Exploring the market penetration of floral arrangements using second-price and double auctions

M. J. Knuth[1a], X. Wu[2], C.R. Hall[3] and M. A. Palma[4]

[1]Department of Horticultural Sciences, North Carolina State University, NC, USA; [2] Texas A&M AgriLife Extension, Texas A&M University, TX, USA; [3]Department of Horticulture Science Texas A&M University, College Station, TX, USA; [4]Department of Agricultural Economics, Texas A&M University, TX, USA.

Abstract
Cut flower products are priced in the market competitively to gain the most profit margin. But, do consumers value floral products at their market value? A single round second-price auction and two rounds of double auctions with buyers and sellers were utilized to gain a true representation of the value placed on a standard hand-tied bouquet priced at $15 - $20. Input for the design used in the experiment was solicited from the Benz School of Floral Design Director and two American Institute of Floral Design (AIFD) members. The flowers used in the designs were valued at the actual prices paid for flowers and hardgoods purchased from floral wholesalers in Houston, Texas. The experiment was conducted at Texas A&M University (TAMU) Human Behavior Lab with 124 community members ranging from 18 to 87 years old. The floral design that the participants were bidding for was physically placed at the front of the room and was also displayed on each of the computer screens for the participants to easily view. Participants were allowed to touch, interact, and examine the design during the experiment if they wished to do so. The results indicate that some consumers value floral products at a much lower price point than the real market value. Floral firms should consider value propositions other than price that would enhance the product or the experience of the product to increase market penetration. Education and marketing (including digital engagement) are key to appealing to consumers and expanding demand by shifting the demand curve into new consumer categories.

Keywords: second-price auction, double auctions, cut flowers, consumers,

INTRODUCTION

Cut flower products in the United States are commonly sold for a variety of purposes: personal use, as gifts for others, for special occasions, and for décor (Kim et al., 1999; Lai and Huang, 2013; Palma and Ward, 2010; Rihn et al., 2011; Yue and Hall, 2010; Zhao et al., 2016). Aesthetic value is a crucial element of purchasing for floral consumers (Behe et al., 1992).

In a typical month, the percentage of U.S. consumers that purchase flowers is less than five percent (Palma and Ward, 2010). However, due to data availability, it is difficult to determine how much floral consumption is specifically related to cut flowers versus potted plants, perennials, or annuals. According to Stephen Bachmann, author of *The Reason for Flowers: Their History, Culture, Biology, and How They Change Our Lives*, the U.S. consumes

[a] E-mail: mjknuth@ncsu.edu

10 million cut flowers on an average day (Keatley Garvey, 2016). Personal consumption of flowers has steadily increased from 1970 to 2017 with some setbacks in 1990-1991, 2000-2001, and 2008-2009 (Arizton, 2019; U.S. Economic Census Bureau, 2019). The maturity of the floral market has led to hyper-competitiveness, squeezed margins, and price competition. This affects consumers' responsiveness to floral products.

In a simulation of the floral market using secondary data sources, Palma and Ward (2010) found that market penetration and buyer frequency increased with age and when female purchasers were buying for self-use. One of the most important overall objectives of their research project was to separate the demand drivers for flowers into the market penetration component from that of the frequency of buying. Most transactions for all flowers took place because of the entry of new buyers rather than repeat buying customers (frequency); however, when analyzing each variable individually, this percentage differed across flower types. The extreme importance of market penetration versus frequency of buying has considerable implications. New buyers may need additional information and are potentially influenced by the first impression, whether the facilities or quality of the flowers. Buying habits may not be as well established in terms of the types of flowers and what is communicated with different types. Hence, having in-store information to guide potential buyers is more important than with products where consumers are frequent repeat buyers.

The top three factors considered when making a floral purchase are convenience, product quality, and price (Floral Purchase, FMRF). Regardless of the age of the respondent, quality and longevity were the most important floral attributes. Additionally, design is important for younger consumers (Yue et al., 2009). In 2005, houseplants were the most spontaneous purchases and approximately 1/3 of all plant purchases were impulse; 80 percent of cut flowers and bedding plant purchases were premeditated (Yue et al., 2009). Seventy percent of consumers are unaware of the origins of flowers, yet 51 percent of consumers would buy locally if given the choice (Arizton, 2019). Seventy percent of supermarket consumers report that they will prioritize holiday purchases while 66 percent said they will emphasize making impulsive purchases (Prince & Prince, Inc., 2016). Consumers choose retail outlets based on floral product type and consumers prefer to buy arranged flowers over unarranged flowers from traditional freestanding floral outlets and through direct-to-consumer channels (Yue and Behe, 2008).

