Assessing the Relationship between Plant Types Purchased and Consideration of Future Consequences to Generate Marketing Messages for Ornamental Plants[1]

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Abstract

Plants are an integral part of the environment and human health can be improved through people interacting with plants. But do "plant people" care about the environment more than others? Plant purchases may be tied to perceptions of future personal and environmental health. The interface of concern for the environment, personal mental health, and plant purchases has yet to be explored and may hold informative suggestions for marketing strategies. Here, an online survey elicited behavior toward plant purchases, mental health, consideration of future consequences (CFC), plant spending and demographic information. A total of 860 U.S. consumers participated in the study. A probit model assessed the relationship between plant spending, demographics and participants' CFC. Results indicate positive correlations between all of the plant types purchased (e.g., annuals, perennials) and plant spending in 2021 and 2020. Mental health ratings (from 20 statements in the PANAS-X Scales Manual for Positive and Negative Affect Schedule) and high mean scores for future consequences (from a CFC scale) were positively correlated. Purchasing indoor foliage plants improved the probability of being in the high CFC group, while negatively impacting the probability of being in the low CFC group. Purchasing annual plants significantly improved participants' mental health ratings.

Index words: Benefit messages, consumer behavior, mental health, online survey, probit model, promotions.

Significance to the Horticulture Industry

Research documents the benefits to humans of being around plants, including reduced stress and improved well-being. This study addressed how different plant types (i.e., annuals, perennials, woody plants, and indoor plants) relate to customers' consideration of future consequences, mental health, and plant purchasing behavior with the intent of better aligning promotional campaign information with what resonates with customers. There was a positive relationship between considering future consequences and improved mental health indicating people with one of these attributes often exhibited the other attribute. This is important given that both are demonstrating an interest in future outcomes. Additional differences were observed across the different plant types. There was a positive relationship between purchasing indoor plants and people who viewed the impacts of their actions on future outcomes (i.e., had high consideration of future consequences ratings). Plant retailers could use promotions highlighting sustainable production practices or initiatives and how indoor plants improve mental health to resonate better with these customers.

Received for publication October 24, 2023; in revised form January 12, 2024.

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Introduction

Plants comprise a large part of the natural environment and are an integral part of humans' ability to survive. In fact, human beings have co-evolved with plants to the point where today plants provide nutrition, fuel, shelter, and pharmaceuticals. This has allowed human society to advance itself through agriculture and enabled settlements to become more complex in modern-day society (Schaal 2019). Because of this co-evolution, there are phenomena documented in the literature indicating that plants can provide multiple benefits to humans from improvement of emotional health and well-being (Hall and Knuth 2019a, 2019b, 2019c) to economic prosperity (Hall and Dickson 2011) to environmental improvement after human intervention (Hall and Dickson 2011).

Interest in and purchases of plants surged during the COVID-19 pandemic (Whitinger and Cohen 2021a, Whitinger and Cohen 2021b). Behe et al. (2022) showed that during that time frame age cohorts responded differently to plant benefits yet responded similarly to the nature-relatedness construct which best reflected environmental interest through interactions with the natural environment. Therefore, even when plant consumers know about plant mental health benefits, are they also interested in or concerned about the environment? Does their awareness of plant benefits have an impact on their perceptions of the future?

The Green Industry marketed $13.8 billion in floriculture, nursery and specialty crops in 2019, down slightly from sales in 2014 (USDA NASS 2020). However, the COVID-19 pandemic spurred sales growth in 2020 and 2021 (Behe et al. 2022, Whitinger and Cohen 2021a, Whitinger and Cohen 2021b). Whitinger and Cohen (2021b) reported 18.3 million Americans participated in gardening activities for the first time in 2020. One of the challenges facing the horticulture industry today is retaining many of

the new consumers while meeting the needs of existing consumers. This might be accomplished partly with effective marketing messages.

More Americans are increasingly concerned about the environment. In a survey, approximately 60% of Americans claim that the government is doing too little to reduce climate change with 90% in favor of "planting about a trillion trees to absorb carbon emissions" (Tyson and Kennedy 2020). In fact, concern about climate change can evoke feelings of anxiety (Clayton 2020) which plant interactions might mitigate.

