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A Conjoint Analysis Framework for Evaluating Floral Marketing and Consumer Preferences in the United States

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Abstract. **This study examined consumer preferences in the United States regarding the distribution of gardening and floral information through Cooperative Extension and related industry sources. Using a conjoint analysis framework, we analyzed survey responses from 2633 participants to identify preferred topics, information sources, delivery methods, and audience formats for gardening education programs. Our findings reveal significant heterogeneity among consumer segments, with preferences clustering around distinct themes, including live hands-on formats, nonlive content, and specific information sources such as Extension, public gardens, or industry. Key clusters included segments that favored gardening, ornamental plants, turfgrass, and houseplants, each with unique preferences for program delivery. These insights underscore the need for a targeted approach to program design and suggest that tailoring gardening education to align with audience-specific preferences could enhance participation and satisfaction. This research contributes to the floral marketing field by providing actionable strategies for industry stakeholders and Extension professionals to improve outreach effectiveness, increase engagement, and optimize resource allocation.**

In the United States, Cooperative Extension (Extension) has a long history of providing agricultural and childhood development information to the general public and businesses (Worley et al. 2023). This mission of providing critical agricultural information to the public began in 1914, when 60% of the population was rural and 40% was engaged in agriculture (Lusk 2016). Over the last century, the composition of the United States has changed, with only 1% of the population employed on farms (US Department of Agriculture, Economic Research Service 2025) and only 15% of the population living in nonurban areas (Dobis et al. 2021).

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Although the direct linkage to traditional production agriculture has waned, more than 95 million households were gardening in 2020 (Statista 2022). Another 18.3 million people began gardening in 2021 as a result of the COVID-19 pandemic (National Gardening Survey 2021). As noted by San Fratello et al. (2021), this increase had a myriad of reasons such as worries about food shortages and being at home more frequently because of the pandemic. San Fratello et al. (2021) also pointed out that some of the new gardeners would not continue gardening in the long-term, but that a large percentage did plan to continue gardening.

Because of the large number of households (and persons) involved in gardening, it is essential to provide a wide range of information to the general public. However, because of the evolution of technology, a plethora of information distribution mechanisms exist. During the early 2000s, in-person and printed media were the only options for providing Extension information. As noted by Kelley and Wehry (2006), printed material was a popular means of distributing information and industry was a popular source of information. However, currently, information can be provided in numerous formats, such as in-person, printed media, live-streamed, and prerecorded formats, that were not available during the survey by Kelley and Wehry (2006). This move away from in-person or traditional hardcopy printed material is highlighted by the many consumers who have resorted to using the Internet to search for gardening information (Behe et al. 2013).

Based on the changing population base (moving away from agriculture and moving to urban settings), it is necessary to understand what type of horticultural information is desired, the preferred information distribution method, and from who or where the general public wants to obtain its information. As noted by Worley et al. (2023), approximately 60% of respondents were aware of university-based extension, but only 30% indicated they had used university-based Extension. Furthermore, approximately 70% were interested in or had used university-based Extension for crop/plant production. Furthermore, Warner et al. (1996), Yang et al. (2009), and Narine et al. (2020) examined consumer preferences for different types of Extension education programs and found that agricultural education, food safety, and sustainable production were critical areas. With respect to specific types of horticultural extension programming, Meyers et al. (2006) found that Florida focus group respondents wanted plant selection and basic maintenance information as well as information from both radio and websites.

Therefore, the purpose of this research was to determine the who, what, and how of Extension distribution of gardening information. By understanding and embracing the findings discussed in this work, industry stakeholders and Extension can better-serve gardening consumers by providing them with opportunities to receive the information they desire from their preferred sources. This would allow for better industry engagement with their clientele and Extension engagement in the planning of information and types of information provided.

Materials and Methods

Using a Jun 2021 national survey of people in the United States, 2633 respondents completed a survey to elicit their preferences regarding types of information, information sources, and information distribution methods. The survey was approved by the University of Georgia Institutional Review Board (IRB) (IRB no. 00004215). After IRB approval, Toluna Inc. (Wilton, CT, USA) was contracted to recruit respondents from their database of millions of panelists. Toluna Inc. sent an e-mail to random panelists with a link to the survey. Panelists who agreed to participate proceeded through the survey that included conjoint gardening and demographic questions. Various quality checks were used by Toluna Inc. and the researchers, including duplicate respondent prevention, speed checks of previous surveys completed, and red herring questions (i.e., select answer "C" for this

question) to check for respondent attentiveness throughout the survey.

