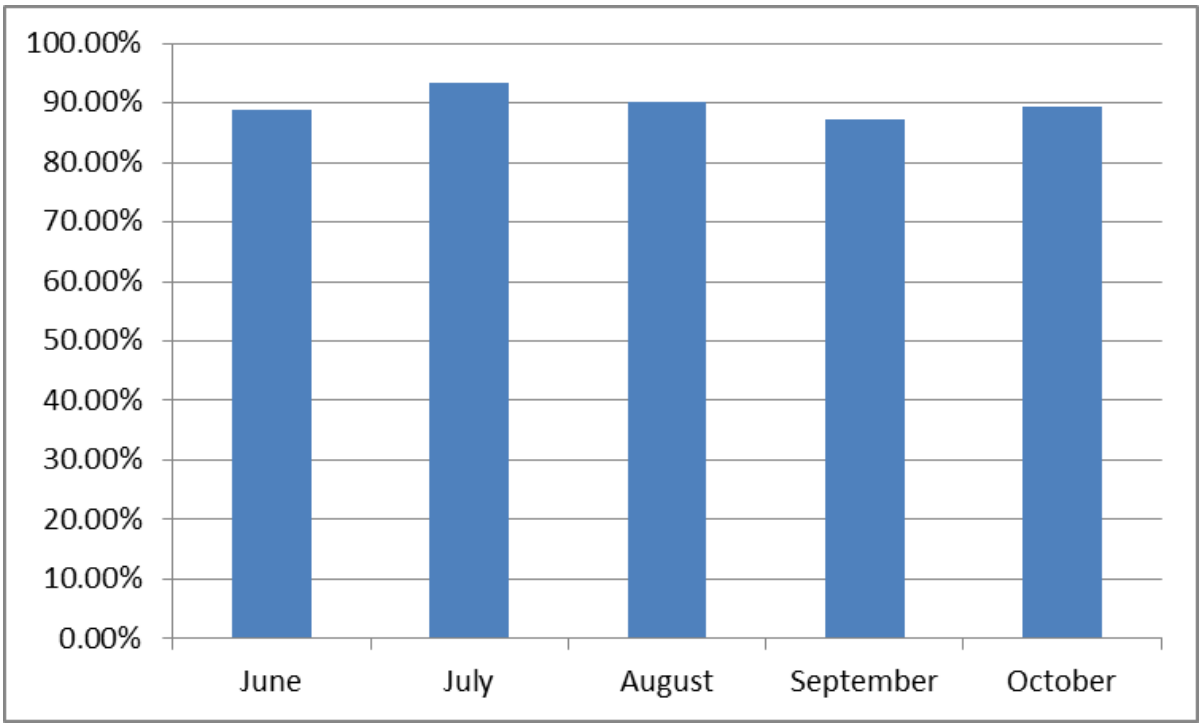

Figure 3. Respondent Reported CSA Basket Consumption by Month (Percentage)
Note. Differences not statistically significant at the 90% level.

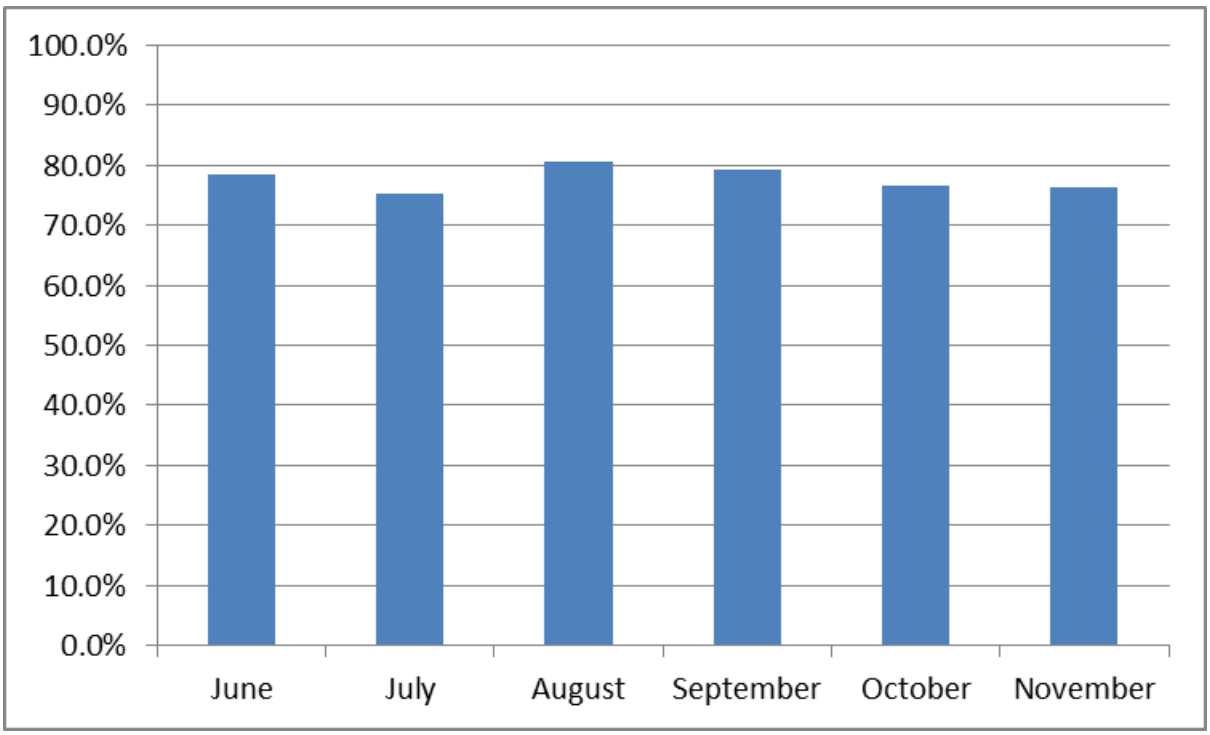

Figure 4. Respondent Reported Average Weekly Meals Consumed at Home by Month (Percentage)
Note. Differences statistically significant at the 90% level or better for July/August, August/October, and August/November.

Post-program survey results indicated that 100% would subscribe to a CSA program in the future and 81% expressed an interest in a winter CSA program. Participants were asked about their perceived changes in food patterns and results are provided in Table 2. Seventy-one percent felt the CSA membership encouraged them to preserve/store more food than normal. They also felt that their fruit and vegetable consumption was much higher (71%), and that there was some or much improvement in their nutritional intake (overall diet) (57% and 35%, respectively). Almost all participants felt that the recipes and the availability of previously unknown products in their CSA baskets changed their food preparation or cooking knowledge (93%). Additionally, average meals consumed at home weekly increased to 17.6 (up from 17.1 pre-program). Two-thirds (64.2%) of the study participants claimed they now ate at home more often.

Table 2. Respondent Post-CSA Program Perceptions

	Description	**Mean**	**Percentage/**
As a result of participating in the CSA program, did you store (can, dry, freeze) more produce items than usual for consumption this winter?	Unsure	1.64	7.0%
	No		21.0%
	Yes		71.0%
As a result of participating in the CSA program, how has your fruit and vegetable consumption changed?	Lower	4.71	0.0%
	No change		0.0%
	Unsure		0.0%
	Slightly higher		28.0%
	Much higher		71.0%
As a result of participating in the CSA program, how do you feel your overall nutritional intake has changed?	Unimproved	4.28	0.0%
	No change		0.0%
	Unsure		7.1%
	Some improvement		57.1%
	Much improvement		35.7%
As a result of participating in the CSA program, How was the number of tims per week you ate at Home impacted?	At at home less	3.50	0.0%
	No change		28.5%
	Unsure		7.1%
	Ate at home slightly more		50.0%
	Ate at home much more		14.2%
Did the recipes provided or availability of previously unknown products in your basket change your food preparation or cooking knowledge?	Unsure	1.90	0.0%
	No		7.1%
	Yes		92.9%

Post-program, study participants desired a smaller CSA basket size (1-2 people at 57.1%). It's not uncommon for CSA basket contents to be higher than expected, leading to increased efforts in using the contents and/or waste. While interest in food preparation ideas and recipes declined from 93% to 79%, it remained the educational program in which participants were most interested. Additionally, participants had an increased interest in food related education, including canning and preserving, wine pairing, and cooking. Participant interest in food safety information and farm tours declined. This is echoed in the comparison of attitude and lifestyle preference pre and post-program which show that participant food safety concerns, diet/health concerns, and food origin concerns decreased (see Figure 2). With regards to labeling, US origin,

certified organic, and natural became more important post-program, while local (in-state) labeling became less important. Product quality and origin became more important and low price became less important. Participant preferences for produce attributes declined overall from pre to post-program, with the exception of product freshness and price, which increased.

Food Consumption Data and Results

As a supplement to the self-reporting surveys, participants submitted their monthly grocery store and farmers' market purchase receipts by mail to the designated study researcher at the end of each month (June to November 2012). Additionally, all contents of participant weekly CSA baskets were tracked by item and weight. The contents of meals consumed outside the home were not tracked. These data sources allowed for comparisons of available nutrients, calories and types of foods purchased during and after CSA program completion. It is not possible to draw conclusions regarding changes in dietary intake (e.g. food consumption) based on the survey results, because information was unavailable on factors such as cooking methods, age, gender, and weight (which can change specific nutritional requirements), and actual food intake. It was beyond the scope of the current study to track actual food intake, for example using a 24-hour food recall survey. Nutrient availability was determined per individual (within a given family) per month, regardless of the age of each individual. Adult vs. child availability was considered. Due to the small sample size and the large variation in dietary choices between families, no between-family comparisons could be made.

All retail-type food purchases were entered into Genesis R&D SQL, based on store receipts, CSA basket contents, and self-reported home delivery and farmers' market purchases. Where possible, UPC codes from receipts were used to pinpoint specific foods. All other products were identified as closely as possible based on store coding or receipt abbreviations, using brand-specific nutrient content information where available. Foods were entered based on net package or unit weight to control for potential error based on differences in serving size between manufacturers. Additionally, nutritional analyses are characteristically conducted on a weight basis, regardless of food type, processing method, or serving size. For foods typically sold by weight (e.g. ground meats) where no weight information was available on the receipt, market reports of average cost per pound during the study period were used to calculate purchase weight. For foods typically sold by piece (e.g. fish filets) where no weight information was available on the receipt, USDA nutrient content databases were used to obtain nutrient values. Nutrient availability per individual per meal within a given month was normalized based on self-reported percentages of meals consumed at home according to the following formula:

$$A_{AX} = (T_{AX} / \text{\# family members}) / (D_X \times 3 \text{ meals daily} \times H_X)$$

Where:

A_{AX} = Amount of nutrient "A" available per meal in month "X" from meals consumed at home
T_{AX} = Amount of nutrient "A" available in month "X" from meals consumed at home based on grocery receipts and CSA basket data
D_X = Number of days in month "X"

H_X = Percentage of meals consumed at home based on self-reported data

Nutrients examined included all categories required by the U.S. Food and Drug Administration to be shown on standard Nutrition Facts Panels, and all additional vitamins and minerals for which a Recommended Daily Allowance is established.

To examine the effect of CSA participation on food purchase choices, foods were assigned to one of the following seven categories:

1. Fresh produce (fruits and vegetables)
2. Processed produce (fruits and vegetables, including frozen, canned, or otherwise prepared)
3. Meats, eggs, nuts and protein substitutes (including nut butters)
4. Dairy and dairy substitutes (excluding frozen desserts such as ice cream)
5. Grains (including pasta, tortillas, dry grains, cereal, prepared breads, rolls and dough; excluding chips, crackers, cakes, dessert and popcorn)
6. Convenience and multi-component meals (including frozen, canned, or otherwise prepared entrees, soups and sandwiches)
7. Snack foods (including chips, crackers, soda, desserts and candy)

Using Genesis software, a listing of each individual food as a percentage of the total monthly food weight was obtained. Individual foods were then assigned to the appropriate category, and a monthly percentage for each category was calculated. Due to the variety of foods included within each subcategory, it was impractical to calculate percentages based on the number of servings available. For example, within the "Proteins" category, serving sizes range from 1 ounce for nuts to about 2 ounces for eggs to 3 ounces for meats and poultry. Nutrient availability and food purchase category values were analyzed as a paired-t. Within a given family (holding number of members and age constant), months during which CSA baskets (June – September) were received were compared to months during which there was no CSA participation (October – December). The percentage of food wasted on average was assumed the same across months, or 10% for CSA basket items and 30% for all other (Buzby, Wells, and Hyman 2014).

As shown in Figure 5, purchases of fresh produce were significantly (at the 95% level or better) higher during CSA participation, and total produce purchases were 13% higher (39% fresh, 6% packaged, or 45% total during CSA; 21% fresh, 11% packaged, or 32% total post-CSA). While the increased purchases of fresh produce during the CSA months may be due to seasonality, it is worth noting that fresh produce is readily available at local grocery stores during post-CSA months as well, giving participants the opportunity to continue consumption after the CSA program. It is also likely that participants did not want to waste the CSA basket contents, and thus used as much of the fresh produce as possible, which is also reflected in the lower proportion of meals consumed outside the home.

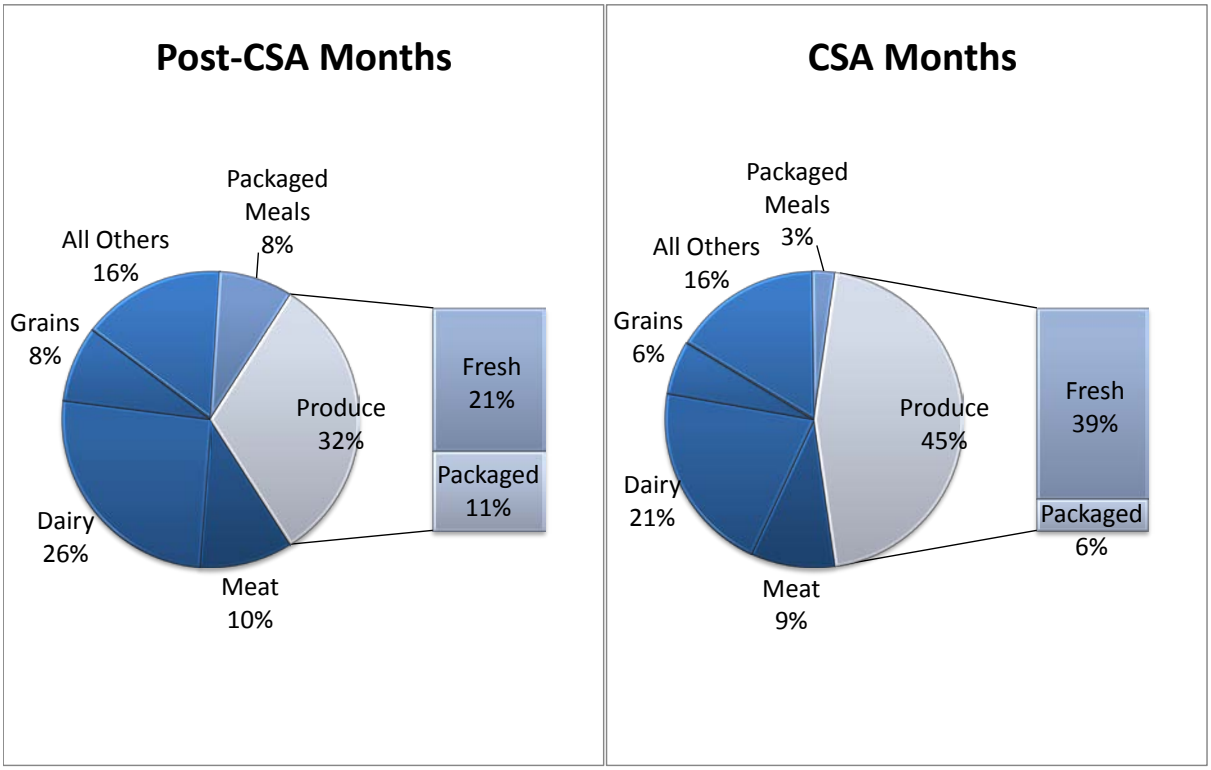

Figure 5. Participant Food Purchases by Weight (Percentage) in CSA and Post-CSA Months

Purchases of grain products fell significantly during CSA participation (5.9% CSA, 8.3% post-CSA), suggesting that fresh produce may have replaced grains in normal consumption. This was reflected as well in the significantly increased availability of Vitamin C and folic acid during CSA months, as fresh produce is a major source of these nutrients. While folate availability was above the RDA for both males and females (400 mcg/day) at all points during the study, some values were below the RDA for pregnant/lactating women (600 mcg/day) during post-CSA months. Several of the average Vitamin C availabilities were below the RDA (90 mg/day males, 75 mg/day females) in post-CSA months. Dairy product purchases were 5% lower during the CSA months, as well as packaged meals, which declined from 8% to 3%, but there was no difference in snack food purchases.