Environmental concern is a complex topic. Scholars have categorized consumer research pertaining to environmentalism into two areas: socio-demographic factors that are related to environmentalism and the perceptions, beliefs, and other constructs that influence green product purchases (Dietz, Stern, and Guagnano 1998, Gifford and Nilsson 2014). Sharma (2021) published a green purchase decision model and reported that there is increased environmental knowledge and awareness among consumers while pro-environmental attitudes and purchasing remain highly varied. Among the research documenting a relationship between demographic characteristics and pro-environmentalism is Larson et al (2011) and Gifford and Nilsson (2014) both of which reported that women with higher incomes and education levels held more pro-environmental attitudes when compared to men within the same demographic categories. Ahmed et al. (2020) showed that pro-environmental beliefs combined with pro-environmental marketing messaging positively influenced purchase intention. Larsson, Andersson, and Osbeck (2010) provided evidence of the same influence by children on family purchases. Yet purchase behavior appears to be widely varied. Newton et al. (2015) reported that intentional learning about the environment enhanced pro-environmental purchases. Conversely, Hafner et al. (2017) reported that showing an image of an automobile being considered for purchase was more influential than environmentalism in car purchases.

Researchers have established a positive connection between concern for future consequences and willingness to pay a premium for plants grown using sustainable and energy-saving production methods as well as grown in eco-friendly containers (Khachatryan et al. 2014). This work arose from the theoretical link between temporal considerations and the desire to have plant purchases consistent with pro-environmental actions. One of the more widely utilized scales is the consideration of future consequences scale (CFC). The CFC scale has been utilized to relate individuals' decisions and environmental responsibility (Joireman et al. 2004, Joireman et al. 2012). It has also been related to the persuasiveness of health-related marketing communications (Orbell and Hagger 2006) and advertisement framing effects (Kees 2011).

Still, the body of literature is limited relating plant purchases to environmental concerns. The overarching goal of this analysis was to investigate the relationship between plant purchasing behavior, mental health, consideration of future consequences, and reported willingness-to-pay (WTP) for plants displayed with plant benefit information, while assessing how plant types purchased relate to consumers' considerations of future consequences and how plant types purchased influence mental health ratings. Thus, our objectives were to:

1. Investigate the relationship between plant purchasing behavior (e.g., plant type, amount spent), mental health, consideration of future consequences, and reported WTP for plants displaying benefit information,
2. Assess how plant types purchased (e.g., annuals, perennials) relate to consumers' consideration of future consequences,
3. Assess how plant types purchased (e.g., annuals, perennials) influence mental health ratings, and
4. Identify marketing messages based on the findings above.

Materials and Methods

An online survey instrument was used to address the research objectives. The survey was hosted on Qualtrics (Provo, UT) and an online panel was recruited from Toluna, Inc. (Dallas, TX). The survey and experimental protocols were approved by the Institutional Review Board (Texas A&M University 2019-1754M Category: Exempt 2). Data was collected in November 2021. Potential participants were screened to ensure they were 18 years old or older and lived in the U.S. A total of 1,008 people started the survey with 148 removed for incomplete responses. A total of 860 (85% of the sampled panel) completed the survey and were included in the analysis. The survey consisted of several sections focusing on plant purchasing behavior, consideration of future consequences, mental health, and socio-demographics. The socio-demographic section included questions eliciting age, gender, education, ethnicity, income, and urban-rural classification.

For the plant purchasing behavior section, participants were asked to select all plant types they purchased in 2021. The list of plant types included: annual flowering plants, vegetable plants, herbs, perennials, flowering shrubs, evergreen shrubs, fruit producing trees, evergreen trees, shade trees, indoor flowering potted plants, indoor foliage plants, and succulents. They also received a "none of the above" option. The plant types listed were based on common plant types grown by the industry and coded to equal 1 if selected, 0 otherwise. For the analysis, the plant types were consolidated into annuals (i.e., annuals, herbs, vegetables), perennials, woody plants (i.e., flowering shrubs, evergreen shrubs, fruit producing trees, evergreen trees, shade trees), and indoor plants (i.e., indoor flowering potted plants, indoor foliage plants, succulents).

Participants also indicated the amount they spent on plants and gardening supplies (excluding mechanical equipment) in 2021 and 2020 using a scale from $0 to $500 or more. Next, participants indicated the maximum amount they would be willing to pay for a plant displaying benefit information using a scale ranging from $0 to $101 or more.

The consideration of future consequences (CFC) metric consisted of a 14-item scale originally proposed by Strathman et al. (1994) and more recently adopted by Joireman et al. (2012). The scale identifies the extent that people consider the future outcomes of their actions and how that influences their behavior. Seven of the statements are

Table 1. Consideration of future consequences scale used in an online survey of U.S. consumers in 2021.