The only screening question was age because respondents had to be 18 years of age or older. Representativeness of the sample was similar to the US population with regard to age, household income, gender, education, and race (Table 1). For instance, the median sample age was 42 years, which is similar to US Census estimates of 38 years; however, the Census takes into account persons younger than 18 years of age, and this segment was excluded from the survey (US Census Bureau 2019a). The median household income for respondents was $68,529, which is similar to the US Census estimate of $62,843 (US Census Bureau 2019b). The sample's regional makeup, Caucasian rate, male rate, and educational levels were similar to US Census estimates.

To assess preferences for the information topic and distribution method, a conjoint analysis was used. As noted by Hopkins et al. (2022), a conjoint analysis can help identify consumer preferences for several attributes and levels. Since its introduction to marketing research in 1971 (Green and Rao 1971), it has been used for thousands of marketing research applications. Rao (2014) further stated that several marketing choices, including the ideal development of new products, the choice of a target market, new product pricing, and competitive responses, have been successfully addressed using a conjoint analysis.

Table 1. Demographics associated with 2633 respondents in an online national survey to assess floral preferences conducted in Jun 2021.

Variable	Sample	Census[i]
Median age (years)	42	38
Generation[ii]		
Baby Boomers or older	37%	
Gen X	17%	
Millennial	32%	
Gen Z	14%	
Region[iii]		
Far West	10%	17%
Rocky Mountains	7%	4%
Southwest	11%	13%
Plains	8%	7%
Great Lakes	5%	14%
Mideast	20%	15%
New England	7%	5%
Southeast	32%	26%
Caucasian (1 = yes)	72%	76%
Male (1 = yes)	43%	49%
Political affiliation		
Republican	38%	
Other affiliation	36%	
Democrat	26%	
Education		
High school or less	27%	38%
Some college	31%	28%
Bachelor's degree	21%	22%
Greater than bachelor's degree	21%	13%
Kids in household (no.)	0.81	
Adults in household (no.)	2.39	
Residence location		
Metropolitan	26%	
Suburban	46%	
Rural	28%	
Median household income ($)	$68,529	$62,843
Principal plant buyer (1 = yes)	78%	

[i] US Census Bureau 2019a, 2019b; US Census Bureau 2020.

[ii] Baby Boomers, born in 1964 or before; Gen X, born between 1965 and 1984; and Millennials, born in 1985 or later.

[iii] US regions are based on the Bureau of Economic Analysis definitions (Abadi 2018).

A conjoint analysis is based on random utility theory whereby the total utility of a product/service is based on the individual utilities of the attributes (and levels) that comprise the product (Wirth et al. 2011). In this study, respondents did not evaluate products; rather, they evaluated potential programs that could be offered. Respondents who entered the conjoint portion of the survey were asked to denote their likeliness to participate in each of the 12 programs described (by evaluating one program at a time) using the following options: 0 = extremely unlikely; 50 = neither unlikely/likely; and 100 = extremely likely. Other options on the scale denoted varying likeliness. The program order was randomized for each respondent. To determine the number and composition of the programs to be evaluated, an orthogonal factorial design that generated 12 programs that needed to be assessed by respondents was used to estimate the main effects. Within each program, one level from each attribute was used (as defined by the orthogonal factorial design). The attributes (levels) included the following: information topic (ornamental, gardening, turf, houseplants); information distribution (prerecorded, printed, live in-person, live-streamed); information source (public gardens, Extension, industry); and participant numbers (multiple people, singular person) (Table 2).

To estimate the main effects of the model, ordinary least-squares (OLS) regression was used; this rating scale represents a buyer's utility for the product (Lusk and Schroeder 2004). Individual OLS regression models (total of 2772) were estimated via the following equation:

$$\begin{aligned} Ratings_{ij} = {} & \beta_0 + \beta_1 eOrnamental_{ij} \\ & + \beta_2 eGardening_{ij} + \beta_3 eTurfgrass_{ij} \\ & + \beta_4 eHouseplants_{ij} + \beta_5 ePreRecorded_{ij} \\ & + \beta_6 ePrinted_{ij} + \beta_7 eLivehandson_{ij} \\ & + \beta_8 eLivestream_{ij} + \beta_9 ePublicGarden_{ij} \\ & + \beta_{10} eExtension_{ij} + \beta_{11} eIndustry_{ij} \\ & + \beta_{12} eMultiple_{ij} + \beta_{13} eAlone_{ij} + \varepsilon_{ij} \end{aligned} \quad [1]$$

where ratings are the ratings, β_0 represents the intercept, β_1 through β_{10} are the part-worth utility vectors, and ε_{ij} is an independent and identically distributed error term. The attribute levels are the effects-coded to transform them into deviations from the men (Hair et al. 1998). Through effects coding, all part-worth utility parameter estimates can be recovered after estimating the OLS model as all parameter estimates for a level within an attribute summed to zero. The effects-coded part-worth utility estimates can be thought of as decreases/increases to the rating scale provided by an attribute level.