An increased availability of Vitamin B12 was also seen during CSA months, but could be due to seasonal effects. Red meats are the primary source of this vitamin and none of the foods provided in the CSA baskets contained this nutrient. Based on information taken from store receipts, more red meats were purchased (hamburger and hot dogs) during the summer months when the CSA was active, while poultry-based purchases were more common in post-CSA months. No other significant (at the 95% level or better) nutrient differences were found (ie. total calories, total saturated/trans fats, sugar, fiber, protein, sodium, etc.). Because purchases of grain products declined during CSA participation, it is likely the source of fiber changed from fresh produce in CSA months to whole grains in post-CSA months. Additionally, based on review of grocery receipts, a portion of the fresh produce purchases in CSA months consisted of lower fiber seasonal choices such as berries (as opposed to higher fiber vegetables). Fat calories mostly came from foods included in the "All Others" category that includes all snack foods (desserts,

chips, candy, etc.), which did not change based on CSA participation. The next largest source of fat calories was packaged meals, which were higher in post-CSA months. However, this was likely balanced by higher red meat purchases in CSA months verses higher poultry purchases in post-CSA months.

Discussion and Conclusions

This study examined the impacts of CSA membership on participant food choices and dietary intake, as well as food preparation attitudes and behaviors. Results show a definite shift in food preparation attitudes and behaviors as participants increased their consumption of meals at home, increased their cooking knowledge and storage/preservation of foods. They also became more interested in cooking and wine pairing classes, and remained interested in food preparation ideas and recipes. These are important outcomes as research shows that the prevalence of obesity is influenced by the number of meals consumed away from home, and that lack of familiarity with food preparation is one of the major driving factors in the proportion of restaurant meals consumed (French, Story, and Jeffery 2001; Rolls, Morris, and Roe 2002; Glanz et al. 1998; Condrasky and Hegler 2010).

Additionally, participant stated and revealed consumption of fresh produce increased during the CSA program, along with decreased consumption of grains, dairy, and packaged meals. Another important outcome as fresh produced consumption is associated with reduced risk for obesity and chronic diseases in people of all ages (Bradlee et al. 2010). Additionally, the increased fresh product consumption was coupled with increased availability of Vitamin C and folic acid in participant diets. Folic acid has been linked to the prevention of certain cancers, and decreased incidence of stroke, osteoporosis, cervical cancer, macular degeneration, and depression (CDC 2015). Participant consumption of snack foods, however, did not decline during the CSA program.

As this pilot study included only a small sample of participants, further studies which include a larger sample size and a more representative population, especially in terms of lower-income individuals of diverse ethnic backgrounds, are needed. However, this study shows the potential for CSA program membership to improve member diets, as well as food purchase and preparation choices, especially for fresh produce. Hence, public programs encouraging or providing CSA membership for participants may be beneficial, especially when paired with food preparation and nutrition instruction.

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CSAs and the Battle for the Local Food Dollar

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Abstract

The Community Supported Agriculture marketing model has evolved from its early roots, adapting to both increases in local food demand and consumer market engagement as well as to expanded competition for the local food dollar from a variety of other direct-to-consumer and intermediated sources. This paper explores the strategic positioning of CSAs in the changing food market and draws on descriptive summaries of observations from a recent survey of CSA managers to document specific trends in adaptations to the CSA business model. An application of the transaction versus alliance marketing framework is applied to local food distribution alternatives and opportunities for differentiation. CSA managers generally are aware of alternative channels for local food but primarily point to other CSAs and farm markets as the closest competition.

Keywords: Community Supported Agriculture, supply chains, business models, local food marketing

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Introduction

Local food demand has impressively expanded in almost every market channel that sells food. State branding programs have emerged in tandem with various other promotional strategies to convey the credence characteristic of local product origin to consumers that are increasingly expressing an interest in local identification. The annual National Grocers Association 2014 Consumer Report (National Grocers Association 2014) reported a fifth consecutive year increase in the proportion of national grocery shoppers selecting their primary grocery store for "offers locally grown produce and packaged goods" as "very important", now at 44.2%. The growth in farmers markets has been well documented (Diamond and Barham 2012, USDA Ag Marketing Service 2015), further reflecting a growing interest in local food. A recently released ERS report highlights USDA Census data on direct-to-consumer and intermediated sales of local foods, confirming growth in sales across various channels but also noting a strong role for intermediated market (Low et al. 2015).

The growth in interest in local food has stimulated research about the local food consumer with particular emphasis on identifying the heterogeneity of the preferences and motivations of the local food consumer (Adams and Adams 2011, Bond et al. 2009, Gumirakiza et al. 2014, Nie and Zepeda 2011, Williamson et al. 2012, Zepeda 2009; and, Zepeda and Li 2006). Strategic marketing has been carried out with a view to engaging various subsets of these "locavore" consumers (Hartman Group 2008, Stanton et al. 2012), a close connection to the Lifestyle of Health and Sustainability (LOHAS) market segment and pursued by natural food retailers like Whole Foods with strategies for core, mid-level, and periphery consumers (Wells and Haglock 2008). The growth in the local foods market has not been lost on food retailers in almost every retail and foodservice market channel. Retailers, as Wells and Haglock note, recognize these core consumers are demanding, but are less price sensitive, loyal, and are leading influencers in their own social circles.

Community Supported Agriculture (CSA) has been around for many years as an alternative marketing model for local food. This subscription-based model has tended to emphasize organic or sustainable production, shared risk though pre-paid season-long shares, and even a variety of on-farm activities where shareholder consumers would contribute labor or at least pick up at the farm in order to lower production and transaction costs. As CSA has expanded in use as a business model for farmers, it has also had to adapt to changing customers, technology, and competition. Growth in the utilization of the CSA model nationally has been documented and discussed in several places (Galt 2011, Galt et al. 2012), including some of the measurement and definition challenges. This has become even more complicated in recent years with wider utilization of subscription, home delivery, multi-farm aggregation strategies for direct marketing, and the ubiquitous emerging food hub concept (Matson and Thayer 2013).

Various surveys of CSA managers help us appreciate the changes that have taken place even over the last 15 years. One of the earlier efforts to survey CSA operations was conducted in 2001 (Lass et al. 2003) that characterized CSA operations as small (median of about 15 acres, about 80 full share equivalents), independent operations that depended substantially on interns and members for labor, 43% were certified organic – over 90% some combination of certified organic, organic, or biodynamic,and substantially viewed the CSA as a means for improving

their community involvement. Later surveys of CSA operations suggest managers were becoming more sophisticated in their business management practices (Woods et al. 2009), using a wide variety of distribution strategies for both single and multi-farm models (Galt et al. 2012), and e-commerce strategies for payment and distribution logistics (Huntley 2014).

CSA shareholders, following recent CSA demographic surveys (Bregendahl and Flora 2006; Pole and Gray 2012), closely reflect the values and influence demonstrated among core LOHAS group highlighted by Wells and Haglock. Still, this CSA consumer community is becoming an even more diverse consumer group reflecting what has been observed on local food consumers in general. Farm-based CSAs and other direct-to-consumer venues, wholesale distributors focusing on local consumers, and other food retailers looking to capture part of the market share are increasingly competing with each other while trying to build on their own business core competency.

Strategic reach considers the core competency of various firms competing for the local foods consumer. Each firm has its own unique capabilities and strategies and reaches to gain market share by building on a value proposition. Local food buyers and CSA shareholders within various models, exhibiting varying degrees of price sensitivity, motivations for wanting local food (or food community engagement), and varying degrees of access can be organized into the core-midlevel-periphery segments suggested by the Hartman Group (2008) and Wells and Haglock (2008).

One way to consider this idea of strategic reach by firms for the local food consumer (including those engaged at some level with CSA) is to think about the transaction-based versus alliance-based supply chain management approach suggested by Ross (1999). A useful contract in strategic approach is summarized from Ross in Table 1.This contrast in strategic reach or approach can be readily applied to the grocery community on the transaction-based end (marketing strategies employed with firms oriented to building transaction frequency and volume) to the single farm-based CSA on the alliance end (oriented toward building more value through fewer, closer customer relationships). The CSA model has traditionally distinguished itself from other retailers as highly engaging, building on relationships, information, and shared values that substantially drive grower and shareholder decision making. This presumably creates a competitive advantage for the CSA seeking to engage the core local food consumer that is pursuing a complex bundle of attributes nuanced by local foods researchers earlier.

Table 1. Ross' Transaction-Based vs Alliance Based Market Management Strategies

Transaction Based	Alliance Based
Short-term relationships	Long-term relationships
Multiple suppliers	Fewer suppliers
Adversarial relationships	Cooperative partnerships
Price dominates	Value-added services dominate
Minimal investment from suppliers	High investment for both buyer and supplier
Minimal information sharing	Extensive product, marketing, and logistics information sharing
Firms are independent	Firms are interdependent with joint decision making
Minimal interaction between respective functional areas	Extensive interaction between buyer and supplier functional areas

Source: D. Ross, Competing Through Supply Chain Management, (1999, 91)

An interesting dynamic among local food suppliers, including the CSA suppliers, has been the drift in strategic reach beyond their traditional core competency. Grocers and other specialty wholesalers have found ways to become more attractive to the mid-level or even core local food consumer as a result of improved in-store merchandising, expanded local foods inventory, and sustainability branding programs. The NGA Shopper Survey has reported six straight years of gains in "excellent" ratings for primary store performance relating to "offers locally grown produce and other locally sourced packaged foods"(National Grocers Association 2014). While controversial, retailers like Whole Foods and WalMart have been pushing to establish their own "responsibly grown" labels or a "sustainability index", with a view toward the emerging consumer demand for sustainable products (Karst 2015). Specialty wholesalers, on-line grocery shopping, and home delivery service models such as PeaPod or Door-to-Door Organics (Johnson 2014) are moving closer in similarity to the forward integration models developed by farmers through food hubs and multi-farm aggregation models.

CSAs, on the other hand, have pursued their own expansion of core competencies through various aggregation and multi-farm strategies to try and close the scale economies gap associated with production, distribution, and promotion. E-commerce and social media applications provide opportunities to CSAs to engage shareholders in new ways and creating virtual communities. These applications also lower search and other transaction costs. While these are generally positive developments in favor of the CSA, these applications also have tended to replace some of the mechanisms for personal interaction or participating in on-farm events. Pole and Gray show access to local and fresh food and convenience to be much more important motivations for joining a CSA than participating in farm activities or meeting like-minded people (Pole and Gray 2012). Many single farm CSAs that struggle with having enough local demand or see attrition have instead pursued multi-farm aggregation strategies or established more distant large-volume delivery sites that can capture the necessary scale economies .

Figure 1 provides a visual depiction of the type of local food consumer emphasized through the strategic reach of the various retailers, distributors, and CSAs. It further conveys the corresponding spectrum of the value propositions typically held by core, mid-level, and periphery local food consumers – particularly emphasizing the shift in the seller-buyer relationship from transaction-based to alliance-based exchange.The notion of price sensitivity relates closely to the transaction/alliance dichotomy, but is highlighted here to emphasize the appeal this consumer group has to all types of local food marketers. There are differences in market focus and strategic reach/capability within the retail grocery community itself as well as within the CSA community.The strategic reach and value proposition continuum, however, provides a framework for considering the increasingly overlapping strategies and market focus.

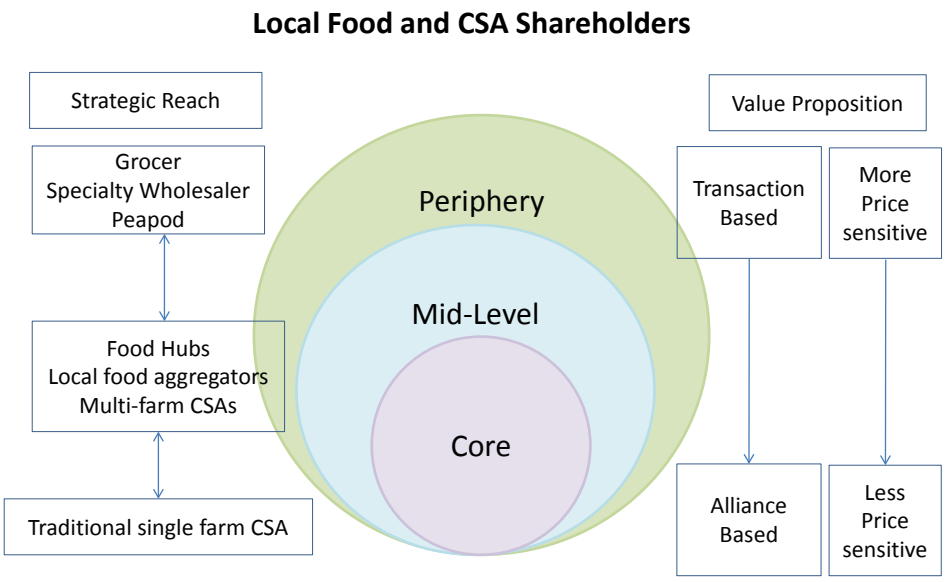

Figure 1. Local Food Strategic Reach and Value Proposition to CSA Shareholders

This paper draws on observations taken from a national survey of CSA managers to explore perceptions of demand trends, competition, and adapting strategies to changes in the local foods market place. The paper further examines the characteristics of adaptive strategies as to whether they are consistent with the traditional alliance-based orientation and, where, not, how they may be converging with the evolving strategic reach of alternative local food distribution systems.

Data from a National Survey of CSA Managers

A national survey of CSA managers was conducted in part to document the evolution of the CSA business model (Woods et al. forthcoming)[1]. This section summarizes some of the pertinent findings of this survey, but also examines the implications for strategic positioning of CSAs as they adapt to compete for the local food dollar.

A web-based survey was utilized to explore business development trends for CSAs nationally. The survey instrument was designed to examine current business characteristics, sales in related market channels, changes in production and marketing strategies, competition and local food demand, prospects for business cooperation, and shareholder recruitment. The target population was CSAs that had been in operation for at least two years, given the emphasis on changes in business activities.

A preliminary invitation was sent to the CSA manager explaining the goals of the study and the intention to conduct a national survey examining the changing CSA business model. Managers were given an option at that time to potentially participate or opt out. Surveys were distributed to

[1] This survey was part of a USDA-AMS cooperative agreement with the authors. Aspects of the survey are summarized here highlighting local foods market competition, shareholder recruitment patterns, and CSA emerging business functions. A detailed report summarizing this national survey is forthcoming.

2,100 addresses that did not opt out of the study, 525 to each region of the U.S.A first distribution was followed three weeks later by a second invitation. A total of 495 usable surveys were returned, yielding an approximate 24% effective return rate. Usable responses regionally were collected from the northeast (100), north central (119), southeast (87), and west (189), providing some differences in response rates by region.

Selected demographic characteristics of the CSA managers responding to the survey are summarized below in Table 2. Managers for CSAs tended to be female, younger, and holding relatively high education, consistent with observations in earlier surveys by Woods et al. (2009), Galt et al. (2012), and in the earliest surveys by Lass et al. (2003).

Table 2. Demographic Characteristics of CSA Managers

CSA Manager Characteristics	
Gender	N
Female	259
Male	171
Age	
18-24	7
25-34	102
35-44	116
45-54	92
55-64	87
65+	26
Education	
Less than high school	0
High school graduate or equivalent	16
some college/associate's degree	94
Bachelor's degree	187
Graduate or professional degree	131
Prefer not to answer	2

CSA managers were asked to assess the significance of emerging sources of competition across a variety of market channels where local food distribution is prevalent or growing. Managers were asked to place these businesses in a rank order as they were observed to be competing against their CSA. Eight business categories were provided and ranked competition as 1 = “highest” to 8 = “lowest”. New CSAs, farmers markets, and expansion of existing CSAs were ranked the highest. This was followed by natural food stores, other home delivery services, and traditional grocers offering local food.High end grocers and restaurants were ranked the lowest. Mean scores are summarized in Table 3.

Table 3. Significance of Emerging Sources of Competition Relating to CSA

Competing Business	Mean Rank	Std Dev
New CSAs entering the market	3.47[a]	2.16
Farm markets	3.48[a]	2.02
Established CSAs Expanding	3.90[a]	2.23
Natural food stores	4.65[b]	1.99
Other home food delivery services	4.65[b]	2.47
Traditional grocers offering local food	4.73[b]	2.14
High end grocers	5.25[c]	2.06
Restaurants offering local food	5.87[c]	2.13

Note: (Rate highest = 1 to lowest = 8);N = 433.Margins sharing a letter in the group label are not statistically different at the 5% level using a Tukey's multiple means statistic.