Instructions: For each of the statements below, please indicate whether or not the statement is characteristic of you using the scale shown below.
1 = Extremely uncharacteristic
2 = Moderately uncharacteristic
3 = Slightly uncertain
4 = Uncertain
5 = Slightly characteristic
6 = Moderately characteristic
7 = Extremely characteristic

1. I consider how things might be in the future and try to influence those things with my day-to-day behavior.
2. Often, I engage in a particular behavior in order to achieve outcomes that may not result for many years.
3. I only act to satisfy immediate concerns, figuring the future will take care of itself.[z]
4. My behavior is only influenced by the immediate (i.e., a matter of days or weeks) outcomes of my actions.[z]
5. My convenience is a big factor in the decisions I make or the actions I take.[z]
6. I am willing to sacrifice my immediate happiness or well-being in order to achieve future outcomes.
7. I think it is important to take warnings about negative outcomes seriously even if the negative outcome will not occur for many years.
8. I think it is more important to perform a behavior with important distant consequences than a behavior with less important immediate consequences.
9. I generally ignore warnings about possible future problems because I think the problems will be resolved before they reach crisis level.[z]
10. I think that sacrificing now is usually unnecessary since future outcomes can be dealt with at a later time.[z]
11. I only act to satisfy immediate concerns, figuring that I will take care of future problems that may occur at a later date.[z]
12. Since my day-to-day work has specific outcomes, it is more important to me than behavior that has distant outcomes.[z]
13. When I make a decision, I think about how it might affect me in the future.
14. My behavior is generally influenced by future consequences.

[z]indicates the seven immediate outcome statements that were reverse coded for the analysis.

future-oriented while the remaining seven focus on more immediate outcomes. For instance, a future-oriented outcome would be "I consider how things might be in the future and try to influence those things with my day-to-day behavior," while an immediate outcome would be "I only act to satisfy immediate concerns, figuring that the future will take care of itself." Participants used a 7-point Likert scale to indicate if the statements aligned with their character (1=extremely uncharacteristic; 7=extremely characteristic). Results from previous research enabled academicians to generalize that individuals who scored high on the CFC scale assign high importance to the distant consequences that may result from their current choices and low importance to immediate consequences or payoffs (Joireman et al. 2012). Conversely, individuals who score low on the CFC scale are those who impart more importance to immediate payoffs and demonstrate less concern about the long-term consequences of their current actions. The CFC scale components are presented in Table 1.

For analysis, the seven immediate outcome statements were reverse coded, so the CFC variable indicates a propensity to consider future consequences. For the analysis, three CFC segments were generated and aligned with participants' mean CFC ratings. The first segment (called "CFC low") were individuals with a CFC score of less than 4. The second segment (termed "CFC mid") were individuals with CFC scores equal to 4. Lastly, the third segment (termed "CFC high") were individuals with CFC scores greater than 4. Participants were coded to equal 1 if they were a member of the segment, zero otherwise.

Participants' mental health was elicited using the PANAS-X Scales Manual for Positive and Negative Affect Schedule (Watson and Clark 1994, Shanahan et al., 2022). The scale has 20 questions with 10 relating to negative affect and the remaining 10 questions addressing positive effects. Participants indicate the extent that they felt that way in the past 12 months using a 5-point Likert scale where 1 equals very slightly or not at all and 5 equals extremely. The questions were randomized in the survey instrument to reduce order bias. The scale is designed to be a unilateral variable. Therefore the negative affect questions were reverse coded and the average of all 20 questions was used as the mental health rating for each participant where lower values equate to a poor mental health rating while higher values correlates to better mental health.

Econometric analysis. The CFC low, CFC mid and CFC high variables were used as the dependent variables in the econometric analysis. Given that each of the CFC variables are binary (1=membership in the group, 0=otherwise), probit models were used to estimate factors impacting participants' CFC perceptions. The random index $\boldsymbol{Y_i^*}$ describing the participants' propensity to be in the CFC group is a function of different factors which can be summarized as:

$$Y_i^* = \boldsymbol{x_i'\alpha} + mental_i\alpha^m + planttype_i\alpha^{plt} + wtpest_i\alpha^{wtp} + spending_i\alpha^{sp} + e_i \quad (1)$$