After estimating the individual-level OLS models, relative importance (RI) values were calculated. The RI was calculated as follows:

$$RI_i = \frac{Range_i \ x100}{\sum range_i}; \ I = 1, \ldots, 4 \quad [2]$$

where range is the highest part-worth utility for attribute *i* minus the lowest part-worth utility for attribute *i*. The RI values can be interpreted as the extent (percent) of the decision that each attribute has in the total decision process.

Although overall means of part-worth utilities and RI values are interesting, the general population is heterogenous in nature. Therefore, we used a cluster analysis to group respondents with like part-worth utilities (Green and Helsen 1989). Ward's linkage was used as the clustering mechanism with a combination of max pseudo-J and min pseudo-t^2 criteria, and a subjective evaluation was used to identify the final number of clusters. The max pseudo-J and min pseudo-t^2 criteria are purely objective measures; however, subjective evaluation allows for clusters to be analyzed to ensure that they are measurable, actionable, accessible, sustainable, and differentiable (Kotler and Armstrong, 2009). After finalizing the number of clusters (9), a multinomial logit (MNL) analysis was used to estimate how various demographics and other variables impacted the probability of being in each cluster. The MNL marginal effects are presented in the results because they are easier to interpret than the initial MNL parameter estimates that are interpreted as log-likelihoods. The MNL marginal effects can be interpreted as follows: continuous variable = percent decrease/increase in the probability of being in a cluster given a 1-unit change in the variable and categorical variable = percent decrease/increase in the probability of being in a cluster compared with the base category.

Results and Discussion

Table 3 shows the part-worth utility and RI values for the sample as a whole and each of the nine clusters. When first examining the whole sample results, the information topic had the highest RI value (37%), followed by information distribution, with an RI value of 31% (Table 3). This implies 37% (out of 100%) of the decision to like/not like a program was based on the topic being covered. With regard to part-worth utilities, gardening provided the highest rating increase (2 rating scale points or 2% gain), and a turf topic resulted in a rating decrease of 5 points (or 5% decrease). Live in-person and Extension had the largest increases in likeliness to attend, but they only moved the scale by 0.7 and 0.2 rating points, respectively.

Clusters

When examining the cluster RI values and part-worth utilities, it was clear that there was heterogeneity within the sample across

Table 2. Attributes and levels used in the conjoint analysis portion of an online national survey to assess floral preferences in Jun 2021.

Attributes	Level 1	Level 2	Level 3	Level 4
Information topic	Ornamental	Gardening	Turf	Houseplants
Information distribution	Prerecorded	Printed	Live in-Person	Live-streamed
Information source	Public gardens	Extension	Industry	
Participant numbers	Multiple	Singular		

most attributes and levels. This implies a "one size fits all" Extension approach to teach gardening has a high probability to fail for many (potential) gardeners.

Cluster 1: Fuzzy cluster. Cluster 1 was termed the fuzzy cluster because no part-worth utility values made a large individual impact on the rating scale (Table 3). Fuzzy clusters are not uncommon and have been denoted in the gardening/turf realm (Hall et al. 2010; Campbell et al. 2021). The fuzzy cluster represented a majority of respondents (56%), which implied that many people did not have strong preferences or were disinterested in plant/turf/gardening information. Overall, this cluster relied on information topic and information distribution the most to determine their decision of whether they liked an educational program. Although the part-worth utilities had a small impact on the overall program rating, this cluster did not want turf content, wanted live content (either in-person or live-streamed), wanted the content provided by a public garden, and wanted to have other people present. The program with the highest likeliness to attend for this cluster would be a gardening topic presented live and in-person by a public garden with multiple people [rating = 56.2 (54.1 + 1.0 + 0.4 + 0.3 + 0.3)] but would be least likely to attend a program about a turf topic that was prerecorded and presented by industry that was completed without other people [rating = 51.5 (54.1 − 1.7 − 0.5 − 0.2 − 0.3)].