Overall, it appears that CSAs look to other farm direct to consumer models as providing the greatest competition. It would suggest that there is a prevailing sense of meaningful differentiation perceived compared to other local food distribution avenues. An interesting qualifier was provided by several CSA managers, noting that they felt there was still a high degree of complementarity associated with local food access being provided through other channels and that positive spillover effects were being realized as local food options increased. This would seem to be an interesting thread for future research related to local food market channels. There are certainly possibilities for network effects (Afuah 2013; Economides 1996; Farrell and Saloner 1986; Katz and Shapiro 1986), positive externalities and reputation gains for local products that can be realized as a market grows. The network effects concept has potential for both positive and negative consequence, enhancing value for a product as supply and a network for delivery grows, but also limiting growth in competitive markets when externalities can't be captured by individual participants lacking means for coordination (Liebowitz and Marglois 1994).

The issue of competition for local food by various market channels should not necessarily be expected to be uniformly regarded across all markets where CSAs are seeking to become established. The data allows a more detailed look at competition rankings by region, rural or urban location of the CSA, and how long the CSA has been in operation.

Mean rankings of emerging sources of competition for the CSA seem to reflect some slight regional differences in magnitude, although the rank order by market channel appears to remain about the same. Other home delivery services moved up the list in the west and traditional grocers offering local food in the southeast.

Perceptions of competition were examined between urban versus rural-based CSAs[2]. Again, the rank order was similar, but urban-based CSAs ranked home food delivery services and high-end grocers relatively higher for local food competition and farm markets lower compared to their rural-based counterparts. High-end grocers and home delivery services tend to locate in and

[2] CSA managers indicated the location of their CSA as near (within 50 miles) a large city (over 1 million) or small city (250,000 – 1 million) or as "small town" or "countryside". Urban-based CSAs representing the first two groups (58%) were slightly more common in the sample compared rural CSAs (42%).

focus on wealthy urban markets due to their particular market density requirements and more likely to be in direct competition with urban-based CSAs.

More established CSAs (in operation for more than 5 years) rated home delivery services higher and natural food stores lower than CSAs that had been in operation for a lesser duration. These results are summarized in Table 4.

Table 4. Emerging Competition Rankings by Region, Population Proximity, and CSA Age

	NE	NC	SE	W	Rural	Urban	Newer CSA	Older CSA
New CSAs entering market	3.01	3.27	3.65	3.76	3.33	3.57	3.55	3.40
Farm markets	3.37	3.42	3.56	3.55	3.26	3.64**	3.55	3.42
Established CSAs expanding	3.66	3.66	4.18	4.06	3.83	3.98	3.74	4.07
Natural food stores	4.67	4.59	4.94	4.54	4.52	4.76	4.43	4.87**
Other home food delivery services	5.21	4.64	4.77	4.33	4.96	4.44**	4.87	4.43*
Traditional grocers offering local food	5.06	4.59	4.59	4.70	4.86	4.62	4.67	4.78
High end grocers	5.06	5.74	4.76	5.24	5.54	5.02**	5.28	5.21
Restaurants offering local food	5.95	6.09	5.54	5.82	5.69	5.98	5.91	5.82

Note: t-tests were conducted for mean ranking levels for each market type between two group sets for rural-urban and newer-older CSAs.* and ** indicate statistical significance at the 10% and 5% levels. "Newer CSA" is defined here as having been in operation 5 years or less.

Most CSAs (85%) noted local food demand to be increasing in their market area, noted in Table 5, almost 25% suggesting it was increasing significantly. Strong demand would suggest the degree of competition for local may be less, providing insight beyond the simple ordinal ranking of source of competition. These CSA manager observations would seem to be consistent with strong local food demand indicators from the NGA surveys and the observed growth in community farm markets and food hubs. But this would also explain the significant interest in the local food market from retailers and distributors in other market channels.

Table 5. How would you rate the demand for local food in your market area?

Declining significantly	Declining somewhat	Staying about the same	Increasing somewhat	Increasing significantly	Total
4	11	48	257	106	426
0.9%	2.6%	11.3%	60.3%	24.9%	

Note: Percent represents of those that indicated they had a basis for knowing demand for local food

CSA managers may maintain a strong demand outlook for their market, but new shareholder recruitment and shareholder retention is an issue CSAs have struggled with for a long time (Bregendahl and Flora 2006). Managers reported an average 6% growth in overall number of shareholders to 2013 and 14% growth to 2014, but there was also evidence that new shareholder recruitment was becoming more challenging for certain types of CSAs. Recruitment difficulty for the 2014 season compared to other recent seasons was rated on a five level measure from "much less difficult" to "much more difficult" and summarized in Table 6. There were 30% of the CSAs in the northeast where some of the older CSAs are located, indicating recruitment was at least somewhat more difficult in contrast to 24%-25% in the other regions. Urban CSAs were more likely to indicate recruitment difficulty compared to their rural counterparts, as were older

CSAs. While local food demand outlook may be relatively strong, CSAs do need to be mindful of maturing markets. Shareholder turnover (Table 6) was clearly higher in the southeast and northeast compared to the north central region and slightly higher among older CSAs.

Table 6. CSA Shareholder Recruitment for 2014 by Region, Urban Proximity, and CSA Age

Recruitment Difficulty	NE	NC	SE	W	Rural	Urban	Newer CSA	Older CSA
Much less difficult	8%	16%	16%	8%	13%	10%	14%	8%
Somewhat less difficult	13%	20%	17%	15%	16%	16%	21%	12%
About the same	49%	39%	44%	52%	48%	46%	43%	51%
Somewhat more difficult	22%	18%	22%	20%	17%	23%	18%	23%
Much more difficult	8%	7%	2%	5%	5%	6%	4%	7%
N	76	88	64	156	164	220	194	190

Many CSAs have pursued a variety of adaptations from the business models common even 15 years ago (as noted in Lass et al 2003, for CSAs in 1999). A series of potentially changing CSA business functions are summarized in Table 7. Multi-farm marketing was noted to be at least "increasing some" by over half the CSAs.Multi-farm CSA strategies allow groups to pursue scale and scope economies in production and distribution. Multi-farm strategies appear to be increasing across all regions and among both the newer and more established businesses.

The original CSA subscription model concept employed single share purchases at the beginning of the season with a view toward helping farmers with cash flow and sharing in the risk of production uncertainty. CSA managers appear to be moving increasingly away from this original payment model. Flexible or installment payment plans have become much more widely used with more of a concern about the shareholder's cash flow consideration. Almost half of the CSAs indicated the use of installment payments was increasing, with 56% indicating an increase in the use of part-season or special shares. Communication with shareholders was noted to be increasing by the majority of managers, which fits in well with the relationship intensive marketing model characteristic of the CSA. Much of this communication now takes place in the form of social media and e-mail.

Web-based sales are increasing significantly, 28% of the managers indicating these were "increasing a lot". Web-based sales typically complement CSA sales and can either supplement a shareholder's purchase or be delivered at a relatively low cost to a consumer at a CSA drop site, similar to the Penns Corner Farm Alliance model (Woods et al. forthcoming). The Internet has certainly impacted the mechanisms and frequency of communication and community building among CSAs and shareholders. These changes are qualitative and relative changes reported by managers, but they suggest important and significant adaptations to earlier approaches to managing these businesses that are in response to new ways of engaging shareholders. Interestingly, the older, more established CSAs generally reported increases in these strategies – likely in part due to their opportunity to observe changes in technology and multi-farm options over a longer period. Northeast CSAs generally reported less change in the selected business functions.

The majority of CSA managers reported the contribution of CSA to their farm profits to be at least "increasing some" with a larger share reporting increases in the overall profitability of the CSA, although with some regional variation. Changes in various CSA business functions and CSA profitability are summarized in Table 7.

Table 7. Share Indicating Business Function "Increasing Some" or "Increasing a Lot" by Region and CSA Age

	Region				CSA Age	
CSA Business Function	**NE**	**NC**	**SE**	**W**	**Newer CSA**	**Older CSA**
Marketing cooperation with other producers	45.8%	47.9%	55.3%	56.4%	51.6%	52.0%
Flexible payment options (ie, installment plans)	43.2%	53.0%	49.1%	47.0%	46.0%	50.3%
Shareholder turnover	22.6%	16.8%	28.2%	19.0%	19.0%	22.4%
Communication with shareholders	55.2%	58.7%	52.8%	59.9%	53.6%	61.4%
Web-based sales	55.8%	74.3%	69.6%	66.1%	63.8%	70.2%
Contribution of CSA to overall farm profits	47.1%	57.1%	52.1%	45.9%	51.6%	48.1%
Overall profitability of CSA	48.8%	65.1%	54.1%	53.2%	53.9%	56.9%

Note: Percent represent of those indicating the production function applies to their operation.Increasing is relative and not an absolute measure here."Newer CSA" is defined here as having been in operation 5 years or less.

Conclusions and Implications

CSAs have continued to emphasize alliance-oriented and relationship-intensive strategies while adapting new communications and e-commerce tools as a means for maintaining their competitive advantage relative to other food retailers. Assessment of the competition by CSA managers suggests they view other CSAs and other similar direct market venues as being in more direct competition compared to the transaction-oriented retailers, although these retailers are aggressively pursuing expansion into the local foods market arena.

Managers generally have a strong outlook for local food demand, while trying to implement strategies that help them capture scale and scope economies and keep closely engaged. This may suggest that the "core" consumer base is also growing, although there may be some evidence of more market maturity in some regions. Alliance-type strategies become increasingly challenging as CSAs become bigger and move toward multi-farm models. Increasing scale with slower demand and/or higher shareholder attrition would necessarily involve reaching to mid-level or periphery consumers that are apt to be more price sensitive and better aligned with the strategic reach of other retailers. This paper suggests these types of CSA management strategies, while having short-term merit in gaining advantages in distribution, move CSAs closer to transaction-based models and converging with other retailers seeking to better provide local food options.

Farmers have been adapting the CSA model by finding a variety of ways to keep their shareholder community engaged. Social media and e-commerce present new ways of enhancing relationships and value within these communities and allow producers to tell the farm story better – reinforcing the sense of personal connection to the farm. Adapting the CSA model to allow more products, share types, and multi-farm collaborations with lower transaction costs and scale economies allows farms to better connect with core and even mid-level local food consumers compared to other competing intermediated models.

This study, although national in scope, has inherent limits with the focus on manager perceptions. Ideally specific financial metrics would be collected for each CSA to further quantify measures like profitability, dollar amounts of web-based sales, sales related to season-extension, and other financial data. There is a clear survey length and business information sensitivity tradeoff. Future studies of CSA operations, however, could strive to better document at least some of these elements in actual margins or sales. There is a sizeable sample of CSA managers represented in the survey, but a fair concern might be expressed about some degree of non-response bias among CSAs that may be struggling. Future studies would potentially consider evaluating a wider complement of alliance-based strategies employed by CSAs. An interesting analysis could be explored from the shareholder perspective in comparison to other non-CSA local food consumers that may fall in the mid-level or periphery category to document. Seller (local food distributor) choices by local food consumers can also reveal preferences for transaction or alliance based relationships around local food.

The future of CSAs based on these manager perspectives suggests an expectation of opportunities to build on largely growing demand for local food, an increased role for social media and other web-based interactions, and increasing scale and profitability, and contribution of the CSA to overall farm profits. The local food supplier market is becoming more crowded, but CSA managers have generally been able to adapt the traditional CSA model to meet the needs of the modern local food consumer competitively.

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Local Wine Expenditure Determinants in the Northern Appalachian States

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Abstract

Tennessee, Kentucky, Ohio, and Pennsylvania have seen significant increases in the number of wineries in the past decade. Most of the wine distribution has focused on premise sales, although a few of the larger wineries have started to explore other ways for market expansion. This study examines wine expenditure patterns for 1,609 wine consumers in this four state region. Expenditure functions estimated for total wine expenditure confirm expected factors that would positively impact wine purchases, such as wine knowledge and food preparation. But it is also observed that greater wine expenditures are associated with greater inclinations to buy local, suggesting opportunities for local wineries to establish a favorable point of differentiation in this market. Local wine expenditures are positively associated with wine knowledge and education. Our results also suggest those that consume more wine spend more on local wine and have a strong preference for local products in general, suggesting there may be opportunities for additional local food cross merchandising – particularly in places where wine is already being promoted and purchased in general.

Keywords: wine expenditure, local wine, wine knowledge, market segmentation

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Introduction

Wine consumption is increasing globally, and is expected to grow by 6.2% between 2010 and 2015, despite a long-term decline in consumption in western European wine-producing countries (New York Daily News 2012). The rise in consumption is largely driven by the United States, as it ranks number one in wine consumption, accounting for 13% of global consumption (Wine Institute 2014). Americans consume more wine than ever before, with 19 consecutive years of volume growth (Wine Institute 2013). Overall table wine consumption in the United States increased from 213 million cases in 2000 to 323 million cases in 2014 (Wine Institute 2015a).

Consumers in the United States are not only consuming more wine, but also more expensive wine. The United States, as the world's largest retail wine market, spent more than $40 billion on wine in 2010, according to Impact Databank (2010). The International Wine and Spirit Research predicts that the United States will increase its wine consumption by 10% between 2011 and 2015 (New York Daily News 2012).

While wine demand is increasing, so is the wine supply in the United States, mainly for domestic consumption. The U.S. wine industry was almost destroyed by war, Prohibition, and economic depression for about half of the 20th century. In the 1970s, the Californian wine industry started the national wine revival and several other states followed. In 1975, 34 states had wineries compared to 47 states in 1997 and 50 states in 2007 with about 60% of the wineries located outside of California (Canning and Perez 2008). U.S. wine exports have increase dramatically since the 1990s, with a record of 109.9 million gallons at a value of $872 million in 2007, almost a five-fold increase (Canning and Perez 2008).

Wine production and winery numbers in the Northern Appalachian states of Kentucky, Ohio, Tennessee and Pennsylvania have also increased significantly during the past decade, although wine production in the region is still quite small compared to California. The market share for these new wine-producing states is very small. The Wine Institute (2015a) estimates that in 2014 California accounted for 60% of all wines sold on the U.S. market by volume; other recent data suggest imported wines accounted for 31%; and wines from the other 49 states accounted for 8% (Hodgen 2011). According to a wine statistical report in 2009 from the Alcohol and Tobacco Tax and Trade Bureau (2010) California produced 634 million gallons of wine (89% of the U.S. wine production), Kentucky produced almost 2 million gallons of wine (0.28%), Ohio produced 1.1 million gallons of wine (0.16%), Pennsylvania produced 0.8 million gallons of wine (0.12%), and Tennessee produced almost 0.3 million gallons of wine (0.04%). According to Wines & Vines (2013), there were 3,532 wineries in California, 166 wineries in Pennsylvania, 142 wineries in Ohio, 66 wineries in Kentucky (Thornberry 2012) and 40 wineries in Tennessee in 2012.

Wineries local to this region tend to focus on on-premise sales or nearby markets, maintaining a much different market focus compared to larger wineries in large wine-producing regions (Woods et al. 2013). There are several challenges to local wineries in the Northern Appalachian region in addition to their small marketshare. First, local wineries use limited marketing channels, relying heavily on tourism or on premise sales. These tend to be particularly small wineries that do not have access to other distribution channels (Sun et al. 2014). competition is

fierce. Foreign producers are increasingly targeting the U.S. market as drinking habits have shifted. Wine consumption is decreasing in western European wine-producing countries such as France and Italy (Wine Institute 2015b).

While wine consumption in the United States is increasing, to be competitive even in the regional wine market, it is crucial for local wineries to understand consumers and develop effective marketing strategies. We explore the factors driving total wine expenditure and compare them with the factors driving local wine expenditure for consumers in Kentucky, Ohio, Tennessee and Pennsylvania. We also explore the determinants of the probability of trying a local wine. To better understand wine consumers' needs and buying habits, it is necessary to have a comprehensive understanding of wine consumers' characteristics (demographics, lifestyle, wine consumption, knowledge and preferences). With this information, small wineries can use specific marketing instruments, like target marketing, to promote their products. An important concept in target marketing is recognizing whether those who are targeted show a strong affinity or brand loyalty to that particular brand and understanding the values conveyed by that brand. Building brand loyalty is essential for local wine promotion and success in a crowded supplier market. Is there an opportunity for differentiation? Part of that branding strategy is the identification of the wine produced as local to the local market.