where $\boldsymbol{x}_i$ is a vector that contains participant i's characteristics (e.g., age, gender, income, etc.), the variable *mental* is the mental health index, the *planttype* variable indicates the different plant types (i.e., annuals, perennials, woody, indoor), the *wtpest* variable is participants' reported estimated willingness-to-pay for plants displaying benefit information, the *spending* variable is plant spending in 2021 and 2020, and $\boldsymbol{\alpha}$ is a vector of coefficients associated with the explanatory variables in $\boldsymbol{x}_i$. The α^m, α^{plt}, α^{wtp}, and α^{sp} parameters are associated with the corresponding variables related to CFC ratings (e.g., mental health, plant types purchased, WTP estimates, plant spending). The probability

Table 2. **Summary statistics of participants' socio-demographics from a 2021 online survey of U.S. consumers.**

Variable	Definition	Sample		U.S.
		Mean	SD	Mean
n	Number of people.	860		333.29 million[z]
Age	Age of participant in years.	58.536 (mean) 63.0 (median)	15.290	38.8[z] (median)
Male	1=male; 0=otherwise	0.503	0.500	0.496[z]
Bsdegree+	1=Bachelor's degree or higher; 0 otherwise	0.487	0.500	0.337[z]
Hispanic	1=Hispanic ethnicity; 0=otherwise	0.086	0.281	0.191[z]
Income	Household income for 2021 in $1,000	70.291	47.945	69.021[z]
Urban	1=urban residency; 0=otherwise	0.338	0.473	0.800[y]
Suburban	1=suburban residency; 0=otherwise	0.443	0.497	
Rural	1=rural residency; 0=otherwise	0.215	0.411	0.200[y]
Cfc_low[x]	1=cfc value is less than 4; 0=otherwise	0.212	0.409	
Cfc_mid[x]	1=cfc value is 4; 0=otherwise	0.091	0.287	
Cfc_high[x]	1=cfc value is great than 4; 0=otherwise	0.698	0.460	

[z]U.S. 2021 data (U.S. Census Bureau, 2022).

[y]U.S. 2020 data (U.S. Census Bureau, 2023).

[x]CFC means consideration of future consequences and indicates whether the participant considers the consequences of their actions on future events (as indicated by a higher value).

that participant i is within the CFC low, CFC mid, or CFC high group can be estimated with a probit model:

$$\begin{aligned}\Pr[Y_i = 1] &= \Pr[Y_i^* > 0] \\ &= \Pr[-e_i < \boldsymbol{x}_i'\boldsymbol{\alpha} + mental_i \propto^m \\ &\quad + planttype_i \propto^{plt} + wtpest_i \propto^{wtp} \\ &\quad + spending_i \propto^{sp}] \\ &= \Phi[\boldsymbol{\alpha} + mental_i \propto^m + planttype_i \propto^{plt} \\ &\quad + wtpest_i \propto^{wtp} + spending_i \propto^{sp}].\end{aligned} \tag{2}$$

Equation 2 assumes e_i is normally distributed has a mean zero and standard deviation σ_e^2 ($N(0,\ \sigma_e^2)$) and $\Phi(.)$ is the cumulative normal distribution. The marginal effects at the means provide identification of positive and negative relationships between participants probability of being within the CFC groups and the magnitude of that relationship. Marginal effects can be expressed as:

$$\frac{\partial \Pr(Y_i = 1)}{\partial z_{spending}} = \phi(.)\alpha_{spending} \tag{3}$$

for continuous variables (e.g., plant spending). While discrete variables (e.g., plant type) can be expressed as:

$$\Pr[Y_i = 1 | x_{planttype} = 1] - \Pr[Y_i = 1 | x_{planttype} = 0] \tag{4}$$

Results and Discussion

Participants' demographics are presented in Table 2. On average, participants were 59 years old, 50% were male, nearly 9% were Hispanic, 34% lived in urban areas, 44% lived in suburban areas, and 22% lived in rural areas. Their 2021 household income was $70,291. Compared to the U.S. population, the sample was comparable for most of the demographic characteristics. Differences were noted for age which likely occurred due to the U.S. Census (2022, 2023) including individuals less than 18 years old, whereas our sample only included adults. The mean CFC rating was 4.54 for the sample. Approximately 21.5% of the sample were in the CFC low segment, 9% were in the CFC mid segment, and 69.5% were in the CFC high segment (Table 2).