Consumer Knowledge about Floral Design/Price

For the U.S. floral market, demand slumped in 2005 (Floral Purchasing, FMRF). Additionally, buying households decreased by roughly $3 million in 2005 versus in 2003 and 2004. Soon after came the Great Recession, where the industry saw the second slump in demand from 2008 to 2009. Buying households had previously purchased floral arrangements an average of 5 times per year, but this has declined slightly over time (Floral Purchasing, FMRF). Prior to this, spending held steady at 5 to 6 floral arrangements purchased per year from 1995 to 2005 (Floral Purchasing, FMRF). The average spending per arrangement was $17.49 during that same period. In 2016, consumers purchased flowers approximately every 4.4 months (Russel Research, 2016). Broken down by generation, Millennials purchased approximately every 3.6 months, Generation X every 4.4 months, and Baby Boomers every 5.3 months (Russell Research, 2016). Given that floral expenditures have been decreasing

among consumers under 40 years of age for the past two decades, innovative marketing strategies to target this age cohort are essential for the floral industry's success in the future (Zhao, 2016).

A 2019 report by the International Association of Horticultural Producers (Hendricks, 2019) shows that average spending on flowers and plants at farmgate value (domestic plus imports) is $26.48-$34.46. The average retail value of flowers and plants (domestic plus imports) is $79.45-$103.36 (Hendricks, 2019). Consumers, on average, cannot tell the difference between visually similar flowers that are priced dramatically differently in the market, for example, ranunculus versus carnations or Nerine versus Alstroemeria (Wu et al., 2020).

Auctions in Behavior Research

Psychologists and behavioral economists want to learn about people's values to understand the degree to which decisions are consistent with preferences and beliefs, while marketing experts are interested in eliciting values to better understand consumer preferences, forecast new product success, and measure the effectiveness of promotional activities (Lusk and Shogren, 2007; Wertenbroch and Skiera, 2002). Experimental auctions are a way for researchers to tease out implicit values, or revealed preferences, for a good or product (Hanley et al., 2006). As a result, applied researchers have turned to experimental auctions to elicit consumer valuations for new goods and services (Bohm, 1972; Brookshire and Coursey, 1987; Hoffman et al., 1993; Lusk et al., 2001; Shogren et al., 1994). In experimental auctions, bids are revealed preferences obtained in a real market with real products and money. Experimental auctions use real money and goods to create a market where people's attention is focused on the valuation task and to determine each person's willingness to pay for a good.

A second-price auction (SPA) is much like an English auction that most individuals are familiar with, where all of the participants submit bids and an auctioneer accepts the highest bid as the winner (Lusk and Shogren, 2007). In the SPA, participants submit sealed bids and the highest bidder wins the product, but they actually pay the second highest bid for the flowers they have purchased. This is what makes the second price auction unique; it prevents participants from competitively bidding to win the auction for the purpose of winning and thereby overbidding (e.g., auction fever). This way, we can gain a more realistic representation of the value placed on the auctioned item.

A double auction divides participants into the role of buyers and sellers to submit bids and prices simultaneously (Lusk and Shogren, 2007). This most resembles what we see in the floral industry where there are multiple companies selling a product and multiple buyers wishing to purchase this product at their individually perceived price level. By imitating the real market, we can ascertain what consumer's true value of the product is by allowing them to make monetary exchanges (within a lab setting) for the product. We used a double auction to see if a person who makes a discrete choice follows through with the same choice when they are bidding for a real, living product in an incentivized market environment. Furthermore, we wanted to be able to capture potential differences in the attribute valuations with ownership of the floral designs (e.g., when acting as a seller versus a buyer). That is, those who play the role of sellers have in their possession the floral designs and may have different valuations (e.g., How much money am I willing to accept to part with these flowers?).

In this experiment, we investigate what floral purchasers' willingness to pay estimates are for typically available floral bouquets and how they value these bouquets using second price and double auction methods.