The fuzzy cluster was more likely to comprise younger respondents; Gen X, Millennials, and Gen Z respondents were 8.6%, 17%, and 8.5% more likely to be in this cluster than the Baby Boomer and older age group, respectively (Table 4). Males, households with more kids, and rural respondents also were more likely to be in this cluster. However, principal plant buyers were 4.3% less likely to be in this cluster.

Cluster 2: Turfgrass/nonlive format. The turfgrass/nonlive format cluster (cluster 2) included 9% of the respondents (Table 3). This cluster valued turfgrass as a topic and having information provided in a nonlive format. A turf topic generated a 7.4% increase in rating, while an ornamental topic resulted in a 8.7% decrease in rating. This cluster also preferred nonlive instructional formats, with prerecorded formats increasing the rating score by 5.6% and printed material resulting in a 3.6% increase in likeliness to participate. Information provided by Extension increased the likeliness to participate score by 2.4%. The optimal program for this cluster would be a turf topic that was prerecorded by Extension but had multiple people viewing the recording, which would have garnered a rating of 66.3 on the likeliness to participate scale. However, an ornamental topic that is live and hands-on provided by industry in a one-on-one setting would have the lowest likeliness rating of 31.2 on the scale.

The turfgrass/nonlive format cluster had few significant demographic variables in the MNL model. Unlike the first cluster, age was not significant but male sex was significant. The likelihood of males in this cluster increased 2.8%. Respondents who lived in the Rocky Mountains and the Plains regions were 5.0% and 4.1% less likely to be in this cluster, respectively.

Cluster 3: Ornamental/live and hands-on. The ornamental/live and hands-on cluster had 10% of respondents in cluster 3. Both information topic and information distribution method had similar importance to participation factors, with 33% and 34% for topic and distribution method, respectively (Table 3). This cluster wanted ornamental information but not gardening information. Ornamental information increased the rating scale by 8.9%, while gardening information decreased the rating scale by 8.6%. This cluster also wanted live and hands-on programs provided by industry. For this cluster, an ornamental program provided live and hands-on by industry in a one-on-one setting would generate the highest likeliness to participate (rating = 68), while a gardening program live-streamed by Extension with multiple people attending would have the lowest likeliness to participate (rating = 31.3).

This cluster was less likely to have respondents with a lower education level. Those

Table 3. Relative importance and part-worth utility values by cluster from a conjoint analysis of data from an online national survey to assess floral preferences in Jun 2021.

	Cluster 1 Fuzzy cluster	Cluster 2 Turfgrass/ not live	Cluster 3 Ornamental/ live hands-on	Cluster 4 Houseplants/ not live industry	Cluster 5 Gardening/ no turfgrass	Cluster 6 Gardening/ live-streamed	Cluster 7 No turfgrass/ live hands-on/ extension	Cluster 8 Gardening/ houseplants/ live/Extension	Cluster 9 No turfgrass/ gardening	Total
					Relative importance values					
Information topic	34%	**38%**	**33%**	**43%**	**43%**	29%	**36%**	**52%**	**65%**	37%
Information distribution	31%	31%	**34%**	29%	28%	**38%**	**36%**	24%	17%	31%
Information source	22%	20%	20%	18%	17%	20%	20%	17%	11%	20%
Participant numbers	13%	11%	13%	11%	12%	13%	9%	7%	7%	12%
					Information topic					
Ornamental	0.2	−8.7	8.9	−1.0	−1.3	−7.6	5.5	−15.5	11.5	0.4
Gardening	1.0	0.0	−8.6	−9.5	15.2	8.2	7.1	20.8	15.5	2.0
Turfgrass	−1.7	7.4	−1.4	−11.5	−14.5	0.6	−19.5	−24.0	−40.6	−5.2
Houseplants	0.5	1.2	1.1	21.9	0.7	−1.2	6.8	18.6	13.6	2.8
					Information distribution					
Prerecorded	−0.5	5.6	−0.4	5.4	−2.1	0.2	−11.0	0.4	−1.5	−0.1
Printed	−0.2	3.6	−0.9	4.6	3.4	−9.2	0.0	−6.3	2.0	0.1
Live and hands-on	0.4	−5.1	7.8	−6.5	−5.4	−5.7	18.5	8.2	1.7	0.7
Live-stream	0.3	−4.1	−6.4	−3.5	4.1	14.7	−7.5	−2.3	−2.2	−0.7
					Information source					
Public garden	0.3	−0.2	−0.3	−3.9	1.8	−1.4	0.4	−5.6	−0.1	−0.1
Extension	−0.1	2.4	−1.2	−1.0	1.7	−1.1	4.0	4.7	−0.7	0.2
Industry	−0.2	−2.1	1.5	4.9	−3.5	2.5	−4.4	0.9	0.8	−0.1
					Participant numbers					
Multiple	0.3	1.9	−1.1	−3.5	−1.1	−2.3	2.4	0.9	−0.6	0.0
Alone	−0.3	−1.9	1.1	3.5	1.1	2.3	−2.4	−0.9	0.6	0.0
Constant	54.1	49.0	48.7	41.8	43.2	45.1	42.5	40.1	54.3	50.4
R^2	82%	85%	85%	89%	88%	84%	89%	92%	94%	85%
Adjusted R^2	2%	17%	20%	40%	34%	10%	40%	54%	69%	15%
Observations (no.)	1,481	228	269	114	147	80	87	66	161	2,633
Percent in cluster	56%	9%	10%	4%	6%	3%	3%	3%	6%	100%