The most frequently purchased plants included annuals, vegetable transplants, herbs, perennials, indoor flowering potted plants, succulents, indoor foliage plants, flowering shrubs, and fruit producing trees (Table 3). Evergreen shrubs, evergreen trees, and shade trees had the lowest purchase incidence in 2021. The means across the consolidated plant types were used in the analysis with the annual plants the most frequently purchased at 0.364, followed by perennials at 0.249, indoor plants 0.193, and woody plants at 0.103.

Figure 1 shows the distribution of plant spending for the two years. In 2021, the mean amount spent was $123.42 with a median of $75. In 2020, the mean amount spent was $112.93 with a median of $75. Figure 2 shows the distribution of their reported mean willingness-to-pay values for plants displaying benefit information. The mean maximum willingness-to-pay was $17.86 with a median of $13.

Spearman correlations were used to test correlations between the plant types purchased, CFC variables, the mental health variable, and plant purchasing behaviors (Table 4). There is a positive relationship between a high mental health rating, CFC high, and annual plant purchases. Meaning that people who are very conscientious of the impact of their actions on the future (CFC high group members) also exhibited higher mental health ratings and were more likely to have purchased annual plants in the previous year. Given that CFC high individuals make decisions based on future outcomes, it makes sense that there is a positive relationship with high mental health ratings since good mental health is defined as someone being hopeful and motivated by current and future goals

Table 3. **Plant categories purchased in 2021 based on an online survey of 860 participants.**

New plant category	Mean	Standard deviation	Original plant category	Mean	Standard deviation
Annual	0.364	0.355	Annual flowering plants	0.434	0.496
			Vegetables	0.364	0.481
			Herbs	0.294	0.456
Perennial	0.249	0.433	Perennials	0.249	0.433
Woody	0.103	0.187	Flowering shrubs	0.184	0.387
			Evergreen shrubs	0.088	0.284
			Fruit producing trees	0.106	0.308
			Evergreen trees	0.073	0.261
			Shade trees	0.066	0.249
Indoor	0.193	0.284	Indoor flowering potted plants	0.214	0.410
			Indoor foliage plants	0.179	0.384
			Succulents	0.185	0.388

(Lombardo 2006). Additionally, it has been shown through horticulture therapy that cultivating and watching plants grow through personal cultivation improves mental well-being (Hall and Knuth 2019a). Annuals have a quick "return on investment" when it comes to labor put into caring for them because they grow quickly compared to other plant categories such as woody shrubs and perennials. These participants are experiencing current positive influences from annual plants quick response that is creating positive mental health currently and positive future consideration. Annual plants can be a gateway into creating that positive cognitive relationship that consumers gain from plants that then can result in lasting, more long term positive impacts when participating with other categories that grow slower and/or require long term care to see an impact on the plant growth.

There is also a positive relationship between CFC mid (i.e., individuals with intermediate CFC ratings (they selected "4" on a 7-point scale)) and woody plant purchases and a positive relationship between CFC high and indoor plant purchases. Some of the positive relationships between the plant types and CFC high and CFC mid groups may be related to the emotional and mental health benefits of interacting with plants (see review article by Hall and Knuth (2019a), Han et al. (2022), Berger et al. (2022).

Not surprisingly, there are positive relationships between all the plant types, plant spending variables, and WTP estimates (Table 4). Negative correlations exist between a high mental health rating, CFC mid, woody plant purchases, and WTP estimates. There is a negative correlation between CFC low and CFC mid, CFC high, and indoor plant purchases. There is also a negative correlation between CFC mid and CFC high and between CFC high and woody plant purchases. As with the annual plants' quick growth pattern and positive mental health, we believe that because perennials and woody plants generally take longer to show change and grow or can be conversely thought of as "impact" from the person's effort, they generally don't contribute strongly to mental health.

The three probit models and their marginal effects are presented in Table 5. The models estimate the relationship between mental health, annual plant purchases, perennial plant purchases, woody plant purchases, indoor plant purchases, plant spending in 2021, plant spending in 2020, participant demographics, and participants' membership in the CFC low (model 1), CFC mid (model 2), and CFC high (model 3) segments.