METHODOLOGY

One hundred and twenty-four participants were recruited through newspaper ads, Craig's List, Homeowner's Association email blasts, and Facebook community groups. In order to capture valuations of all consumers, there were no participating restrictions for previous purchasing of floral product in the past 12 months. Participants came to the Human Behavior Laboratory (College Station, TX) to physically participate in the experiments (Texas A&M University IRB#2019-0717M). Once at the lab, a consent form was completed then the eye-tracking software was calibrated to the participants' eye movements. One hundred and twenty-four participants were retained. This portion took approximately 10-15 minutes of the 1-hour long experiment. Participants were paid approximately $15 for their participation and up to an additional $15 depending on their decisions during the auction rounds.

Designs and flowers were chosen based on floral industry standards and the arrangements were freshly created at the Benz School of Floral Design. A professional photographer was hired to take and process all photographs. Photos were used instead of fresh arrangements because the variability of the fresh product could not be consistent for the entire study period. Photos were then imported into iMotions Biometric software (Copenhagen, Denmark) and randomized to prevent picture ordering effects.

Participants played one round of a Second Price Auction and two rounds of a Double Auction (therefore playing one round in the role of Seller and one round in the role of Buyer). Rounds were randomized to prevent ordering effects. The floral design that the participants were bidding for was present at the front of the room and also displayed on each of the computer screens for the participants to easily view (Figure 1). Participants were allowed to touch, interact, and examine the design during the experiment if they wished.

Figure 1. Example of an arrangement (hand-tied bouquet) used for the auction experiments. This floral design was patterned after the most commonly sold bouquet in the United States. The design and number of flowers were chosen to meet the approximate $20 price point based on industry mark-up standards.

Participants had an unlimited amount of time to submit bids for the Second Price Auction, but only had two minutes per bidding round for the Double Auction. Therefore, if the round timed out but the participant had not chosen to accept a bid or an offer, they wouldn't have made an exchange. The auctions were made salient to the participants by bidding with their $30 participation fee. If participants wanted the floral design, as a seller they could keep it and their $30 compensation. If they wanted to exchange their floral design for more earnings, they could make offers to the buyers.

Additionally, if buyers wanted to take home a floral design, they would have to bid and win a floral design. The amount that was accepted during the exchange was deducted from their participation fee. If buyers did not want to buy a floral design, they could abstain and keep their $30 compensation. This portion represented 25-30 minutes of the 1-hour experiment. At the conclusion of the experiment session, one participant volunteered to draw a chip to determine which of the auction rounds would be binding for payment. Payments and floral designs were distributed after a demographic survey.

Double Auction "bids" were sorted highest to lowest to represent the theoretical demand curve and "offers" were sorted lowest to highest to represent the theoretical supply curve. Both lines were displayed in a line graph to illustrate the market. In contrast, the Second Price Auction only consists of bids and therefore only simulates the demand curve. Second Price Auction bids were averaged and presented as a horizontal line along with the Double Auction curves.

Input regarding the floral designs used in the study was solicited from the current Director of the Benz School of Floral Design at Texas A&M University, Mr. Bill McKinley, AIFD, CFD, ICPF and one of the research team members, Xuan (Jade) Wu, Ph.D., AIFD, CFD, EMC. The flowers used in the designs were valued at the actual prices paid for flowers and hardgoods purchased from floral wholesalers in Houston, Texas.

Using the bouquet pictured in Figure 1 as an example, this bouquet contains eight carnations purchased wholesale at a price of $0.48 to $0.62/stem (depending on the time of the year) with two baby's breath stems valued at $0.92 to $1.12/stem and four leatherleaf stems at valued at $0.20 to $0.25/stem, Thus, the cost of the flowers and greenery alone in the bouquet would range from $6.48 to $8.20, depending on the time of the year and the prices negotiated. We also assume that it would take 7 to 9 minutes of labor to make the bouquet, including prep and clean-up time. This would cost an additional $0.93 to $1.20 for labor (valued at $8.00 assuming minimum wage plus burden). Table 1 summarizes these costs, as well as the calculated selling price of the bouquet using three common pricing methods used by florists today.

Table 1. Example methods to determine the experimental bouquet at the $20 price point.