Table 4. Marginal effects from a multinomial logit model for the first four clusters using data from an online national survey to assess floral preferences in Jun 2021.

	Cluster 1		Cluster 2		Cluster 3		Cluster 4	
	Fuzzy cluster		Turfgrass/not live		Ornamental/live hands-on		Houseplants/not live industry	
Variable	Marg. Eff.	*P* value	Marg. Eff.	*P* value	Marg. Eff.	*P* value	Marg. Eff.	*P* value
Gen X	**0.086**	**0.002**	−0.009	0.570	−0.021	0.203	**−0.019**	**0.024**
Millennial	**0.170**	**0.000**	−0.010	0.505	−0.020	0.181	**−0.022**	**0.007**
Gen Z	**0.085**	**0.006**	0.013	0.500	−0.022	0.220	**−0.017**	**0.065**
Region								
Far West	0.010	0.781	−0.009	0.651	−0.026	0.185	−0.011	0.319
Rocky Mountains	0.032	0.441	**−0.050**	**0.005**	−0.023	0.347	−0.005	0.747
Southwest	0.010	0.778	−0.015	0.416	0.030	0.211	**−0.030**	**0.000**
Plains	−0.010	0.793	**−0.041**	**0.023**	0.040	0.155	−0.014	0.239
Great Lakes	0.014	0.769	0.000	0.991	0.028	0.403	**−0.024**	**0.038**
Mideast	−0.026	0.364	0.015	0.350	0.013	0.477	−0.002	0.864
New England	−0.001	0.973	0.022	0.378	**−0.050**	**0.009**	0.018	0.286
Caucasian (1 = yes)	0.014	0.565	−0.016	0.254	**−0.031**	**0.048**	0.003	0.774
Male (1 = yes)	**0.096**	**0.000**	**0.028**	**0.020**	−0.001	0.963	**−0.016**	**0.043**
Political affiliation								
Republican	0.004	0.889	0.000	0.993	−0.017	0.281	−0.008	0.425
Other affiliation	−0.022	0.396	0.004	0.806	0.013	0.405	0.001	0.951
Education								
High school or less	**0.092**	**0.002**	−0.016	0.329	**−0.034**	**0.033**	−0.012	0.258
Some college	**0.047**	**0.092**	−0.013	0.386	**−0.039**	**0.013**	−0.009	0.367
Greater than bachelor's degree	0.030	0.334	−0.017	0.274	0.011	0.588	0.000	0.999
Kids in household (no.)	**0.016**	**0.078**	−0.001	0.828	0.006	0.275	−0.003	0.461
Adults in household (no.)	0.003	0.744	0.002	0.678	0.004	0.391	0.003	0.308
Residence location								
Suburban	−0.022	0.363	0.017	0.244	0.000	0.980	0.003	0.785
Rural	**0.048**	**0.089**	−0.001	0.971	−0.008	0.640	−0.003	0.767
Median household income ($)[i]	0.003	0.184	−0.000	0.836	**−0.004**	**0.007**	**−0.002**	**0.053**
Principal plant buyer (1 = yes)	**−0.043**	**0.077**	−0.003	0.808	0.001	0.944	0.013	0.136

[i]Median household income is interpreted as the percent decrease/increase in the probability of being in a cluster given a $10,000 increase in the median household income.

with a high school diploma or less and those with some college were 3.4% and 3.9% less likely to be in this cluster than were respondents with a bachelor's degree (Table 4). Respondents in this cluster were also more likely to have a lower median household income; for every $10,000 increase in median household income, a respondent was 0.4% less likely to be in this cluster.