Market researchers apply different econometric methods to discern segments within wine consumer markets. These methods include segmentation according to geographic criteria, psychology, demographics, purchasing behavior (propensity to purchase), occasion for purchase or consumption, benefits sought by consumers, etc. There is a vast body of literature on wine market segmentation. Costanigro et al. (2007) argued that different prices mean different products, and segmented the wine market into different price categories. Their results confirmed that implicit prices for attributes differ across prices categories and at least two different wine classes exist: "consumption wines" and "collectible wines." Therefore, these classes identify differentiated products that fulfill different needs and should be considered separately. After examinining over 180 hedonic wine price models, Oczkowski and Doucouliagos (2015) identified a moderate price-quality correlation suggesting the existence of imperfect information regarding wine quality. They identified wine reputation as one of the most important structural vairables for price-quality studies and recommend wine producers to direct resources to improve reputation.

The Wine Market Council (2003) proposed five major behavioral wine segments of the U.S. population by consumption rate: super-core (consume wine daily), core (consume wine at least two or three times per month), marginal (consume wine at least two or three times per quarter), non-adopters (do not drink wine but drink other alcoholic beverages), and non-drinkers (do not drink any alcoholic beverages). Lancaster and Stillman (2009) segmented wine consumers into four categories based on generation: Traditionalists (born between 1900 and 1945), Baby Boomers (born between 1946 and 1964), Generation Xers (born between 1965 and 1977), and Millennials (born between 1977 and 2000). Thach and Olsen (2006) conducted a demographic wine market segmentation targeting millennial wine drinkers. Their results indicated that there is a need for greater wine advertising to this group utilizing fun, social, and relaxed settings; more innovative packaging and labels; a focus on "value" wines; as well as taste enhancements and environmental characteristics.

Johnson, Ringham and Jurd (1991) used conjoint choice analysis to do behavioral segmentation for the Australian wine market. They identified six distinct choice segments: "dry wine enthusiast", "white wine trendies", "Moselle preferrers", "price-sensitive white drinker", "red wine buffs", and "popular red brand preferrers". They found that key profile areas were demographics, values, lifestyle media habits, brand behavior, and brand perceptions. Bruwer and Li (2007) confirmed the existence of five lifestyle-related segments in the South Australia wine market. These segments are: "conservative, knowledgeable wine drinkers" (19.2%), "enjoyment-oriented, social wine drinkers" (16.2%), "basic wine drinkers" (23.5%), "mature, time-rich wine drinkers" (18.2%), and "young professional wine drinkers" (22.9%). They also recognized the evolving nature of this market. Within the U.S. wine market, geographic segmentation demonstrated that most wine consumers live near major cities, such as San Francisco, Los Angeles, Miami, Seattle, and Chicago (ACNielsen 2003).

Arias-Bolzmann et al. (2003) treated country of origin, quality, variety and age as predictors of wine prices, using data from the *Wine Spectator* magazine. Their results confirmed that the North American wine market recognizes differences in country of origin, quality and variety. Zhao (2008) compared the classification systems and structure in the California and French wine industries. The author found that similar categories and wine attributes affect wine price differently under different classification systems. Ali and Nauges (2007) showed that in the short-term pricing depends on reputation to a larger extent than in quality by using data on Bordeaux wines.

This literature documents the heterogeneity of preferences across wine consumers and subsequent opportunities for targeted marketing. However, there are fewer studies on preferences for local wines, particularly across types of wine consumers.

In this study, we explore the answers to three research questions: 1) what are the determinants of total wine expenditure? 2) what are the determinants of local wine expenditure? and 3) what are the determinants of the probability of purchasing a local wine? We use the results from a four state survey of 1,609 wine consumers in Pennsylvania, Ohio, Kentucky and Tennessee. We use a market segmentation model following a Hartman consumer survey on natural foods consumers (The Hartman Group 2000). We classify wine consumers into three categories according to their wine purchases: periphery (at least once per year), mid-level (at least once per month), and core (at least once per week) (Woods et al. 2013). We differentiate between total wine expenditure and local wine expenditure to identify differences among consumers choosing local wine to help local wineries develop effective marketing strategies.

There are several contributions from this study. It contributes to the understanding of Northern Appalachian wine consumer characteristics and expenditure patterns, and subsequently provides a framework for future market strategies for the development of wineries in general and local wineries in specific based on segmentation observations. It is a reasonable expectation that there may be some differences between the factors contributing to local wine purchase (defined here as produced within the state of the wine consumer) as opposed to wine purchases in general.

Data

The data used in this paper were collected using a web-based consumer survey distributed and managed by Zoomerang, an affiliate of Market Tools, Inc. Each participant was double pre-screened, to ensure they were at least 21 years old, and they were wine consumers. A total of 1,609 complete observations were collected in September, 2012. Participants were recruited from Tennessee (403 observations), Kentucky (402 observations), Ohio (401 observations), and Pennsylvania (403 observations).

Survey participants were asked about their wine consumption and purchase habits in the past 12 months, including their expenditures on all types of wine, expenditure on local wine, wine consumption frequency, purchasing habits regarding differently priced wines, past local wine experience, wine knowledge level, local purchase frequency for all products, lifestyle, as well as demographic information.[1] Variables used as dependent and independent variables are defined in Tables 1 and 2 (see Appendix for Table 2).

Table 1. Definitions and Sample Statistics of Dependent Variables (N = 1,609)

Variables	Description of Variables	Mean	Std. Dev.	Min.	Max.
Total_expend	Categorical variable from 1 to 6 if respondents indicate their average monthly expenditure on **ALL wine** within the past 12 months either on: 1. Less than $20; 2. $20-$39; 3. $40-$59; 4. $60-$79; 5. $80-$99; and 6. $100 or more.	2.45	1.60	1	6
Local_expend	Categorical variable from 1 to 6 if respondents indicate their average monthly expenditure on **State wine** within the past 12 months either on: 1. Less than $20; 2. $20-$39; 3. $40-$59; 4. $60-$79; 5. $80-$99; and 6. $100 or more.	1.38	1.00	1	6
Local_tried	Binary variable=1 if respondents have tried what they know to be a state local wine within the past 12 months.	0.38	0.48	0	1

From our sample of 1,609 consumers, 627 respondents (38%) indicated that they tried a state local wine (defined as from a winery within their state) and 34% purchased local wine in the past 12 months, while 45% visited a local winery in the past three years. There are observable differences in the absolute expenditure levels, purchase frequency, and the frequency of wine purchases by quality/cost category. Monthly wine expenditure was self-reported and ranged from $10 to $110, with a mean of $39 for the total sample and $34.62 for the local sample, with only a small fraction (12.92%) reporting zero expenditures on local wine in the last year (no zeroes for the total sample). In terms of wine purchase frequency, 57.60% of consumers purchased wine at least once per month, and 12.11% purchased wine at least once per week in the total sample, while 67.45% of consumers purchased wine at least once per month, and 16.74% purchased wine at least once per week in the local sample. Consumers in both samples buy more wine in the super category ($7-$14 per bottle) on average, 71.4% of total sample and 78.30% of the local sample consumers bought a bottle of wine priced $7-$14 often. Around 50% of the consumers believed their wine knowledge was average to above average in the total sample, compared to 62.67% in the local sample. More information comparing expenditure and consumption characteristics of our total and local consumers is found in Table 3 (see Appendix).

[1] For more information about the survey and data see Woods, Nogueira and Yang (2013).

Methodology

The methodology used to estimate the determinants of total and local wine expenditure in this study follows the random utility theory, which accounts for an optimization of consumer utility for every choice consumers make on wine expenditure. Therefore, an ordered logit model can be specified as: $y_i^* = x_i'\beta + u_i$. We define: $y_i = j$ if $\gamma_{j-1} < y_i^* < \gamma_j$ in a given *M*-alternative ordered model where $\gamma_0 = -\infty$, and $\gamma_M = \infty$. The error term, u_i, is assumed to be independent and identically distributed, and the ordered logit model has a logistic cumulative distribution function: $F(z) = e^z/(1+e^z)$. Since wine consumers were asked to choose their total expenditure in six categories, i.e. "less than $20," "$20-$39," "$40-$59," "$60-$79," "$80-$99," and "$100 or more," the *M*–alternative equals 6 and the ordered logit model can be framed as:

(1) $y_i^* = x_i'\beta + u_i$,
(2) $y_i = 1$ if $y_i^* \le 0$,
(3) $y_i = 2$ if $0 < y_i^* \le \gamma_1$,
(4) $y_i = 3$ if $\gamma_1 < y_i^* \le \gamma_2$,
(5) $y_i = 4$ if $\gamma_2 < y_i^* \le \gamma_3$,
(6) $y_i = 5$ if $\gamma_3 < y_i^* \le \gamma_4$,
(7) $y_i = 6$ if $y_i^* > \gamma_4$,

To explain the optimal decision on wine expenditure for each consumer, y_i^* represents wine consumers who would be better off when they spend a certain amount of dollars for wine within a range at each expenditure level. The explanatory variables, x, consist of wine consumption frequency, geographic factors, various lifestyle factors, wine knowledge, past experience with local wine, general support for local food, common wine price points, and demographic factors. The model specification for total or local wine expenditure is:

(8) $$Y = \beta_0 + \beta_1 Male + \beta_2 Age + \beta_3 White + \beta_4 Wine\_drinkers + \beta_5 Income + \beta_6 Income^2 + \beta_7 Education + \beta_8 Education^2 + \beta_9 Kids + \beta_{10} Urban + \beta_{11} PA + \beta_{12} KY + \beta_{13} TN + \beta_{14} Residency2 + \beta_{15} Residency3 + \beta_{16} Buy\_local2 + \beta_{17} Buy\_local3 + \beta_{18} Food\_channel + \beta_{19} Prep\_freshfood2 + \beta_{20} Prep\_freshfood3 + \beta_{21} Wine\_knowledge2 + \beta_{22} Wine\_knowledge3 + \beta_{23} Grade\_Popular + \beta_{24} Grade\_Super + \beta_{25} Grade\_Ultra + \beta_{26} Grade\_Luxury + \beta_{27} Local\_Range + \beta_{28} Type\_White + \beta_{29} Type\_Red + \beta_{30} Type\_Fruit + \beta_{31} Type\_Champagne + \varepsilon$$

where *Y* represents the category of wine expenditure for total or local wine, β_s are the estimated coefficients, and ε is the error term. Dependent variables are defined in Table 1 and independent variables in Table 2 (see Appendix).

The maximum likelihood method is used to estimate the ordered logit model. The estimated coefficients and odds ratios are provided for interpretation. The odds ratio is calculated by taking the exponent of the estimated coefficient. A positive odds ratio represents the odds of a specific

wine expenditure increase with a higher value of the explanatory variable. However, when the estimated coefficient is negative, the odds ratios would be between 0 and 1, the odds of a specific wine expenditure decreases for the explanatory variable.

One of the assumptions for the ordered logit model is the proportional odds assumption, which means that the estimated coefficients among pairs of outcome groups are the same. Therefore, based on the Chi-Square Score examination in the logistic procedure provided by SAS, a rejected null hypothesis for the proportional odds assumption suggests that the ordered logit model is not valid and one should use a less restrictive model. Each ordered logit model with total or local wine expenditure is examined and the test outcome provided in Tables 4 and 5 (see Appendix).

We assume that consumers optimize their utility when they decide to purchase a local wine. Thus, we also use random utility theory to explain the consumer decision on purchasing local wine. The probability of purchasing a local wine can be explained by wine consumption frequency, geographic factors, various lifestyle factors, wine knowledge, past experience with local wine, general support for local food, common wine price points, and common demographic factors. In the determinants of the probability of purchasing local wine, this study follows the same independent variables as in equation 8. A logistic model is used in determining the probability of purchasing a local wine. The logistic model can be specified as:

$$(9)\quad p = L(x_i'\beta) = \frac{e^{x_i'}\beta}{1+e^{x_i'\beta}}$$

where β is an estimated parameter, x is a vector of regressors, and $L(.)$ is the standard logistic distribution function. To explain the estimated parameters we use the marginal effect since it accounts for the probability regarding the independent variables. The calculation of marginal effects is:

$$(10)\quad \frac{\partial p_i}{\partial x_j} = \frac{\partial \Pr[y_i = 1 \mid x_i]}{\partial x_{ij}} = \frac{\partial L(x_i'\beta)}{\partial x_{ij}} = \frac{\sum L(x_i'\beta)[1 - \sum L(x_i'\beta)/n]}{n}\beta_j.$$

The examination of the logistic model also provides McFadden's Adjusted R^2, Correctly Predict, and Goodness-of-fit for the model in Table 6 (see Appendix).

Results

The general expenditure function for all wine among consumers in this region suggests several variables are important determinants to explain wine expenditure variation. The ordered logit regression results are summarized in Table 4 (see Appendix). State dummy variables were significant, suggesting some heterogeneity in expenditure across the four states. The propensity to buy more local food and prepare food at home were positive, suggesting these food purchase behaviors are complementary to wine purchase.

Wine knowledge is also positively related to wine purchases. These results were expected. The frequency of wine purchase by cost category also proved to be a good indicator of overall expenditure. These variables are essentially frequency of purchase measures that one would expect to be positively correlated to overall wine expenditure, the frequent purchase of the higher

cost luxury wines providing the largest impact on expenditure. Frequent purchase of white or red wines were also significant coefficients.

It is important to keep in mind that this total wine expenditure regression looks at expenditure patterns for consumers specifically in Tennessee, Kentucky, Ohio, and Pennsylvania. These results do provide, however, a way to characterize wine consumers in the region that could have promotional implications for regional wine marketing in general.

The Brant test suggested a violation of the parallel coefficients assumption that might be employed in a regular logit model.[2] The full multinomial logit model is presented with specific marginal effects reported for each total wine expenditure class.

The odds ratio allows us to interpret the coefficients in terms of relative likelihood of a higher value for the independent variable. A positive coefficient estimate, such as Buy_local2 at 0.581 with an odds ratio of 1.787, means the odds of spending more on wine is 1.787 times more likely for those consumers indicating that they "often" or "always" purchase what they know to be locally produced foods. The odds ratio, then, allows us to not only determine the positive or negative effects, but the magnitude of the effect.

Similar regressors were applied to expenditures on local wine, summarized in Table 5 (see Appendix). Male wine consumers and those that reported larger numbers of wine consumers in the home were more likely to have higher local wine expenditures. Income also had a positive effect, although at a decreasing rate. Urban wine consumers were less likely to have higher local wine expenditures. Frequent wine purchasing in general, not surprisingly, is a strong determinant of local wine expenditure as is inclination to buy local products. Wine consumers "often" and "always" purchasing local food were 4.1 times more likely to spend more on local wine than those that never purchase what they know to be locally produced foods.

Overall wine knowledge strongly impacted expenditure levels for local wine, suggesting wine connoisseurs are more likely to have given local wines a trial and not dismissing them without experiencing them. Wine consumers that purchased relatively higher priced wines (particularly the luxury category above $25/bottle) were also more likely to have a higher expenditure on local wine. Local wine prices tend to be higher due to their smaller scale of production and not particularly targeted to the value price shopper. It is not surprising to see positive relations to local wine expenditure with frequent purchases of higher priced wine categories here.

Fruit wine consumption turned out to be a strong determining factor for local wine consumption, interestingly not significant for overall wine expenditure. Consumers indicating that they often or always purchased fruit wine were 2.38 times more likely to have a higher expenditure on local wine compared to those that did not. Fruit wines are a popular product among many small and local wineries, supplementing their grape-based wines as a means for product differentiation.

The expenditure functions for all wine versus just local wine suggest several important differences. Several variables were significant explaining local wine expenditures that were not significant for all wine. Gender (male) and income show up as positive factors for local wine

[2] The results of the Brant test are available upon request.

expenditure and urban shows up as a negative factor– none of these emerging as significant factors for overall wine expenditures. Fresh food preparation, significant for overall wine expenditure, was not a significant determinant for local wines. The heterogeneity observed for overall wine expenditure across states also did not present itself in the local wine results. The specific relation between local wine expenditure and general wine consumption is captured in "core", "mid-level", and "periphery" variables included in the local model. Core and mid-level categories of general wine purchase are positively influencing the local wine expenditure (relative to the periphery category), suggesting more general wine consumption positively affects local wine consumption.

The final model explored the actual likelihood of purchasing local wine using similar determinants, with local trial being a simple response to "tried/not tried a local wine within the past 12 months" (Table 6, see Appendix). This binary logit model would be expected to follow a somewhat similar pattern observed in the expenditure regression, but providing a more general perspective of product awareness and likelihood to consume, recognizing reported trial of a local wine is a less accurate consumption measure than local wine expenditure.

Male, ethnically white, and more frequent wine consumers were more likely to have tried a local wine. Income and education were also positively related, increasing at a decreasing rate (with the negative squared term). Urban consumers were less likely to have tried a local wine. Tennessee consumers were less likely than Ohio (the base) consumers. Propensity to buy local products and knowledge of wine in general, as in the expenditure function, were also a strong determinants. Frequent consumption of the middle priced wine categories were significant. The local trial regression also pointed to both frequent purchase of white wines and fruit wines as significant determinants of trial. The pseudo R^2 for this regression was 0.116 while correctly predicting 68.74% of the responses.