Input item	# of stems	Low cost/stem	High cost/stem	Total (low cost)	Total (high cost)
Carnation	8	$0.48	$0.62	$3.84	$4.96

Baby's breath	2	$0.92	$1.12	$1.84	$2.24
Leatherleaf	4	$0.20	$0.25	$0.80	$1.00
Subtotal				**$6.48**	**$8.20**
Cellophane sleeve	1	Sleeve		$0.50	$1.25
Labor (7-9 minutes @ $8/hr)	7-9	Minutes		$0.93	$1.20
Subtotal				**$1.43**	**$2.45**
Method 1 – 2X flowers and greenery, plus 1X hard goods, plus labor				$14.39	$18.85
Method 2 – 3X flowers and greenery, 2X hard goods, plus labor				$21.37	$28.30
Method 3 – 1X flowers, greenery, hard goods, plus labor, plus overhead (33%)**				$14.51	$17.25
Add in industry average Net Profit**					
Method 1				**$15.19**	**$19.65**
Method 2				**$22.17**	**$29.10**
Method 3				**$15.31**	**$18.05**

**industry averages for overhead and net profit are from the 2019 Premium Report on Florists (AnythingResearch, 2019)

The first price-setting method often used by florists is to take the wholesale value of the flowers and greenery and double the value, then add the cost of any hard goods and upgrades, and finally the cost of labor. Doubling the product cost would add up to $12.96 to $16.40 for the low-cost and high-cost floral input prices, respectively. Including the cellophane at $0.50 to $1.25/sleeve and $0.93 to $1.20 for 7 to 9 minutes of labor, the total cost would be $14.39 to $18.85 per bouquet, to which a desired profit margin would be added to arrive at the final selling price.

Another common pricing model used by florists for determining selling price is to markup floral products by 3X and hardgoods by 2X. Using this model (see Table 1), the total costs of the example bouquet would range from $21.37 to $28.30, to which a desired profit margin would be added to arrive at the final selling price.

The final pricing model evaluated in Table 1 involves taking 1X the actual Cost of Goods Sold (flowers, greenery, hard goods, labor) which would equate from a low of $14.51 to a high of $17.51, then adding an overhead allocation and a desired profit margin.

The 2019 Premium Report on Florists (AnythingResearch, 2019) reports industry-wide overhead costs at 33 percent of sales and industry-wide Net Profit Margin at 4 percent of sales. In Table 1, these are added to the above methods respectively. Given the estimates above, our attempt to model a bouquet that would typically sell at a $20 price point seems reasonable, though the selling price calculated using the 3 methods may range from a low of $15.19 to a high of $29.10 depending on the time of year, input prices negotiated, the profit margin desired, and the method a florist uses for calculating selling price.

RESULTS AND DISCUSSION
Demographics
      Comparing the sample with two national survey results of overall plant purchasers and floral purchasers, our sample consists of younger and more female consumers (Russell Research, 2016; Whitinger and Cohen, 2021). The median household income of the sample ($60,000) is slightly less than the median household income for the American households in 2019 ($67,521) (U.S. Census Bureau, 2021). On average, the sample was highly educated, with an average education level of a bachelor's degree (approximately 16 years of education) which is consistent among plant purchasers and floral purchasers (Russell Research, 2016; Whitinger and Cohen, 2021). Approximately 30 percent of the sample had not purchased a floral product in the past 12 months, 64 percent had purchased a floral product a few times yearly, 15 percent had purchased a few times monthly, and none of the participants had purchased floral products weekly. This aligns with Palma and Ward (2010), who indicated that less than 5 percent of floral consumers purchase flowers weekly.

      Even though the sample is younger and has a slightly lower income than the average floral consumer, this sample can demonstrate the perceived value that younger consumers place on floral products. This information can educate floral firms as to how much younger, less affluent consumers would be willing to pay for common product offerings.

Table 2. Demographic characteristics of the sample

Demographic Characteristic	Mean/Percent	Std. Dev.
Male	35%	0.48
Age (years)	37.63	16.86
Income (US Dollars, median)	$60,000	$32,725.82
White (percent)	0.65	0.48
Education (years)	15.94	2.57
Frequency of floral purchase		
Never	20.97%	
Few times yearly	63.71%	
Few times monthly	15.32%	
Few times weekly	0%	

Auctions
      Using the procedures described earlier, the auctioned hand-tied bouquet was created to be reflective of a typical $20 bouquet using industry standard mark-up procedures. The average bid that the participants reported for the Second Price Auction is $5.51 (s.d.= 6.21) (Table 3). Yet, the range of prices reported was from $0.00 to $50.00 for the bouquet. For the Double Auction, the average bid offered was $4.38 (s.d.=$11.78) with a range of $0.01 - $75.00. The average asking price requested was $5.74 (s.d.=$4.81) with a range of $0.10 - $25.00.