Cluster 4: Houseplants/nonlive/industry. The houseplant/nonlive/industry cluster represented only 4% of the sample, but cluster 4 did have important drivers of their likeliness to participate in a program (Table 3). Information topic was the most important factor in their likeliness to participate, thus making up 43% of the decision. Information distribution method was the second most important attribute, making up 29% of the decision. Providing this cluster with houseplant information resulted in a 21.9% increase in their likeliness to participate, while all other information topics resulted in a decrease in the rating score. This cluster also gave increased ratings for prerecorded and printed material as well as programming provided by industry. This cluster wanted to participate in the program alone. The program comprising an ornamental topic that was prerecorded by industry that could be taken alone had the highest likelihood of attendance (rating = 77.4). The score of 77.4 for this cluster was the highest likeliness score across all clusters. However, a turf topic that was live and hands-on, provided by a public garden, and had multiple people attending was the least likely to be attended by these respondents (rating = 16.4).

This cluster was more likely to be older, with Gen X, Millennial, and Gen Z respondents being 1.9%, 2.2%, and 1.7% less likely to be in this cluster compared with Baby Boomer and older respondents, respectively (Table 4). Households with higher median household incomes were also less likely to be in this cluster, as were males (compared with females) and respondents from the Southwest and Great Lakes (compared with respondents from the Southeast).

Cluster 5: Gardening/no turf. Six percent of respondents were in the gardening/no turf cluster (cluster 5) (Table 3). Information topic was the primary driver in their decision to participate, comprising 43% of their likelihood to participate. When presented with a gardening topic, this cluster's rating score increased by an average of 15.2%. However, a turf topic caused a decrease in likeliness to participate by 14.5%. All part-worth utilities for the other attributes were less than 4.1% (live-streamed). To optimize a program for this cluster, a gardening topic that was live-streamed by a public garden that allowed for a participant to be alone resulted in highest scores on the likeliness to participate scale (rating = 65.4). However, a turf program that was live and hands-on provided by industry with multiple people attending was least preferred (rating = 18.7).

Respondents with higher median household incomes were more likely to be in this cluster because for every $10,000 increase in the median household income, a respondent was 0.2% more likely to be in this cluster (Table 5). Having greater than a bachelor's degree resulted in the respondent being 2.4% less likely to be in this cluster compared with a respondent with a bachelor's degree. Furthermore, only Millennials were less likely than Baby Boomers and older individuals to be in this cluster because a Millennial was 2.9% less likely to be in this cluster.

Cluster 6: Gardening/live-streamed. Three percent of respondents were in the gardening/live-streamed cluster (cluster 6) (Table 3). This cluster relied on information distribution method as the major factor in their decision to participate in a program. Thirty-eight percent of their decision to participate was based on the information distribution method, with 29% based on information topic. Information source and participant numbers comprised 20% and 13% of the decision, respectively. As with the previous cluster (cluster 5), the gardening/live-streamed cluster wanted gardening topics. A gardening topic resulted in a 8.2% increase in the likeliness rating, while an ornamental topic resulted in a 7.6% decrease in that rating. Live-streamed content increased a respondent's likeliness to participate by 14.7%, on average, compared with printed material, which decreased the rating by 9.2%. Industry was the preferred information source, and singular participation in the program was also preferred. The program with the highest likeliness to attend was a gardening topic presented by industry that was live-streamed, with the respondent being able to complete the

Table 5. Marginal effects from a multinomial logit model for clusters 5 through 9 using data from an online national survey to assess floral preferences in Jun 2021.