Conclusions

Wine consumption per capita in the United States moved to their highest levels in 2013 at 2.82 gallons and a total national wine consumption twice what it was in 1979 (Wine Institute 2014), as noted earlier. A steadily growing market has created demand for imports, large domestic producers, and small regional wineries. This competition plays out in local areas where local wineries have pursued their niche in the market. Heterogeneity in wine consumer preferences creates the potential for segmenting and targeting wine consumers with particular tastes. The results of overall wine expenditure suggests considerable variation in who purchases wine and to what extent within the Northern Appalachian states of Tennessee, Kentucky, Ohio, and Pennsylvania. Expenditure functions estimated for total wine expenditure confirm expected factors that would positively impact wine purchases, such as wine knowledge and fresh food preparation. A positive connection for local wines with the established wine consumer community should result in a continued growth for local wines as general wine consumption continues to expand. It is also observed that greater wine expenditures are associated with greater inclinations to buy local among general wine consumers, suggesting continued opportunities for local wineries to establish a favorable point of differentiation in this market. These opportunities could be pursued through joining local foods merchandising efforts of existing grocery retailers, restaurants that featured local foods, or local food festivals and events. These results provide

some possible market growth directions to wineries that have traditionally limited themselves to on-premise sales.

Expenditures on local wine are a subset of total wine expenditures, but appear to have somewhat different determinants. They are observed to be driven by gender (more by male consumers), overall frequency of consumption, propensity to buy local, and overall wine knowledge. There appears to be some price sensitivity for local wines. Wine consumers indicating frequent purchases of luxury price category wines had the highest local wine expenditure, but only 15% of the surveyed population indicated purchasing wine in these price ranges "sometimes" or "often".

The relation between local wine expenditure and a number of the independent variables clearly differ across the six expenditure categories, as noted by the marginal effects. These results suggest some heterogeneity of preferences for local wine among Northern Appalachian consumers. Some factors, such as income, number of wine consumers per household, wine knowledge, and frequent purchase of more expensive wines are not surprisingly positively associate with higher local wine expenditure.

As local wine expenditures are positively associated with general wine knowledge and overall education, these results reiterate the opportunities to promote and differentiate local wine in the established wine consumer community. Our results also suggest that local wine may become better accepted as periphery wine consumers expand wine consumption and become more knowledgeable about wine in general. We find that those who consume more wine spend more on local wine and also have a strong preference for local products in general, suggesting there may be opportunities for additional local food cross merchandising – particularly in places where wine is already being promoted and purchased in general

Local wine trial results point more directly to evidence of different consumer segments that could serve as target markets. Local wine has tended to have a better reception – or at least trial – among higher income, higher educated consumers that already have a good knowledge of wine. Wine knowledge and consumption in the region is increasing but local wines are still an underdeveloped market. General education about wine seems to positively impact local trial and expenditure. There is evidence regionally of more heterogeneous wine preferences among those consumers choosing more local wine – especially preferences for fruit wine. White grapes and fruit for wine have been typically easier to grow in the region and subsequently easier to manufacture into better wines.

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Appendix

Table 2. Definitions and Sample Statistics of Independent Variables (N = 1,609)

Variables	Description of Variables	Mean	Std. Dev.	Min.	Max.
Male	Binary variable=1 if respondent is male.	0.30	0.46	0	1
Age	Continuous variable; year of age.	52.80	14.26	21	82
Wine_drinkers	Count variable for the number of wine drinkers at respondent's household.	1.77	0.70	1	6
White	Binary variable=1 if respondent's race is white.	0.90	0.29	0	1
Income	Continuous variable; total yearly household income before tax ($1,000).	67.33	41.12	7.5	225
Education	Continuous variable; year of education.	14.56	2.10	9	18
Kids	Binary variable=1 if respondent has kids under 18 at home.	0.26	0.44	0	1
Urban	Binary variable=1 if respondent is from urban (including city and suburb).	0.63	0.48	0	1
OH	Binary variable=1 if respondent is from Ohio.				
PA	Binary variable=1 if respondent is from Pennsylvania.	0.25	0.43	0	1
KY	Binary variable=1 if respondent is from Kentucky.	0.24	0.43	0	1
TN	Binary variable=1 if respondent is from Tennessee.	0.25	0.43	0	1
Residency1	Binary variable=1 if respondent has lived in the state for 1-4 years.	0.05	0.22	0	1
Residency2	Binary variable=1 if respondent has lived in the state for 5-9 years.	0.08	0.28	0	1
Residency3	Binary variable=1 if respondent has lived in the state for 10 or more years.	0.85	0.34	0	1
Core	Binary variable=1 if respondent has purchased wine for any occasion within the past 12 months at least once per week.	0.12	0.32	0	1
Mid_level	Binary variable=1 if respondent has purchased wine for any occasion within the past 12 months at least once per month.	0.45	0.49	0	1
Periphery	Binary variable=1 if respondent has purchased wine for any occasion within the past 12 months at least once per year.	0.42	0.49	0	1
Buy_local1	Binary variable=1 if respondent never purchases what they know to be locally produced foods.	0.06	0.23	0	1
Buy_local2	Binary variable=1 if respondent sometimes purchases what they know to be locally produced foods.	0.52	0.49	0	1

Table 2. *Continued*

Variables	Description of Variables	Mean	Std. Dev.	Min.	Max.
Buy_local3	Binary variable=1 if respondent often and always purchases what they know to be locally produced foods.	0.41	0.49	0	1
Food_channel	Binary variable=1 if respondent watches the food channel or similar programs.	0.75	0.42	0	1
Prep_freshfood1	Binary variable=1 if respondent never prepares fresh food at home.	0.02	0.16	0	1
Prep_freshfood2	Binary variable=1 if respondent prepares fresh food at home for 1-6 times per month.	0.25	0.43	0	1
Prep_freshfood3	Binary variable=1 if respondent prepares fresh food at home for 7 times above per month.	0.72	0.44	0	1
Wine_knowledge1	Binary variable=1 if respondent rates their wine knowledge as a “little” and “novice” level.	0.50	0.50	0	1
Wine_knowledge2	Binary variable=1 if respondent rates their wine knowledge as an “average” level.	0.37	0.48	0	1
Wine_knowledge3	Binary variable=1 if respondent rates their wine knowledge as an “above average” and “expert” level.	0.12	0.32	0	1
Grade_popular	Binary variable=1 if respondent purchases popular wine ($4-$7/bottle) at the frequency of sometimes and often.	0.50	0.50	0	1
Grade_super	Binary variable=1 if respondent purchases super wine ($7-$14/bottle) at the frequency of sometimes and often.	0.71	0.45	0	1
Grade_ultra	Binary variable=1 if respondent purchases ultra wine ($14-$25/bottle) at the frequency of sometimes and often.	0.43	0.49	0	1
Grade_luxury	Binary variable=1 if respondent purchases luxury wine (above $25/bottle) at the frequency of sometimes and often.	0.15	0.36	0	1
Local_range	Continuous variable; respondent defines local winery in terms of mile range from their home.	60.68	64.82	0	1001
Type_white	Binary variable=1 if respondent indicates the white wine purchasing frequency as “often” and “usually/always.”	0.43	0.49	0	1
Type_red	Binary variable=1 if respondent indicates the red wine purchasing frequency as “often” and “usually/always.”	0.52	0.49	0	1
Type_fruit	Binary variable=1 if respondent indicates the fruit wine purchasing frequency as “often” and “usually/always.”	0.33	0.47	0	1
Type_champagne	Binary variable=1 if respondent indicates the champagne/sparkling purchasing frequency as “often” and “usually/always.”	0.24	0.43	0	1

Table 3. Consumption Characteristics' Comparison in Total versus Local Samples.

Consumption Characteristics	Total Wine Expenditure (1,609)	Local Wine Expenditure (627)
Expenditure		
<$20	38.66%	52.31%
$20-$39	22.93%	25.52%
$40-$59	17.72%	9.57%
$60-$79	9.14%	4.31%
$80-$99	4.29%	1.28%
$100 or more	9.26%	7.02%
Core	12.11%	16.74%
Mid_level	45.49%	50.71%
Periphery	42.38%	32.53%
Buy_local1	6.09%	3.34%
Buy_local2	52.14%	43.54%
Buy_local3	41.77%	53.12%
Food_channel	75.69%	78.78%
Prep_freshfood1	2.73%	1.75%
Prep_freshfood2	25.06%	20.26%
Prep_freshfood3	72.21%	77.99%
Wine_knowledge1	50.66%	37.33%
Wine_knowledge2	37.29%	43.54%
Wine_knowledge3	12.05%	19.13%
Grade_popular	50.21%	50.87%
Grade_super	71.40%	78.30%
Grade_ultra	43.74%	52.95%
Grade_luxury	15.96%	21.37%
Local_range	60.68	63.13
Type_white	43.25%	51.03%
Type_red	52.75%	59.16%
Type_fruit	33.37%	40.50%
Type_champagne	14.84%	17.53%

Note. Expenditure level <$20 includes no zeroes for the total sample and 12.92% zeroes for the local sample. All consumers in the local sample have tried a local wine. Local_range is defined in miles.

Table 4. Total Wine Expenditure

Dependent Variable	Total Wine Expenditure		Marginal Effects					
	Coefficient	O.R [a]	Less than $20	$20-$39	$40-$59	$60-$79	$80-$99	$100 or more
Male	0.154	1.166	-0.035	-9.4e-05	0.012	0.009	0.004	0.008
	(0.106)		(0.023)	(0.001)	(0.008)	(0.006)	(0.003)	(0.005)
Age	-0.002	0.997	0.0005	-8.2e-06	-0.0002	-0.0001	-6.8e-05	-0.0001
	(0.003)		(0.000)	(0.000)	(0.0003)	(0.0002)	(0.0001)	(0.0002)
Wine_drinkers	-0.102	0.902	0.023	-0.0003	-0.008	-0.006	-0.002	-0.005
	(0.069)		(0.015)	(0.000)	(0.005)	(0.004)	(0.001)	(0.003)
White	-0.019	0.980	0.004	-4.4e-05	-0.001	-0.001	-0.0005	-0.001
	(0.164)		(0.037)	(0.000)	(0.013)	(0.010)	(0.004)	(0.008)
Income	0.002	1.002	-0.0005	8.6e-06	0.0002	0.0001	7.1e-05	0.0001
	(0.003)		(0.000)	(0.000)	(0.0003)	(0.000)	(0.0001)	(0.0001)
$Income^2$	0.00001	1.000	-4.5e-06	6.6e-08	1.6e-06	1.2e-06	5.4e-07	1.0e-06
	(0.000)		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education	-0.344	0.708	0.079	-0.001	-0.029	-0.021	-0.009	-0.018
	(0.378)		(0.086)	(0.002)	(0.032)	(0.023)	(0.010)	(0.019)
$Education^2$	0.009	1.009	-0.002	0.00003	0.0008	0.0005	0.0002	0.0005
	(0.012)		(0.002)	(0.000)	(0.001)	(0.000)	(0.000)	(0.0006)
Kids	-0.010	0.989	0.002	-0.00003	-0.0009	-0.0006	-0.0002	-0.0005
	(0.119)		(0.027)	(0.000)	(0.010)	(0.007)	(0.003)	(0.006)
Urban	0.088	1.092	-0.020	0.0004	0.007	0.005	0.002	0.004
	(0.101)		(0.023)	(0.000)	(0.008)	(0.006)	(0.002)	(0.005)
PA	0.027	1.027	-0.006	0.00006	0.002	0.001	0.0007	0.001
	(0.138)		(0.031)	(0.000)	(0.011)	(0.008)	(0.003)	(0.007)
KY	0.549***	1.732***	-0.120***	-0.008	0.043***	0.035***	0.016***	0.032***
	(0.141)		(0.029)	(0.005)	(0.010)	(0.009)	(0.005)	(0.009)
TN	0.539***	1.715***	-0.118***	-0.007	0.043***	0.034***	0.016***	0.032***
	(0.140)		(0.029)	(0.005)	(0.010)	(0.009)	(0.005)	(0.009)
Residency2	-0.306	0.735	0.072	-0.006	-0.026	-0.017	-0.007	-0.014
	(0.257)		(0.062)	(0.009)	(0.022)	(0.013)	(0.005)	(0.010)
Residency3	-0.073	0.928	0.016	0.00001	-0.006	-0.004	-0.002	-0.003
	(0.214)		(0.048)	(0.000)	(0.017)	(0.013)	(0.006)	(0.011)
Buy_local2	0.581**	1.787**	-0.133**	0.002	0.048**	0.035**	0.015**	0.030**
	(0.234)		(0.053)	(0.004)	(0.019)	(0.014)	(0.006)	(0.012)
Buy_local3	0.749***	2.114***	-0.167***	-0.003	0.060***	0.046***	0.021***	0.042***
	(0.240)		(0.052)	(0.005)	(0.018)	(0.015)	(0.007)	(0.014)
Food_channel	0.131	1.140	-0.030	0.001	0.011	0.007	0.003	0.006
	(0.117)		(0.027)	(0.001)	(0.010)	(0.006)	(0.003)	(0.005)
Prep_freshfood2	0.819**	2.269**	-0.174**	-0.018	0.061**	0.053**	0.025*	0.052*
	(0.393)		(0.076)	(0.018)	(0.024)	(0.026)	(0.014)	(0.030)
Prep_freshfood3	0.716*	2.047*	-0.169*	0.016	0.061*	0.040**	0.017**	0.033**
	(0.386)		(0.093)	(0.017)	(0.032)	(0.020)	(0.008)	(0.016)
Wine_knowledge2	0.743***	2.102***	-0.164***	-0.006	0.059***	0.046***	0.021***	0.043***
	(0.107)		(0.022)	(0.005)	(0.008)	(0.007)	(0.004)	(0.007)
Wine_knowledge3	1.094***	2.987***	-0.213***	-0.050***	0.066***	0.073***	0.039***	0.084***
	(0.165)		(0.026)	(0.015)	(0.007)	(0.012)	(0.008)	(0.018)

Table 4. *Continued*

Dependent Variable	Total Wine Expenditure		Marginal Effects					
	Coefficient	O.R [a]	Less than $20	$20-$39	$40-$59	$60-$79	$80-$99	$100 or more
Grade_popular	0.104	1.110	-0.024	0.0003	0.008	0.006	0.002	0.005
	(0.101)		(0.023)	(0.000)	(0.008)	(0.006)	(0.002)	(0.005)
Grade_super	0.274**	1.315**	-0.064**	0.003	0.023**	0.016**	0.007**	0.013**
	(0.112)		(0.026)	(0.002)	(0.009)	(0.006)	(0.002)	(0.005)
Grade_ultra	0.532***	1.702***	-0.120***	-0.0005	0.044***	0.032***	0.015***	0.029***
	(0.113)		(0.025)	(0.003)	(0.009)	(0.007)	(0.003)	(0.006)
Grade_luxury	0.882***	2.415***	-0.181***	-0.030***	0.061***	0.058***	0.029***	0.061***
	(0.141)		(0.025)	(0.010)	(0.008)	(0.010)	(0.006)	(0.013)
Local_range	0.0003	1.000	-8.8e-05	1.2e-06	0.00003	0.0002	1.0e-05	2.0e-05
	(0.000)		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Type_white	0.427***	1.532***	-0.097***	-0.0002	0.035***	0.026***	0.012***	0.023***
	(0.099)		(0.022)	(0.002)	(0.008)	(0.006)	(0.003)	(0.005)
Type_red	0.593***	1.809***	-0.136***	0.003	0.049***	0.035***	0.016***	0.031***
	(0.101)		(0.023)	(0.003)	(0.008)	(0.006)	(0.003)	(0.005)
Type_fruit	0.164	1.179	-0.037	-5.4e-05	0.013	0.010	0.004	0.008
	(0.153)		(0.034)	(0.001)	(0.012)	(0.009)	(0.004)	(0.008)
Type_champagne	-0.106	0.898	0.024	-7.4e-04	-0.009	-0.006	-0.002	-0.005
	(0.164)		(0.038)	(0.001)	(0.014)	(0.009)	(0.004)	(0.008)
Intercept 1	-0.219							
	(2.840)							
Intercept 2	0.991							
	(2.840)							
Intercept 3	1.942							
	(2.841)							
Intercept 4	2.700							
	(2.841)							
Intercept 5	3.192							
	(2.842)							
N. of observations	1609							
LR χ^2	538.010***							
Proportional odds test	148.920* [b]							

Note. Asterisks indicate levels of significance: * = 0.10, ** = 0.05, and *** = 0.01.
Wald Test was also performed in SAS for inference of each coefficient, β_k: $z^* = b_k / s\{b_k\}$.