Table 3. Means, standard deviation, and range of auction prices and timings for Second Price and Double Auctions

	Mean	Std. Dev.	Range (Min. – Max.)	Proportion above minimum market price	Proportion above maximum market price
Second Price Auction Bids	5.51	6.21	0.00 – 50.00	18%	15%
Double Auction Bids	4.38	11.78	0.01 – 75.00	2.5%	2.5%
Double Auction Asks	5.74	4.81	0.10 – 25.00	5%	0%

Figure 2 displays all auction bids and offers during the two Double Auction rounds and Second Price Auction round. The Double Auction average bidding price is $4.38 and Second Price Auction average bidding price is $5.51. This is much lower than the retail price that this bouquet is valued at in the market by producers. The results here are a quite normal reflection of a demand curve. We would expect the demand curve to reach zero for a high price. We postulate these results occur for a myriad of reasons: lack of knowledge of what the product is currently sold at (i.e., no reference price), impulse purchasing, conceptual aversion (barriers) to buying floral products, and alternative product options (substitutes).
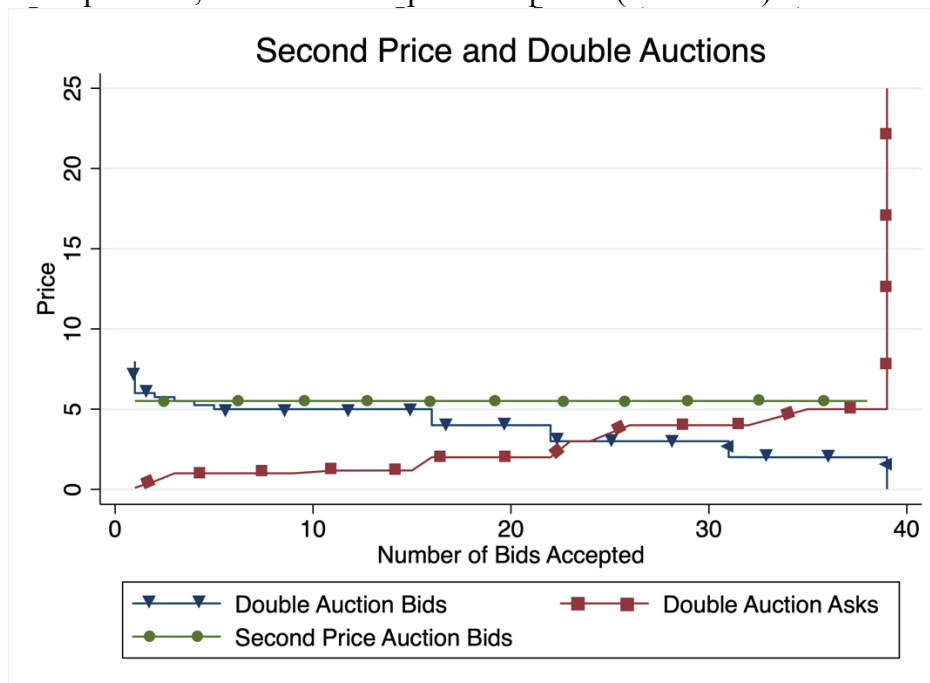

Figure 2. Auction Rounds from Second Price and Double Auctions with aggregated bids and asks.

Due to their relative lack of experience purchasing floral products, it is possible that the participants are not aware of the current price offerings for bouquets of various sizes with differing flower species and therefore perceive the value to be lower than the actual price offering. Floral firms should consider value propositions other than price that would enhance

the product or the experience of the product. There could be potential barriers to purchase, which is why the participants are pricing the bouquet lower than the actual price offering. Because they have pre-established perceptional barriers to purchasing, they would rather not purchase the bouquet, and therefore bid low dollar amounts for the bouquet (M&RR, 2016). A limitation of this experiment is that we did not ask if the participants had any *ex ante* barriers to purchase, which would limit their purchase intent.

Alternatively, lack of floral purchasing could be due to participants choosing to buy alternative products instead of floral products. Younger consumers value floral products, but due to their lower income, they could be more elastic in their demand for floral products and choose to purchase alternative products such as chocolates, balloons, and potted plants (M&RR, 2016; Russell Research, 2016).

Another reason that the purchase intent may have been lower is due to the design. Design is important for younger consumers (Yue et al., 2009). If the design is not of interest to them, or if they prefer other designs better, they may not be willing to pay the asking price for the floral product because the design is not of the quality they prefer (Floral Purchase, FMRF).