	Cluster 5		Cluster 6		Cluster 7		Cluster 8		Cluster 9	
	Gardening/ no turfgrass		Gardening/ live-streamed		No turfgrass/ live hands-on/ Extension		Gardening/ houseplants/ live/Extension		No turfgrass/ gardening	
Variable	Marg. Eff.	*P* value	Marg. Eff.	*P* value	Marg. Eff.	*P* value	Marg. Eff.	*P* value	Marg. Eff.	*P* value
Gen X	−0.002	0.895	**−0.017**	**0.007**	−0.005	0.475	0.003	0.505	**−0.015**	**0.030**
Millennial	**−0.029**	**0.004**	**−0.023**	**0.000**	**−0.014**	**0.047**	**−0.011**	**0.009**	**−0.042**	**0.000**
Gen Z	−0.005	0.715	**−0.014**	**0.046**	−0.002	0.846	**−0.013**	**0.001**	**−0.026**	**0.000**
Region										
Far West	0.027	0.185	0.002	0.888	0.000	0.973	0.004	0.556	0.004	0.757
Rocky Mountains	0.017	0.461	0.005	0.711	−0.007	0.493	0.007	0.410	0.022	0.171
Southwest	0.019	0.303	−0.002	0.870	**−0.013**	**0.089**	0.003	0.632	−0.002	0.859
Plains	0.021	0.349	0.003	0.817	0.000	0.980	**−0.010**	**0.034**	0.010	0.467
Great Lakes	0.002	0.941	0.026	0.235	**−0.025**	**0.000**	−0.007	0.244	−0.015	0.198
Mideast	0.009	0.509	0.002	0.808	−0.006	0.416	−0.004	0.399	−0.003	0.768
New England	0.004	0.837	−0.001	0.959	0.016	0.271	0.004	0.616	−0.011	0.310
Caucasian (1 = yes)	0.007	0.519	−0.013	0.144	0.008	0.245	0.004	0.374	**0.026**	**0.000**
Male (1 = yes)	−0.012	0.187	−0.004	0.505	**−0.022**	**0.000**	**−0.020**	**0.000**	**−0.049**	**0.000**
Political affiliation										
Republican	0.010	0.411	−0.006	0.435	−0.001	0.912	0.006	0.260	0.012	0.163
Other affiliation	−0.012	0.271	−0.006	0.397	0.005	0.546	0.006	0.238	0.011	0.206
Education										
High school or less	−0.005	0.706	0.014	0.271	**−0.022**	**0.001**	**−0.013**	**0.001**	−0.005	0.607
Some college	0.016	0.242	0.013	0.273	**−0.012**	**0.084**	−0.003	0.390	0.000	0.967
Greater than bachelor's degree	**−0.024**	**0.035**	0.020	0.191	−0.007	0.386	**−0.013**	**0.001**	0.002	0.878
Kids in household (no.)	0.002	0.574	**0.006**	**0.020**	**−0.008**	**0.020**	−0.003	0.150	**−0.014**	**0.002**
Adults in household (no.)	−0.006	0.108	**−0.007**	**0.014**	0.003	0.167	0.001	0.706	−0.002	0.529
Residence location										
Suburban	0.017	0.143	0.002	0.782	−0.007	0.335	−0.005	0.214	−0.004	0.549
Rural	−0.002	0.884	−0.007	0.443	−0.011	0.130	**−0.007**	**0.090**	−0.009	0.311
Median household income ($)[i]	**0.002**	**0.035**	−0.000	0.865	0.000	0.530	0.000	0.987	0.001	0.256
Principal plant buyer (1 = yes)	0.003	0.802	0.010	0.141	−0.001	0.917	0.001	0.837	**0.019**	**0.006**

[i]Median household income is interpreted as the percent decrease/increase in probability of being in a cluster given a $10,000 increase in the median household income.

program alone (rating = 72.8). However, an ornamental topic via printed material provided by a pubic garden with multiple people attending was least likely to gain participation from this cluster (rating = 24.5).

The gardening/live-streamed cluster was less likely to have younger respondents because Gen X, Millennial, and Gen Z were less likely to be in this cluster (Table 5). However, as the number of children in a household increased, there was a higher likelihood that the person would be in this cluster. In contrast, as the number of adults in a household increased, there was a lower likelihood that the person would be in this cluster. Given this finding, it appeared that this cluster comprised single-parent families and that the parent wanted garden information but did not have the time or resources to attend an in-person event and wanted the in-person feel of live-streaming the program.

Cluster 7: Nonturf/live and hands-on/ Extension. Cluster 7 was the nonturf/live and hands-on/extension cluster and comprised 3% of the sample (Table 3). This cluster equally valued the information topic and distribution method, with both comprising 36% of the decision to participate. A turf topic resulted in a 19.5% decrease in the likeliness to participate in the program, while gardening, houseplant, and ornamental topics increased the likeliness by 7.1%, 6.8%, and 5.5%, respectively. A live and hands-on program increased the rating by 18.5%. Extension as a source of information increased the rating by 4.0%. The program that this cluster would be most likely to attend would be a gardening topic presented by Extension that is live and hands-on with multiple people attending (rating = 74.6). The least likely program to be attended by this cluster would be a turf topic that is prerecorded by industry with singular participation (rating = 5.2).