[a] O.R. represents odds ratio.

[b] The result of the proportional odds test suggests to use a less restrictive model, like the multinomial logit model. However, we only present the outcomes of the ordered logit model for ease of interpretation, since the outcomes of the multinomial logit model are very similar. The outcomes of the multinomial logit model are available upon request.

Table 5. Local Wine Expenditure

Dependent Variable	**Local Wine Expenditure**		**Marginal Effects**					
	Coefficient	O.R [a]	Less than $20	$20-$39	$40-$59	$60-$79	$80-$99	$100 or more
Male	0.318**	1.375**	-0.038**	0.022**	0.017*	0.003*	0.0009	0.004*
	(0.153)		(0.019)	(0.011)	(0.003)	(0.001)	(0.0005)	(0.002)
Age	-0.006	0.993	0.0007	-0.0004	-0.0001	-6.2e-05	-1.7e-05	-0.00009
	(0.005)		(0.000)	(0.000)	(0.000)	(0.000)	(0.0005)	(0.000)
Wine_drinkers	0.178*	1.194*	-0.020*	0.011*	0.004*	0.001*	0.0004	0.002*
	(0.096)		(0.011)	(0.006)	(0.002)	(0.0009)	(0.000)	(0.001)
White	0.176	1.192	-0.019	0.011	0.003	0.001	0.0004	0.002
	(0.248)		(0.025)	(0.015)	(0.005)	(0.002)	(0.0003)	(0.003)
Income	0.012**	1.012**	-0.001**	0.0008**	0.0002**	0.0001**	3.3e-05*	0.0001**
	(0.005)		(0.000)	(0.000)	(0.000)	(0.000)	(0.0006)	(0.000)
$Income^2$	-6.5e-05**	0.999**	7.5e-06**	-4.3e-06**	-1.4e-06**	-6.1e-07**	-1.7e-07*	-8.9e-07**
	(0.00002)		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Education	0.596	1.816	-0.068	0.039	0.013	0.005	0.001	0.008
	(0.573)		(0.066)	(0.038)	(0.013)	(0.005)	(0.000)	(0.007)
$Education^2$	-0.024	0.976	0.002	-0.001	-0.0005	-0.0002	-6.6e-05	-0.0003
	(0.019)		(0.002)	(0.001)	(0.000)	(0.0001)	(0.001)	(0.0002)
Kids	-0.104	0.901	0.011	-0.006	-0.002	-0.0009	-0.0002	-0.001
	(0.168)		(0.018)	(0.010)	(0.003)	(0.001)	(0.000)	(0.002)
Urban	-0.279*	0.756*	0.033*	-0.019*	-0.006*	-0.002*	-0.0007	-0.003*
	(0.149)		(0.018)	(0.010)	(0.003)	(0.001)	(0.0004)	(0.002)
PA	0.191	1.211	-0.022	0.013	0.004	0.001	0.0005	0.002
	(0.210)		(0.025)	(0.014)	(0.005)	(0.002)	(0.0005)	(0.003)
KY	0.072	1.074	-0.008	0.004	0.001	0.0006	0.0002	0.001
	(0.210)		(0.024)	(0.014)	(0.004)	(0.002)	(0.0006)	(0.003)
TN	-0.019	0.980	0.002	-0.001	-0.0004	-0.0001	-5.3e-05.	-0.0002
	(0.210)		(0.024)	(0.013)	(0.004)	(0.001)	(0.0005)	(0.002)
Residency2	-0.173	0.841	0.018	-0.011	-0.003	-0.001	-0.0004	-0.002
	(0.388)		(0.040)	(0.023)	(0.007)	(0.003)	(0.0009)	(0.004)
Residency3	0.267	1.307	-0.028	0.016	0.005	0.002	0.0006	0.003
	(0.318)		(0.031)	(0.018)	(0.006)	(0.002)	(0.0007)	(0.003)
Buy_local2	1.159***	3.188***	-0.180***	0.095***	0.038***	0.016***	0.004**	0.025***
	(0.248)		(0.048)	(0.023)	(0.011)	(0.005)	(0.002)	(0.008)
Buy_local3	0.719***	2.053***	-0.085***	0.048***	0.016***	0.007***	0.002**	0.010***
	(0.186)		(0.022)	(0.013)	(0.004)	(0.002)	(0.0009)	(0.003)
Food_channel	0.793	2.211	-0.091	0.052	0.017	0.007	0.002	0.010
	(0.539)		(0.061)	(0.035)	(0.012)	(0.005)	(0.001)	(0.007)
Prep_freshfood2	1.417***	4.124***	-0.181**	0.100**	0.036**	0.015**	0.004*	0.023**
	(0.540)		(0.075)	(0.039)	(0.016)	(0.007)	(0.002)	(0.011)
Prep_freshfood3	-0.200	0.818	0.023	-0.013	-0.004	-0.001	-0.0005	-0.002
	(0.181)		(0.022)	(0.012)	(0.004)	(0.001)	(0.0005)	(0.002)
Wine_knowledge2	1.047	2.849	-0.146	0.080	0.029	0.012	0.003	0.019
	(1.043)		(0.170)	(0.087)	(0.036)	(0.016)	(0.005)	(0.025)
Wine_knowledge3	1.186	3.274	-0.114	0.067	0.022	0.009	0.002	0.013
	(1.036)		(0.083)	(0.049)	(0.016)	(0.006)	(0.002)	(0.009)

Table 5. *Continued*

Dependent Variable	Total Wine Expenditure		Marginal Effects					
	Coefficient	O.R [a]	Less than $20	$20-$39	$40-$59	$60-$79	$80-$99	$100 or more
Grade_popular	-0.082	0.921	0.009	-0.005	(0.010)	-0.0007	(0.002)	(0.007)
	(0.149)		(0.017)	(0.009)	-0.001	(0.001)	-0.0002	-0.001
Grade_super	0.169	1.184	-0.019	0.011	(0.003)	0.001	(0.0004)	(0.002)
	(0.176)		(0.019)	(0.011)	0.003	(0.001)	0.0004	0.002
Grade_ultra	0.256	1.291	-0.029	0.017	(0.003)	0.002	(0.0004)	(0.002)
	(0.170)		(0.020)	(0.011)	0.005	(0.001)	0.0007	0.003
Grade_luxury	0.499***	1.647***	-0.065**	0.036**	(0.004)	0.005**	(0.0005)	(0.002)
	(0.189)		(0.027)	(0.015)	0.013**	(0.002)	0.001*	0.008**
Local_range	3.1e-05	1.000	-3.6e-06	2.0e-06	(0.005)	2.9e-07	(0.0009)	(0.003)
	(0.001)		(0.000)	(0.000)	7.1e-07	(0.000)	8.5e-08	4.3e-07
Type_white	0.264*	1.303*	-0.030*	0.017*	(0.000)	0.002*	(0.000)	(0.000)
	(0.145)		(0.017)	(0.009)	0.006*	(0.001)	0.0007	0.003*
Type_red	0.117	1.124	-0.013	0.007	(0.003)	0.001	(0.0004)	(0.002)
	(0.153)		(0.017)	(0.010)	0.002	(0.001)	0.0003	0.001
Type_fruit	0.867***	2.380***	-0.111***	0.062***	(0.003)	0.009***	(0.0004)	(0.002)
	(0.217)		(0.030)	(0.017)	0.022***	(0.003)	0.002**	0.014***
Type_champagne	-0.219	0.803	0.024	-0.014	(0.006)	-0.001	(0.001)	(0.004)
	(0.226)	0.921	(0.024)	(0.014)	-0.004	(0.001)	-0.0005	-0.002
Intercept 1	9.495							
	(4.386)							
Intercept 2	10.541							
	(4.388)							
Intercept 3	11.220							
	(4.389)							
Intercept 4	11.694							
	(4.390)							
Intercept 5	11.880							
	(4.391)							
N. of observations	1609							
LR χ^2	285.910***							
Proportional odds test	134.830							

Note: Asterisks indicate levels of significance: * = 0.10, ** = 0.05, and *** = 0.01.
Wald Test was also performed in SAS for inference of each coefficient.
[a]O.R. represents odds ratio.

Table 6. Probability of Local Trial

Dependent Variable	**Local_tried**	
	Coefficient	**Marginal Effect**
Male	0.230*	0.047*
	(0.126)	(0.025)
Age	-0.005	-0.001
	(0.004)	(0.0009)
Wine_drinkers	-0.006	-0.001
	(0.079)	(0.016)
White	0.462**	0.090**
	(0.200)	(0.037)
Income	0.007*	0.001*
	(0.004)	(0.0008)
$Income^2$	-4.7e-05**	-9.6e-06**
	(0.000)	(4.3e-06)
Education	1.061**	0.215**
	(0.484)	(0.097)
$Education^2$	-0.035**	-0.007**
	(0.016)	(0.003)
Kids	-0.184	-0.037
	(0.140)	(0.027)
Urban	-0.318***	-0.047***
	(0.121)	(0.024)
PA	-0.234	-0.036
	(0.157)	(0.031)
KY	-0.182	-0.138
	(0.164)	(0.032)
TN	-0.709***	-0.031***
	(0.171)	(0.031)
Residency2	-0.155	-0.050
	(0.320)	(0.063)
Residency3	0.255	0.091
	(0.262)	(0.051)
Core	0.436**	0.040**
	(0.203)	(0.043)
Mid_level	0.200	0.032
	(0.133)	(0.027)
Buy_local2	0.370	0.073
	(0.287)	(0.054)
Buy_local3	0.872***	0.182***
	(0.294)	(0.060)
Food_channel	-0.080	-0.016
	(0.140)	(0.028)
Prep_freshfood2	-0.141	-0.028
	(0.401)	(0.080)
Prep_freshfood3	0.168	0.034
	(0.393)	(0.079)
Wine_knowledge2	0.556**	0.112***
	(0.130)	(0.025)

Table 6. *Continued*

Dependent Variable	Local_tried	
	Coefficient	**Marginal Effect**
Wine_knowledge3	0.979***	0.209***
	(0.198)	(0.042)
Grade_popular	-0.004	-0.0009
	(0.121)	(0.024)
Grade_super	0.339**	0.068**
	(0.137)	(0.027)
Grade_ultra	0.220	0.045
	(0.136)	(0.028)
Grade_luxury	0.234	0.048
	(0.177)	(0.037)
Local_range	-9.4e-05	-1.9e-05
	(0.0008)	(0.0001)
Type_white	0.398***	0.082***
	(0.117)	(0.024)
Type_red	0.178	0.036
	(0.121)	(0.024)
Type_fruit	0.720***	0.149***
	(0.177)	(0.036)
Type_champagne	-0.150	-0.030
	(0.186)	(0.036)
Constant	-10.273***	
	(3.655)	
Log Likelihood	-950.920	
Wald χ^2	207.250***	
Pseudo R^2	0.116	
McFadden's Adjusted R^2	0.084	
N. of observations	1,609	
Correctly predict	68.74%	
Goodness-of-fit (χ^2)	1,625.110	

Note. Asterisks indicate levels of significance: * = 0.10, ** = 0.05, and *** = 0.01.

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Strategic Use of Audience Response Systems for Extension Programming Impact Evaluation

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Abstract

Audience response systems (ARS) are an increasingly popular tool used to deliver curricula and educational content across diverse, heterogeneous audiences while providing instant data on learner understanding. Given the increasing pressure to assess Cooperative Extension Service (CES) program impact on audiences across a widening scope of demographics, geography, agricultural experience, and education with limited time and human resources, ARS may offer a viable solution. In this paper, audience responses from a targeted Extension program reaching 204 agricultural producers are presented. Improved strategies for ARS applications in Extension program assessment are suggested.

Keywords: Cooperative Extension, audience response, Extension Program Assessment

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Introduction

Cooperative extension personnel have employed numerous variants of post-workshop evaluations in an effort to record effectiveness and efficiency of program content and impact on participants. With programming ranging from farm firm management, feasibility studies of new varietals, cost-benefit analysis of environmental management, and evaluation of value-added consumer markets, Extension economists are faced with added layers of complexity when gauging our impact on audiences. For example, implementation of an aerobic digester to handle post-harvest onion waste to provide energy for a community may take many years to prove its value, which is expected to cross numerous industries and result in time-dependent environmental implications. However, in this case, the workshop may have included an introduction to the digester process along with initial equipment and installation costs and estimates of net present value of the technology, yet less than half of the audience may have the capacity or need, half again may decide to explore further into this alternative, and the few who do choose to install an aerobic digester may not see returns on the investment until five or ten years have passed. Extension economists typically present market situation and outlook reports as a relatively minimal portion of production-oriented workshops. Audience evaluations of educational impact are limited to recording the number of farmers who indicate an interest in using a new tool, or apply new chemicals or fertilizers or feeding rates, or participate in certification programs. These evaluations fail to capture the long-run implications of improved profitability or cost savings associated with a greater understanding of the overall economic situation. Finally, pressure from competitive grant-funding agencies that require project teams to provide reports on the economic impacts of Extension programming on an annual or even quarterly basis is resulting in an increasing need for a quick, consistent, and transparent evaluation process and protocol.

A unique characteristic of the farmer audiences that attend Extension workshops is their relationships to one another and their community. As most meetings are geographically situated where the majority of the farmers are involved with the same commodity, there exists a strong sense of awareness between audience participants. Owners and managers of the largest operations are well-known, newcomers are easily identified, and there are natural comraderies, yet underlying tensions that result from the tendency of improved profitability to attract competition exist. Farmer audiences may be producing similar commodities; however, wide ranges in years of farming experience, formal and informal agricultural education, and position along the market supply chain (i.e., producer, processor, packinghouse, sales channels) are common. Increasingly, Extension audiences are expanding beyond the traditional multi-generational farm family, as the agricultural industry continues to attract new producers from all walks of life. The authors have encountered a range of Extension audiences, including young entrepreneurs with limited or no agricultural background interested in escaping from high-pressure corporate environments, recent retirees looking to diversify investment portfolios or start second careers, and recent graduates hired as farm managers who are charged with overseeing operations funded by investment companies. In this atmosphere, Extension specialists are expected to record demographic data, production and marketing techniques, information sources, etc., and, test audience retention of the material, as well as develop a sense of which economic issues are of primary importance to that specific group “on-the-fly,” all of which may have to take place in a 20-40 minute presentation. Given the traditional reliance on a two-page

hard-copy written evaluation collected at the end of the workshop (when half the audience may have left prior to completing the form), there is a demonstrated need to explore new technologies that allow Extension specialists to meet federal, state, and funding agency reporting requirements and, improve the value-added educational experiences offered to our farmer audiences.

Audience-response systems involve the use of hand-held "clickers" by workshop participants to indicate their response to questions viewed on a traditional PowerPoint slide, with results immediately tallied, shown to the audience, and recorded into a database either anonymously or linked to an individual. Questions ranging from yes/no or true/false, single or multiple answer choice selections, numeric answer, priority ranking, Likert scale, and ice breakers and short essays can be presented to the audience, with responses appearing on the next slide as histogram bar charts. Wireless ARS technology has been used in a traditional classroom setting, as well as corporate and organizational environments, since the early to mid- 2000s. The majority of ARS research reported in the literature focused on the educational progress of large, relatively homogeneous student audiences that were used to record participation, testing and review of lecture materials, with limited applications in continuing education courses in fields such as nursing and in-house corporate training programs.

Although many Extension specialists anecdotally report using ARS technology during adult educational programs, reported results are limited and appear to vary greatly due to ambiguous assessment objectives and inconsistent techniques. There exists a need to explore the capacity of ARS technology to verify achievement of adult instructional and learning objectives. The purpose of this paper is to present the results of traditional Extension workshop evaluations collected using ARS within the context of a broad, multidisciplinary review of the literature which applies ARS approaches and provides evidence of results and, (1) to evaluate the ability of ARS to measure learning outcomes; and, (2) to suggest strategies for effective implementation of ARS in Extension program assessment.

Review of Literature

All ARS consist of presentation software, receiver hardware, and hand-held wireless response devices. Audience responses can be collected anonymously or identified by the individual user, and responses can be shown to the audience or simply recorded into a data file (Cain and Robinson, 2008). These authors reviewed aspects of the use of ARS in classroom environments, and concluded that the primary benefits included: (1) improvements in the lecturer's ability to gauge and improvise by using student feedback; (2) capacity to encourage student interaction and engagement in the lesson content; and (3) a "safe" way for students to indicate their understanding of the material, and their true thoughts and opinions, across personality type, without fear of reprisal or scrutiny for incorrect answers. As with all technology, the value of ARS results was influenced by strategic implementation, the pedagogical methods used within specific learning environments, and constrained by technical limitations in the classroom.