Plant type and demographics influenced CFC segment membership. Purchasing indoor plants negatively impacted the probability of CFC low segment membership (Model 1, Table 5). This aligns with research which demonstrates that interacting with and caring for indoor plants positively impacts health (Han et al., 2022) and that people who have high future consciousness have heightened interest in personal wellbeing (Lalota et al., 2021). Conversely, being of Hispanic ethnicity increased the probability that a participant would be categorized as CFC low. Due to the variables that were collected in the survey, we are unable to parse out why Hispanic participants were more likely to be in the low Current and Future Consequences category. This warrants further investigation in future studies. Regarding the CFC mid segment, the probability of being in the segment increased for participants who had purchased woody plants,

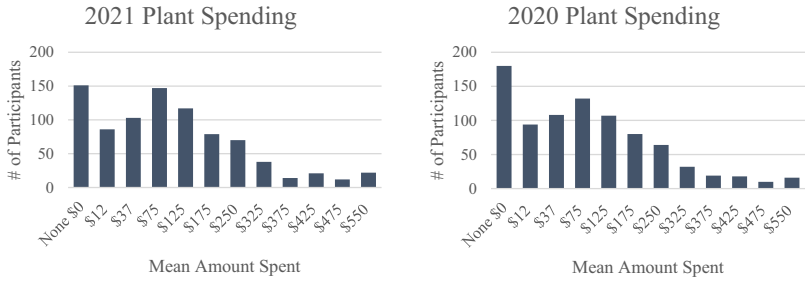

Fig. 1. Distribution of plant expenditures in 2021 and 2020 by U.S. consumers from an online survey of 860 respondents.

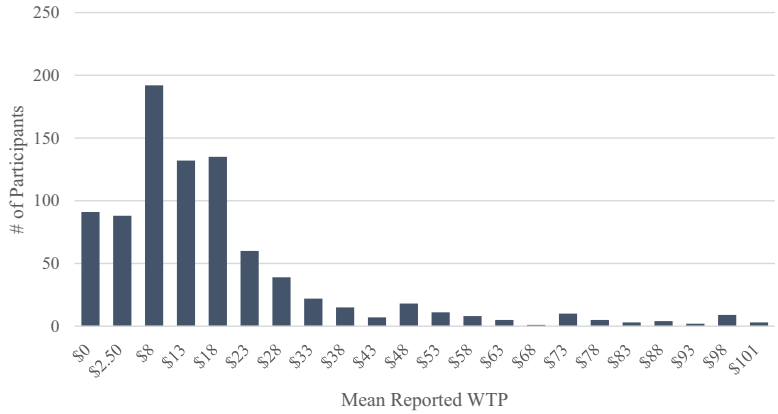

Fig. 2. Maximum reported willingness-to-pay for plants with benefit information by U.S. consumers from an online survey of 860 respondents.

were male, and had higher incomes. However, participants' probability of being in the CFC mid segment decreased as mental health ratings and education increased. In addition, having higher education is generally correlated with higher income and higher levels of leadership within organizations. These types of participants may gain more impact on their mental health from indoor plants because they are spending more time indoors within offices and buildings rather than blue collar jobs, which generally require less education and can have outdoor components to the job responsibilities, resulting in the ability to be around plants outdoors rather than indoors. For the CFC high segment, the probability of being in this segment increased for participants who had a higher mental health rating (i.e., exhibited positive wellbeing and emotions), purchased indoor plants, were older, and had a level of education. This could be because the older individuals are, the less mobility they have outdoors and seek to enjoy plants indoors, resulting in higher mental health reporting with indoor plants. The probability of membership in this segment decreased if the participant purchased a woody plant or was male.

Table 6 presents the OLS regression estimates on the effect of the different plant types on participants' mental health ratings. Individuals in the CFC_high segment or had purchased an annual plant exhibited a higher mental health rating. Alignment of high CFC and mental health ratings is likely due to positive outlooks for the future (Lalota et al. 2021). Age, income, and living in a suburban area (relative to rural) all improved participants' mental health ratings. This aligns with existing literature. Generally, research has shown that older people exhibit better mental health than younger adults (Westerhof & Keyes 2010). Older people's mental health is amplified if they perceived aging positively, have a better financial status, and are physically healthy (Bryant et al. 2012). Conversely, individuals who had purchased perennial plants exhibited lower mental health ratings.

In conclusion, the overarching goal of this analysis was to investigate the relationship between plant purchasing behavior, mental health, consideration of future consequences, and reported WTP for plants displaying plant benefit information. We also assessed how plant types purchased related to consumers' considerations of future consequences and mental health ratings.