Some of the participants did offer higher bids than the floral bouquet's actual price. For example, the maximum bid value for the Second Price Auction was $50. The maximum bid value for the Double Auction was $75 and the maximum ask value was $25. For the Second Price auction, 18 percent of the subjects bid above the minimum calculated market price of ($15.19 – Price Method 1, Table 1). Fifteen percent of subjects bid higher than $29.10, which is the maximum calculated market price. Approximately 3 percent of subjects bid above the minimum and maximum calculated market prices. Five percent of subjects were asked for the minimum calculated market price, but none of the subjects as sellers asked for a price above $29.10. The proportion of subjects willing to pay the market price for the floral bouquet is a direct indicator of the real market penetration for floral bouquets. No matter the method of price calculation, there is the same proportion of subjects bidding, or asking for the set market prices in Table 1.

Even though there were participants who priced the bouquet lower than the market price value, there were participants who priced it as much as four times higher than the market price value. This is an indicator to floral firms that there are consumers who perceive greater value in floral products and are willing to pay high dollar values for the products. When comparing the frequency of floral purchases, there was no difference in the amount that participants bid or asked for (Bid Chi2=40.55 p=0.827; Ask Chi2=43.6729 p=0.809). This indicates that the frequency of floral purchase does not influence the perceived value that the consumers were willing to purchase the floral bouquet. This indicates, instead, that there are intrinsic attitudes about the floral product that are influencing the perceived value.

When not controlling for currently existing floral consumers in this experiment, we can capture the valuation of floral bouquets for all consumers. The low-price value does not mean that industry participants should be pricing themselves to the bottom, but instead should consider other elements of their value propositions that would enhance the product or the experience of the product in order to compel purchasing (Floral Purchasing, FMRF). Education and marketing (including digital engagement) are key to appealing to consumers and affecting their inelasticity of demand.

CONCLUSION

The following conclusions can be drawn from the study:

– Maintaining the consumer value is essential in light of intensifying competition between retail flower shops and other shopping channels due to convenience and competitive pricing.
– Maintaining value does not mean decreasing prices.
– The current perceived value of floral bouquets is lower than the market price offerings.
– The frequency of floral purchasing does not affect the price the participants valued the floral bouquet at.
– Education and marketing (including digital engagement) are key to appealing to consumers.
– Floral firms can reach new consumers by providing a variety of product offerings to appeal to consumers at different price points.

ACKNOWLEDGEMENTS

Literature Cited

Anything Research. (2019). 2018 U.S. industry statistics & market research – florists. Anything Research Industry Data & Market Research. Retrieved April 2021 from https://www.anythingresearch.com/industry/Florists.htm

Arizton. Floral gifting market in the U.S.: regional outlook & forecast for 2018 – 2023. Arizton Advisory & Intelligence. Retrieved April 2021 from https://www.arizton.com/market-reports/floral-gifting-market-in-united-states-2025

Behe, B.K., Price, T.A., and Tayama, H.K. (1992). Analysis of consumer purchases of floral products in supermarkets. HortScience 27, 455-459. doi: 10.21273/HORTSCI.27.5.455.

Bohm, P. (1972). Estimating demand for public goods: an experiment. European Economic Review 3, 111–130.

Brookshire, D.S. and Coursey, D.L. (1987). Measuring the value of a public good: an empirical comparison of elicitation procedures. American Economic Review 77, 554–566.

Brookshire, D.S., Coursey, D.L., and Schulze, W.D. (1987). The external validity of experimental economics techniques: analysis of demand behavior. Economic Inquiry 25, 239–250.

IPSOS. (2016). Floral purchase tracking study 2016. Floral Market Research Fund and Society of American Florists. Retrieved April 2021, from https://floralmarketingfund.org/product/2016-consumer-purchasing-study/.

Keatley Garvey, K. (2016). The real reason for flowers: not just for Valentine's day. Davis, CA Patch. Retrieved May 11, 2022, from https://patch.com/california/davis/real-reason-flowers-not-just-valentines-day-1.

Hanley, N., Shogren, J.F., and White, B. (2006). Introduction to environmental economics. Oxford, UK: Oxford University Press.

Hendricks, J., Briercliffe, T., Oosterom, B., Treer, A., Kok, G., Edwards, T., and Kong, H. (2019). Ornamental horticulture: a growing industry? International Association of Horticulture Producers (AIPH). Retrieved April 2021 from https://aiph.org/wp-content/uploads/2020/11/GIIC_AIPH_IVP_Report2019.pdf.