In developing the scope of this study, this review of literature was expanded to discover the best practices, theoretical frameworks, empirical findings, and strategic fundamentals incorporated into ARS usage. Academic disciplines spanning agricultural economics, psychology, physiology, education, medicine, nursing, pharmacology, dentistry, veterinary medicine and, nationwide

audiences ranging from grade school students to professionals to retirees were represented in the ARS-related literature. The incorporation of ARS into classrooms varied from anonymous, single use, single lecture, and binary response options, which targeted audiences composed of relatively similar individuals where results were hidden from the audience to the other end of the spectrum, where heterogeneous participants are queried several times during a lecture with responses recorded specifically to the individual.

Forest (2012) developed an ARS implementation guide for effective use of ARS in classroom settings which included the following suggestions: (1) develop questions that promote critical thinking; (2) develop questions students perceive as important and relevant; (3) prepare for discussion/questions and allow time for discussion; (4) keep questions simple, short, and easy to read; (5) vary question formats (multiple choice, true/false, yes/no, Likert scale); (6) insert a question to stimulate interaction every 10 to 20 minutes; and as with all technology, (7) arrive early to test the ARS and avoid technical problems. Forest offered a summative table detailing evidence of ARS benefits as revealed in his review of literature, which were classified by classroom environment, learning and assessment benefits. Classroom environment benefits were shown by increased attendance, participation and attention, improved participation and anonymity of participation. Learning benefits were demonstrated by increased peer interaction, active discussion, contingent teaching based on feedback, and increased learning performance and quality. Evidence of ARS assessment benefits were evidenced by regular feedback, formative evaluation, and ARS responses compared to class responses.

The applicability of ARS benefits to Extension educational programs was confirmed by findings in a recent Journal of Extension article that documented farmer audience acceptance of the technology across 26 workshops, 1,093 participants ranging from volunteers to students to farmers, and six types of client categories (Sciarappa and Quinn, 2014). Across this diversity of audiences, time, geography, and subject matter, the authors shared evidence of improved lecture content flexibility and student bonding, increased interest levels in subject matter, and, the ability of presenters to quantify knowledge gained, behavior changes, and learner adoption with empirical data. Additional comments highlighted the simplicity of use of the ARS technology, relative low cost in terms of equipment costs and time needed to set up the equipment and prepare data analyses and reports, and the ease of creating appropriate questions for use before, during and after each training session. A recent Journal of Extension article (DeKoff, 2013) provided additional information on the positive audience feedback and relative cost of ARS technology. In this paper, DeKoff (2013) collected ARS data from a dozen farmer participants at a biofuels workshop and included questions asked before and after the training program using the hand-held clickers. Overall, the audience members indicated they enjoyed using the clickers and, the author suggested the cost of the ARS equipment ($1,826 for up to 50 respondents) was reasonable compared to earlier versions (Salmon and Stahl, 2005) and recommended it for audiences with at least ten participants.

While numerous articles outline an array of feasible benefits of using ARS, few articles provide theoretical constructs or comparisons of statistically significant gains in learning between traditional and ARS evaluation methods. Boscardin and Penuel (2012) published a systematic review of literature with the objectives of evaluating the benefits and consequences of using ARS, to provide context to educators for reporting outcomes, and, optimal utilization of the ARS

technology. The authors presented a review of reported outcomes types and the instructional context in which ARS was implemented, spanning 42 articles published from 2000-2009 where the empirical effects of ARS on learning were reported. The authors suggested "For the implementation of ARS to be successful, every question should serve pedagogic objectives that can range from checking for understanding to eliciting discussion for conceptual change and understanding…the combination of these question types will deliver the optimal utilization of this technology for instructional improvement (p. 406)."

As reported in similar articles, the authors discovered: ARS as an instructional tool is relatively simple and low-cost; learners reported improvements in engagement and motivation; peer-to-peer interactions were improved through initiation of discussions; and, instructors were able to use the immediate feedback to adjust lecture points of emphasis. However, inconsistent results were reported when ARS was used by instructors to facilitate formative assessment (monitor student learning) and, measurable gains in student knowledge were limited. The authors concluded that the use of ARS as an instructional strategy with the goal of documenting significant gains in learner outcomes would require incorporation of a theoretical framework. Specifically, and most importantly for adult educators who choose to strategically implement ARS, the authors note that educators must be experts in the subject content, learn to develop appropriate ARS-delivered questions, and possess the expertise to adjust and modify the training based on learner feedback.

Evaluation Methodology

Extension agricultural economists and food scientists conducted one-day workshops focused on delivery of the Market Ready program originally designed and delivered by Tim Woods and his team at the University of Kentucky (www.uky.edu/fsic/marketready). The Mississippi-Arkansas Market Ready workshops were tailored to specific needs identified by statewide producers and state agencies such as health departments and departments of agriculture. Partner organizations included farmers' market associations, food policy councils, restaurant associations, and the state's Cooperative Extension Service (CES). Audience participants were recruited using existing CES and partner organization email list-serves, and an online registration link was provided as well as a hardcopy that could be returned by regular mail to the program organizers. The program was advertised to attract growers with a wide range of experience, diverse production practices and product variety, farm sizes, and market channels utilized.

The Market Ready curriculum was based on testimonials resulting from in-depth interviews of 29 chefs and restaurant owners conducted by Woods (2010). Comments collected during the interviews were reviewed, and primary challenges and obstacles faced by buyers when attempting to source locally grown food items were included in the curriculum. The Mississippi and Arkansas Market Ready Farm to Restaurant curricula were developed to provide access to specific online resources to producers interested in selling a range of food and food products direct to restaurants and retail establishments and minimizing market risk exposure. Each workshop was prefaced with a Market Ready Motivation introduction, which included information from the literature on nationwide and state-specific direct marketing trends, food handling and safety regulations, and the Market Maker food industry portals for Mississippi and Arkansas. The curriculum targeted nine primary beyond-the-farm gate marketing areas,

including packaging and labeling, pricing, consumer demand, production supply, state Market Maker portals (foodmarketmaker.com), delivery/invoicing/insurance, storage/quality assurance, and satisfaction guarantee/communication. Each workshop included four hours of lecture, a working lunch, and a 1.5 hour question and answer session with an expert panel consisting of Extension marketing specialists, a horticultural specialist, a food safety specialist, and a representative of the state agricultural department. Each participant was provided with a 4MB flash drive that included 1,200+ pages of online and hard copy materials that formed the basis of the training materials and related agencies needed to successfully deliver product to restaurants in their respective state.

The ARS technology was incorporated into the Market Ready day-long workshop in the form of both pre- and post-workshop questionnaires. The questionnaire was created using Turning Technology's TurningPoint software and delivered using a traditional Power Point presentation. Audience members were given handheld response devices (Figure 1) at the beginning of the workshop. Prior to launching the questionnaire, the audience was informed of the competitive grant funding that was used to support delivery of the program and of the need for accurate documentation of their learning experience to provide feedback to the educators, funding agency, their state's Cooperative Extension Service (CES), and the federal government.

Figure 1. Turning Point Technologies Handheld Devices Provided to Market Ready Farm to Restaurant Extension Audience Participants.

The ARS questionnaire was developed following survey methodology guidelines outlined by Dillman (2008) and informed by CES and funding agency reporting requirements. Questions included an initial icebreaker to ensure the audience was comfortable with the handheld devices, and a range of demographics, including: gender, age, level of education, percent of family income from farming operations, years of farming experience, sources of production and marketing information, types of food produced, primary and any type of marketing channels used. Audience members were asked to provide pre- and post-workshop subjective assessments of their level of understanding of direct marketing, pricing strategies, food safety and direct-to-restaurant marketing strategies such as Market Maker portal awareness using the clickers that were provided.

Results and Conclusions

Six individual workshops were offered (five in Mississippi and one in Arkansas) and 204 producers attended the programs (Table 1) between December 2011 and February 2013. The

audience was provided with handheld response devices and asked to complete both the pre- and post-workshop evaluations, which were identical in all locations. Almost half of the audience was female (Table 2), and just over half were at least 50 years of age (Table 3). Seventy-seven percent of the audience had completed college and/or graduate school (Table 4). The range in farming experience was extensive, with 20% having no experience, 30% with less than ten years' experience, 15% farming for between ten and 19 years, and 35% with 20 or more years of experience with farming activities (Table 5). However, 64% of participants derived less than ten percent of their family income in the previous year from their farming activities, and 12% indicated that more than half of their income resulted from their farming activities (Table 6).

As understanding the audience backgrounds and educational needs represent a key component of successful implementation of ARS technology, participants were asked about their current marketing channels, food and food items produced, information sources, and the primary challenge facing today's farmers. The top two concerns of workshop participants were labor (26%) and regulations (21%), followed by markets and marketing (17%) and rising input costs (17%) which were identified as equivalent challenges (Figure 2). The majority of participants claimed that CES was their primary production information source (38%), while 18% relied on the Internet, 16% attended workshops and conferences, and 13% looked to their fellow growers (Figure 3). As these workshops were sponsored and delivered by state CES personnel at CES facilities, these responses indicate a growing need to consider innovative partnering opportunities and media types when delivering education and outreach programs.

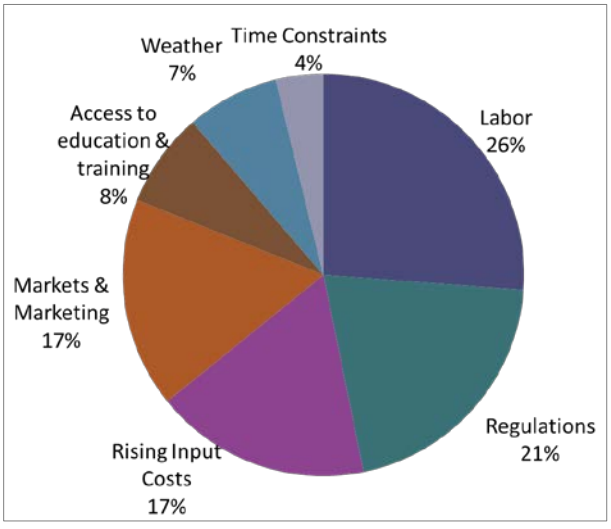

Figure 2. Market Ready Pre-Workshop WorkshopParticipant Responses – "Greatest Challenge Facing Farming Today?" (Limited to single response).

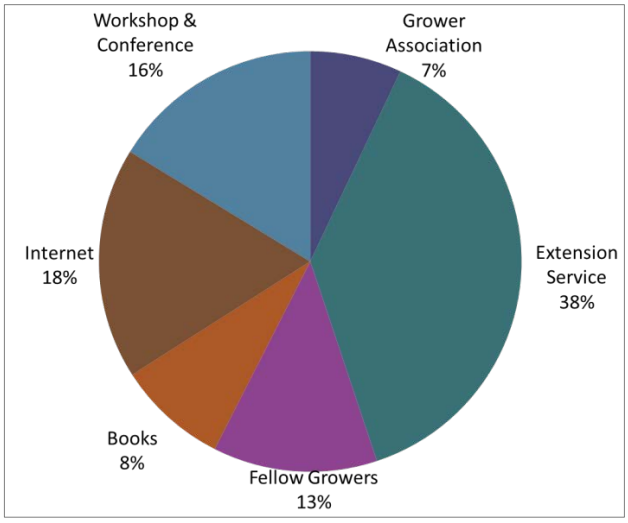

Figure 3. Market Ready Pre-Workshop Workshop Participant Responses – "Primary Production Information Source?" (Limited to single response).

Vegetables were produced by the majority of workshop participants (38%), followed by fruit (15%), and livestock (12%), which together represent those food and food items that are highly desired by restaurants and consumers (Figure 4). When asked to identify their primary marketing channel, 45% of participants selected farmers' markets, followed by 16% with on-farm sales, roadside stands (8%) or wholesalers (8%) (Figure 5). Overall, just three percent of audience members indicated that sales to restaurants represented a primary marketing channel. Of these, 11% indicated they had sold product to restaurants (Figure 6), although it still ranked lower then farmers' markets (25%), on-farm sales (20%) and roadside stands (20%).

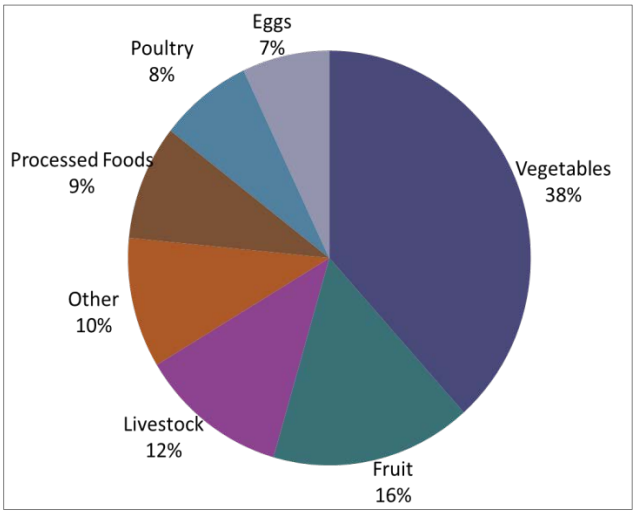

Figure 4. Market Ready Pre-Workshop Workshop Participant Responses – "Food and Food Items Produced…?" (Multiple responses allowed).

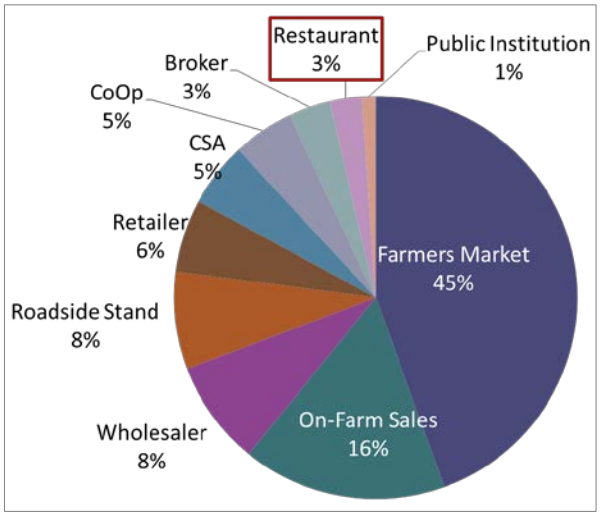

Figure 5. Market Ready Workshop Pre-Workshop Participant Responses – "Primary Marketing Channel?" (Limited to single response).

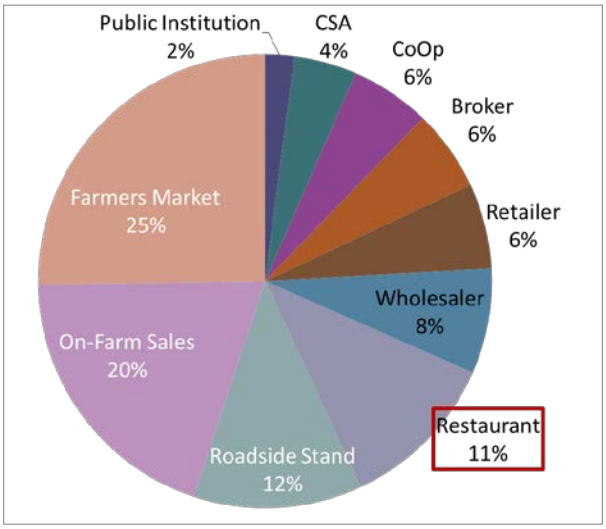

Figure 6. Market Ready Workshop Pre-Workshop Participant Responses – "I have sold my produce to…" (Multiple responses allowed).

Market Maker, an online food marketing portal that is financially supported primarily by states' CES, departments of agriculture, and Farm Credit and offered at no cost to producers, was made available in Mississippi in 2006 and Arkansas in 2009. Although each state had devoted considerable resources to educating agricultural supply chain participants about the features, advantages and benefits available to them through Market Maker, 45% of these participants indicated they had never heard of Market Maker, and just 14% had established an account and/or completed a profile on the Market Maker state-specific portal (Figure 7). Another 23% indicated that had visited their state Market Maker portal, while 18% were aware of the portal but had not yet visited the site. Just nine percent had completed a Market Maker profile for their agribusiness, with an additional five percent responding that they had set up an initial account (Figure 7).