Respondents with lower education levels were less likely to be in this cluster, as were households with more kids (Table 5). Males were 2.2% less likely and Millennials were 1.4% less likely to be in this cluster. Respondents from the Southwest and Great Lakes were 1.3% and 2.5% less likely, respectively, to be in the nonturf/live and hands-on/extension cluster.

Cluster 8: Gardening/houseplant/live/ Extension. Three percent of respondents were in the gardening/houseplant/live/extension cluster (cluster 8) (Table 3). The majority of the decision to participate was based on information type, with 52% of the decision based on what information would be provided in the program. Both gardening and houseplant information had large impacts on the likeliness rating, with gardening increasing the rating by 20.8% and houseplant topics increasing the rating by 18.6%. This cluster also wanted live and hands-on programming (8.2% rating increase) with information coming from Extension (4.7% rating increase). The 4.7% rating increase for Extension was the highest increase across all clusters. The program with the highest likeliness to participate was a gardening topic that is live and hands-on by Extension with multiple people attending (rating = 74.7). This cluster was the least likely to attend a turf topic via printed material from a public garden that was to be completed alone (rating = 3.4).

Baby Boomers and older groups were more likely than Millennials and Gen Z to be in this cluster (Table 5). Males were 2.0% less likely to be in this cluster, as were respondents with a high school or less education (1.3% less likely) and respondents with more than a bachelor's degree (1.3% less likely).

Cluster 9: Nonturf/gardening. The ornamental/gardening cluster represented 6% of the sample (cluster 9) (Table 3). Information type was the primary participation decision driver, comprising over 65% of the decision space. By far, this cluster did not want a turf topic. A program with a turf topic reduced the likeliness of participating by 40.6%, while a gardening topic increased the likelihood by 15.5%. This cluster also wanted printed material (2.0% increase), with live and hands-on providing a similar rating increase (1.7%). The optimal program for this cluster would be a gardening topic via printed material from industry that can be used alone (rating = 73.3). The least optimal program would be a turf topic that is live-streamed from Extension

with multiple people attending (rating = 10.1).

This cluster largely comprised older respondents, with Gen X, Millennials, and Gen Z respondents comprising 1.5%, 4.2%, and 2.6%, respectively, of this cluster (Table 5). Males were 4.9% less likely to be in this cluster. As the number of kids increased in a household, the likelihood of being in this cluster decreased by 1.4%.

Conclusions

As the green industry, Extension, and other stakeholders try to increase participation in gardening and landscaping, it is essential to understand what information is desired and how to distribute the information. An educator can develop the perfect program, but if they market the program in the wrong way or attract the wrong attendees, then the program will fail and the likeliness of attending future programs could be diminished. This study examined what information is desired along with what information distribution methods are desired by different types of people.

The results indicated that the types of information and how it should be distributed are extremely heterogeneous in nature because people want different information, in different ways, from different sources. A "one size fits all" approach that often has been a central part of our industry and Extension educational efforts is outdated. Through the cluster analysis, it was apparent that one cluster desired live-streamed gardening information while another cluster wanted that same gardening information via live and hands-on programming. Failure to offer programming in the format desired will result in a lower likelihood of participation even though both want the same information.

Furthermore, marketing a program incorrectly may result in serious ramifications for that program. For instance, an ornamental program labeled as a gardening program could drive more attendance, but it will most likely create detrimental long-term impacts if participants do not receive the topic content they were expecting. In contrast, labeling a program as an ornamental program that has a focus on gardening may cause a large number of people to not attend even though they might benefit from the information.

Using the results of this study, Extension educators can assess the size of the clientele who may want a particular program and directly target those clientele to increase participation rates. For instance, cluster 6 (gardening/live-stream) comprised 3% of respondents. Although 3% sounds like a small cluster, because it represented approximately 75 respondents, by directly targeting a program that this cluster values, participation rates in the program should increase. By increasing the participation rates marginally, the return on investment associated with providing the program is increased. Furthermore, by generalizing the results to a larger population, for example, 10,000 in an area, 300 people in cluster 6 could be directly targeted with a specific program that appeals to them.

Although there is no "silver bullet" that can make a program fit everyone's needs, a targeted approach whereby the educator targets different programs to different clientele will increase efficiency. Notably, correctly labeling programs based on their content and targeting demographics who are not only more likely to participate but also more likely to value the material is essential. An educational program that focuses only on "butts in the seats" and does not account for differences in what information is desired or how to effectively distribute the information is destined to fail in the long-term.

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