Hoffman, E., Menkhaus, D., Chakravarti. D., Field, R., and Whipple, G. (1993). Using laboratory experimental auctions in marketing research: a case study of new packaging for fresh beef. Marketing Science *12*, 318–338.

Kim, H.H., Kyung, Y.J., Ohkawa, K., Pak, C.H. and Kwack, B.H. (1999). Flower industry in Korea Acta Hort. *482*, 407-414.

Lai, Y. and Huang, L. (2013). The effect of relationship characteristics on buying fresh flowers as romantic Valentine's Day gifts HortTech. *23*, 28-37. doi:10.21273/HORTTECH.23.1.28.

Lusk, J.L., and Shogren, J.F. (2007). Experimental auctions. Methods and Applications in Economic and Marketing Research, 46-94.

Lusk, J.L., Fox, J.A., Schroeder, T.C., Mintert, J., and Koohmaraie, M. (2001a). In-Store Valuation of Steak Tenderness. American J. Ag. Economics *83*, 539–550.

M&RR. (2016). Purchasing barriers tracking study. Floral Marketing Fund. Retrieved April 2021, from https://floralmarketingfund.org/.

Palma, M.A. & Ward, R.W. (2010). Measuring demand factors influencing market penetration and buying frequency for flowers in the US Intl. Food Agribus. Mgt. Rev. 13 65 82

Prince & Prince, Inc. (2019). Trends in mass-market floral. Produce Marketing Association (PMA) and The Food Marketing Institute. Retrieved April 2021 from https://www.freshproduce.com/resources/floral/floral-supermarket-benchmarks/

Russel Research. (2016). Generations of Flowers Study. Society of American Florists and American Floral Endowment. 11 May 2018. <https://endowment.org/wp-content/uploads/2016/03/2016GenerationsOfFlowersStudy.pdf>.

Rihn, A.L., Yue, C., Behe, B. and Hall, C. (2011). Generations X and Y attitudes toward fresh flowers as gifts: Implications for the floral industry. HortScience *46*, 736-743. doi: 10.21273/HORTSCI.46.5.736.

Shogren, J.F., Shin, S.Y., Hayes, D.J., and Kliebenstein, J.B. (1994). Resolving differences in willingness to pay and willingness to accept. American Economic Review *84*, 255–270.

United States Census Bureau. (2017). 2016 Economic census. Census.gov. Retrieved May 11, 2022, from https://www.census.gov/programs-surveys/economic-census.html

United States Department of Agriculture. (2019). Floriculture crops 2018 summary. 12 Jan. 2020. <https://www.nass.usda.gov/Publications/Todays_Reports/reports/floran19.pdf>

Wertenbroch, K., and Skiera, B. (2002). Measuring consumers' willingness to pay at the point of purchase. J. Marketing Research *39*, 228–241.

Whitinger, D. and Cohen, P. (2021). National Gardening Survey: 2021 Edition. New York: America Community Garden Association. Williston, VT.

Wu, X., Knuth, M., Hall, C., and Palma, A. (2021). Increasing profit margins by substituting species in floral arrangements. HortTechnology *31*(1), 19-26.

Yue, C. and Hall, C. (2010). Traditional or specialty cut flowers? Estimating U.S. consumers' choice of cut flowers at noncalendar occasions. HortScience *45*, 382-386. doi: 10.21273/HORTSCI.45.3.382.

Yeh, T.F. and Huang, L.C. (2009). An analysis of floral consumption values and their difference for genders and geographic regions. HortTechnology *19*, 101-107. doi: 10.21273/HORTSCI.19.1.101.

Yue, C., Rihn, A., Behe, B., and Hall, C. (2009). Consumer preference for flowers as gifts: Age segments, substitutes, and perceived risk. American Floral Endowment, Alexandria, VA.

Yue, C. and Behe, B.K. (2008). Estimating U.S. consumers' choice of floral retail outlets. HortScience *43*, 764-769. doi: 10.21273/HORTSCI.43.3.764.

Zhao, S., Yue, C., Meyer, M.H., and Hall, C.R. (2016). Factors affecting U.S. consumer expenditures of fresh flowers and potted plants. HortTechnology *26*(4), 484-492. doi.org/10.21273/HORTTECH.26.4.484>