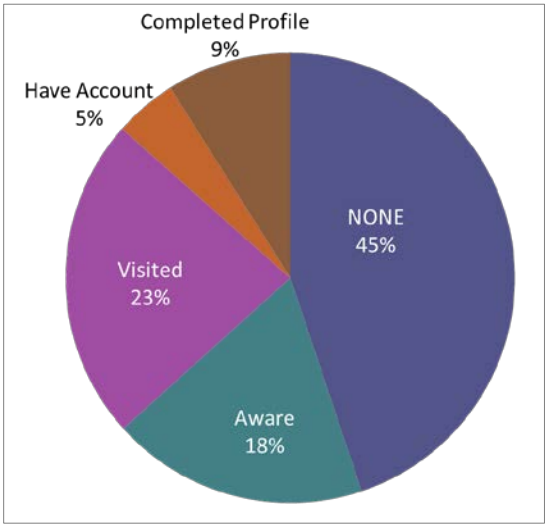

Figure 7. Market Ready Workshop Pre-Workshop Participant Responses – "Pre-workshop Knowledge of Market Maker?" (Limited to single response).

Strategic implementation of the ARS feedback into the workshop lectures was the motivation for including pre-workshop questions. In each workshop, participants were asked to provide a subjective assessment of their own knowledge levels of direct-to-restaurant sales strategies, pricing, and food safety requirements by choosing from a 5-point Likert scale, with response options ranging from "strongly agree" to "strongly disagree." Responses were recorded anonymously and the audience and instructors were immediately presented with the final tallies in a bar chart format. This information was then used by the instructors to prioritize the related component of the material and focus examples used to demonstrate the learning objectives based on the audience demographics and existing knowledge levels. At the conclusion of the workshop, participants were asked to indicate changes, if any, in their knowledge levels, offering the same set of responses. When asked to reveal "knowledge of direct marketing strategies," a total of 64% indicated pre-workshop levels of "none" or "low," with post-workshop responses of "working" and "high" accounting for the majority (60%) for this same learning objective (Figure 8a). Post-workshop participant knowledge of direct sales pricing improved from initial subjective assessments where 77% of the audience selected the "none" and "low" options, shifting to 59% who selected either the "working" or "high" categories (Figure 8b). Similar improvements were

evidenced in participant responses to "knowledge of food safety requirements," with 58% of participants indicating post-workshop knowledge levels of "working" and "high" (Figure 8c). At the beginning of the workshop, 81% of the audiences indicated "none" or "low" knowledge of selling food and food products direct to restaurants, with overall knowledge levels improving to 77% at the end of the workshops (Figure 8d.).

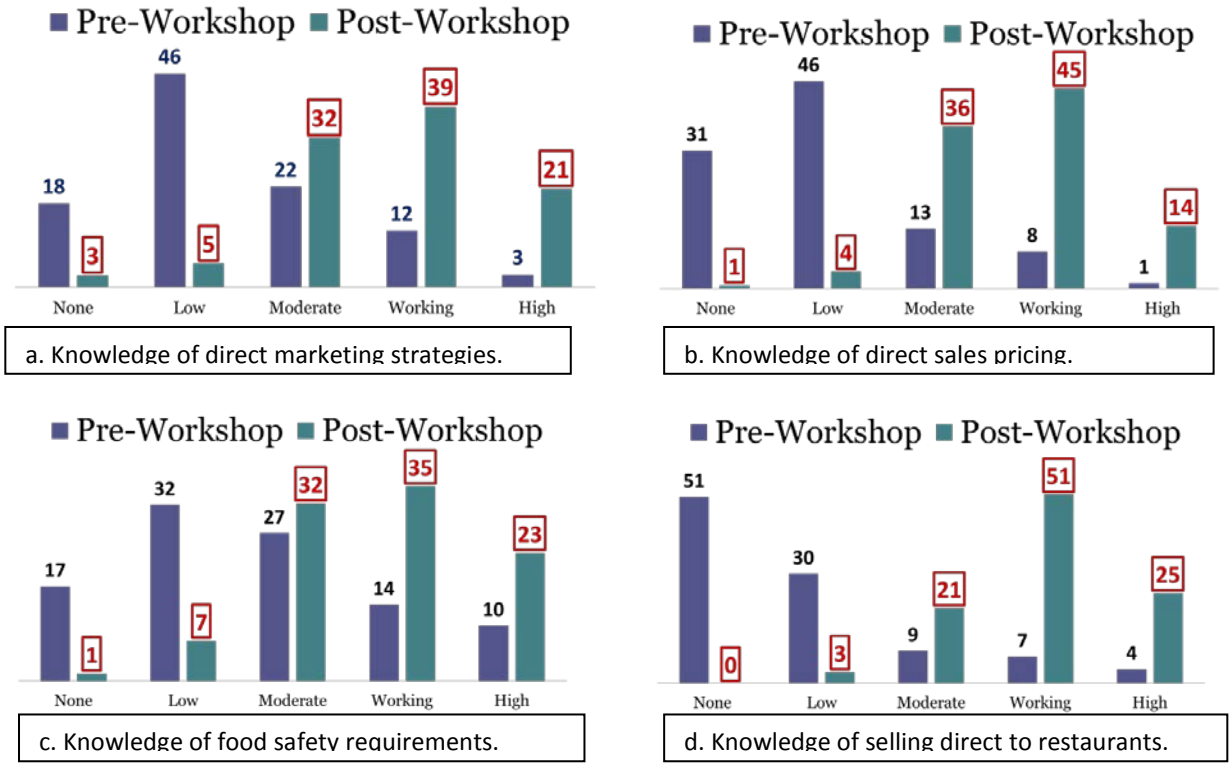

Figure 8 (a-d). Market Ready Workshop Pre- and Post-Workshop Participant Responses – "Indicate Your Knowledge Level of…" (Listed below each figure).

At the conclusion of each workshop, participants were asked to respond to four statements by choosing from a 5-point Likert scale, with response options ranging from "strongly agree" to "strongly disagree." Overall, 73% of participants indicated they "agree" or "strongly agree" with the statement "I am better prepared to sell my food items directly to a restaurant (Figure 9a)." Ninety-four percent of participants selected "strongly agree" and "agree" with respect to understanding how to best manage buyer communication (Figure 9b). Another 85% agreed with the statement "I know where to find information about market data (Figure 9c)." Nearly all (92%) agreed to "better understand the relationship between my production plans and restaurant supply needs (Figure 9d)."

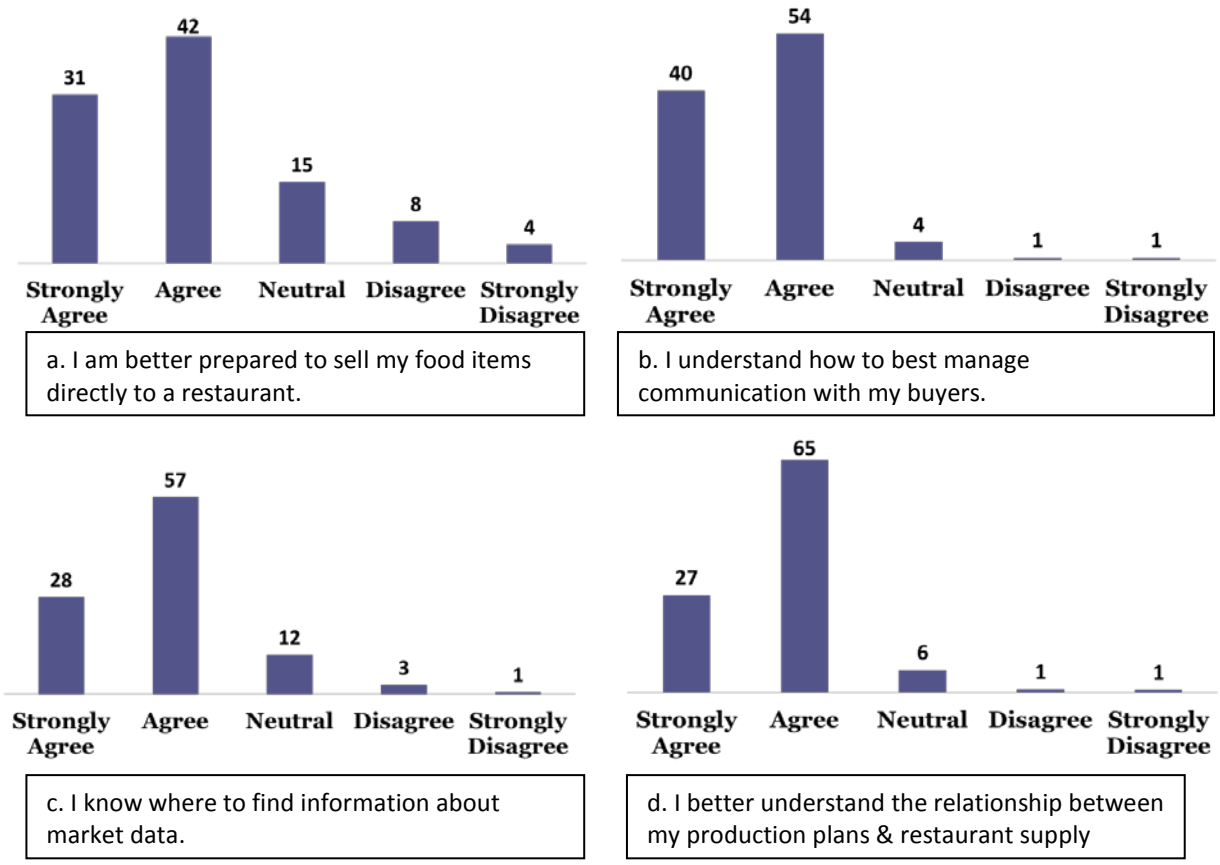

Figure 9 (a-d). Market Ready Workshop Post-Workshop Participant Responses to Statements (Listed below each figure).

Suggested Strategies for ARS Applications in Extension Programming

Development of a theoretical framework targeted at one or more of the four major categories of learner engagement, peer instruction, formative assessment, and knowledge gains that can be addressed by ARS may allow educators the opportunity to test for significant gains in learner knowledge levels. Strategic decisions to use ARS should be founded on the methods and practice of teaching and require educator training on intellectual engagement and exposure to the psychology of learning. The ARS results presented in this paper provide conclusive support for the use of this technology across Extension audiences, providing feedback to both audience members and instructors that served to guide educational content, build rapport, and shape panel discussion topics at the conclusion of the workshop. For example, an unanticipated result of the workshop and panel discussion was a joint effort between Extension personnel, the state food policy council, and the department of agriculture to lobby the state legislature to make changes to regulatory obstacles related to direct sales of meat to restaurants.

The use of ARS to gather learner feedback related to specific educational content prior to the workshop provided the authors with the opportunity to personalize the content to producer

audiences across commodity types, market supply chain position, production and marketing risk management experience, and demographic variations, which provided necessary solutions in a world where contact hours are limited, audience compositions are increasing diverse, and more accurate and timely impact reporting is required. To develop modifications to the instruction "on the fly," instructors and panel discussants took notes on the ARS data as it was recorded, and selected examples for Market Maker specific to the type of food items that audience produced and based on the primary marketing channels utilized. Contrary to the authors' initial concerns, there were no technical problems during any of the six workshops, nor did the participants experience difficulty in adapting to the handheld devices nor user fatigue or frustration. In fact, the authors noted that all participants appeared to be intensely interested in "learning" about one another and, observing the subjective assessments of knowledge levels of each subject matter, as the bar graphs were revealed at the conclusion of each question.

Limitations of employing ARS for Extension programming evaluation include the inability to ask open-ended questions that require written responses, such as preferred future educational topics, or providing an opportunity for individuals to sign up for mailing lists or list-servs. There exists a need for educators to discover which types of questions delivered through ARS are most appropriate to elicit the feedback necessary. As with any survey questionnaire, results are dependent upon the question composition and are restricted to ARS delivery mechanisms. For example, current versions of hand-held response devices are limited to single alpha-numeric responses, which necessitate the use of close-ended or short answer questions and limits the ability of the instructor to capture open-ended or essay responses via ARS. The types of queries included in the ARS should focus on an examination of the audience composition, characteristics, indication of content comprehension, and demonstrated improvements in knowledge levels.

Given the interactive nature of the ARS, the authors recommend employing the ARS more often during the talk, to continue to engage the participants with two or three queries to confirm understanding of each learning objective before moving along to the next item. Using ARS data during a workshop provides the instructors with the opportunity to encourage guided discussions based on "teachable moments" while minimizing the risk of "tangent" or "off-topic" discussions which tend to plague larger audiences and disrupt workshop timetables.

In conclusion, the use of ARS to evaluate Extension program impacts across two states, six workshops, and a widely diverse audience with varying degrees of technological experience, within the time constraints of a day-long program and limited human resources, provided a viable, cost-effective alternative and generated qualitative evidence of the value of this tool for Extension educators. Future studies of multiple-session Extension programs are recommended to explore any differences in audience comprehension levels when ARS or traditional paper questionnaires are used.

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Appendix

Tables 1 -6

Table 1. Market Ready Workshop Location Dates, and Participants (ARS)

Workshop Location	Workshop Date	# Participants	% of Participants
Raymond, MS	12-8-11	42	21%
Hattiesburg, MS	1-19-12	33	15%
Little Rock, AR	2-1-12	56	28%
Pontotoc, MS	3-2-12	32	16%
Biloxi, MS	7-19-12	17	8%
Starkville, MS	2-13-13	24	12%
TOTAL		204	100%

Table 2. Market Ready Workshop Participants by Location and Gender (ARS)

Workshop Location	Male Participants		Female Participants	
	#	%	#	%
Raymond, MS	21	10%	21	10%
Hattiesburg, MS	22	11%	11	5%
Little Rock, AR	28	14%	28	14%
Pontotoc, MS	18	9%	14	7%
Biloxi, MS	6	3%	11	5%
Starkville, MS	11	5%	13	7%
TOTAL (N=204)	106	52%	98	48%

Table 3. Market Ready Workshop Participants by Location and Age(ARS)

Workshop Location	< 20 yrs		20-29 yrs		30-39 yrs		40-49 yrs		50+ yrs	
	#	%	#	%	#	%	#	%	#	%
Raymond, MS	0	0%	6	3%	7	3%	5	3%	24	12%
Hattiesburg, MS	0	0%	4	2%	5	3%	5	3%	18	9%
Little Rock, AR	2	1%	7	3%	12	6%	10	5%	26	13%
Pontotoc, MS	1	<1%	1	<1%	4	2%	8	3%	18	9%
Biloxi, MS	0	0%	2	1%	4	2%	3	2%	9	4%
Starkville, MS	0	0%	1	<1%	1	<1%	8	3%	13	6%
TOTAL (N=204)	3	2%	21	10%	33	16%	39	19%	108	53%

Table 4. Market Ready Workshop Participants by Location and Education Level (ARS)

Workshop Location	High School/GED		Tech/Trade		College		Graduate School	
	#	%	#.	%	#.	%	#.	%
Raymond, MS	7	3%	3	2%	20	10%	13	6%
Hattiesburg, MS	3	2%	4	2%	17	9%	9	5%
Little Rock, AR	2	1%	7	3%	18	9%	28	14%
Pontotoc, MS	10	5%	2	1%	7	3%	13	6%
Biloxi, MS	1	<1%	0	0%	12	6%	4	2%
Starkville, MS	1	<1%	7	3%	11	5%	4	2%
TOTAL (n=203)	24	12%	23	11%	85	42%	71	35%

Table 5. Market Ready Workshop Participants by Location and Years' Farming Experience (ARS)

Workshop Location	No Experience		1-9 years		10-19 years		20+ years	
	#	%	#	%	#	%	#	%
Raymond, MS	5	3%	17	9%	7	4%	13	6%
Hattiesburg, MS	8	4%	4	2%	6	3%	15	8%
Little Rock, AR	18	9%	18	9%	7	4%	12	5%
Pontotoc, MS	3	1%	8	4%	4	2%	15	8%
Biloxi, MS	1	<1%	4	2%	5	3%	7	4%
Starkville, MS	5	3%	8	4%	2	1%	8	4%
TOTAL(n=200)	40	20%	59	30%	31	15%	70	35%

Table 6. Market Ready Workshop Participants by Location and Percent of Family Income Sourced from Farming Activities (ARS)

Workshop Location	< 10%		10-25%		26-50%		51-74%		75+%	
	#	%	#	%	#	%	#	%	#	%
Raymond, MS	29	15%	12	6%	0	0%	0	0%	1	<1%
Hattiesburg, MS	17	8%	7	4%	3	1%	2	1%	4	2%
Little Rock, AR	34	18%	10	5%	0	0%	6	3%	6	3%
Pontotoc, MS	17	8%	8	4%	4	2%	2	1%	0	0%
Biloxi, MS	10	5%	1	<1%	3	1%	1	<1%	2	1%
Starkville, MS	21	10%	0	<0%	1	<1%	1	<1%	0	0%
TOTAL (N=202)	128	64%	38	19%	11	5%	12	6%	13	6%