Results indicate positive correlations between different plant types purchased and plant spending in 2021 and 2020. Mental health ratings and high current and future consequences (CFC) ratings were positively correlated. Purchasing different plant types impacted consumers' probability of being in low, medium, or high CFC groups. Purchasing

Table 4. Spearman correlations between respondents' mental health ratings, consideration of future consequence (CFC) ratings, plant types purchased, willingness-to-pay for plants, and plant spending from a 2021 online survey of 860 respondents.

Variables[z]	Mental	CFC low	CFC_mid	CFC_high	Annual	Perennial	Woody	Indoor	WTPest	Pltspend21	Pltspend20
Mental	1.000										
CFC_low[y]	−0.062	1.000									
CFC_mid[y]	**−0.110**	**−0.164**	1.000								
CFC_high[y]	**0.124**	**−0.787**	**−0.480**	1.000							
Annual	**0.095**	−0.057	0.027	0.033	1.000						
Perennial	−0.022	−0.055	−0.004	0.051	**0.314**	1.000					
Woody	**−0.074**	−0.004	**0.148**	**−0.089**	**0.372**	**0.272**	1.000				
Indoor	0.037	**−0.142**	0.025	**0.111**	**0.309**	**0.210**	**0.202**	1.000			
WTPest[x]	**−0.087**	−0.040	0.049	0.005	**0.310**	**0.204**	**0.430**	**0.221**	1.000		
Pltspend21[w]	0.023	−0.052	0.041	0.021	**0.607**	**0.399**	**0.517**	**0.406**	**0.493**	1.000	
Pltspend20[w]	−0.011	−0.051	0.039	0.021	**0.547**	**0.368**	**0.477**	**0.337**	**0.468**	**0.863**	1.000

[z]Bold font indicates significance at the 5% level.

[y]CFC means consideration of future consequences and indicates whether the participant considers the consequences of their actions on future events (as indicated by a higher value).

[x]WTPest indicated participants' willingness-to-pay for a plant displaying plant benefit information.

[w]Pltspend21 and Pltspend20 indicate participants' spending on plants in 2021 and 2020.

Table 5. **Probit model estimates and marginal effects for mental health ratings, plant types purchased, willingness-to-pay estimates, plant spending, and demographics on participants' consideration of future consequences ratings of U.S. consumers[z].**

	Model 1 - CFC low			Model 2 - CFC mid			Model 3 - CFC high		
	Coef.	SE	M.E.	Coef.	SE	M.E.	Coef.	SE	M.E.
Mental	−0.033	0.081		−0.207	0.102**	−0.030**	0.125	0.075*	0.043*
Annual	−0.056	0.174		−0.173	0.189		0.108	0.158	
Perennial	−0.108	0.131		−0.147	0.158		0.151	0.122	
Woody	0.510	0.343		0.985	0.363***	0.140***	−0.945	0.310***	−0.323***
Indoor	−0.807	0.210***	−0.058***	−0.015	0.224		0.648	0.187***	0.222***
WTPest	−0.001	0.003		−0.001	0.004		0.001	0.003	
Pltspend21	−0.001	0.001		0.000	0.001		0.000	0.001	
Pltspend20	0.000	0.001		0.000	0.001		0.000	0.001	
Age	−0.006	0.004		−0.007	0.005		0.009	0.004**	0.003**
Male	0.085	0.104		0.321	0.134**	0.046**	−0.222	0.097**	−0.076**
Bsdegree+	−0.185	0.114		−0.235	0.143*	−0.033*	0.257	0.107**	0.088**
Hispanic	0.372	0.170**	0.059**	−.086	0.221		−0.259	0.165	
Income	−0.001	0.001		0.003	0.001**	0.000**	−0.001	0.001	
Urban	−0.020	0.143		0.213	0.197		−0.072	0.137	
Suburban	−0.205	0.131		0.158	0.183		0.112	0.124	
Constant	−0.023	0.345		−0.631	0.413		−0.512	0.324	
Number of obs.	860			860			860		
Wald chi2	41.56			39.88			61.67		
Prob > chi2	0.0003			0.0005			0.0000		

z***, **, * indicate significance at 1%, 5%, and 10% levels. Only significant marginal effects (M.E.) are presented in the table.

indoor foliage plants improved the probability of being in the high CFC group, while negatively impacting probability of being in the low CFC group. Interestingly, purchasing annual plants significantly improved participants' mental health ratings.

Plant purchases and spending are positively correlated regardless of plant type. For example, if people purchase one type of plant, they are more likely to purchase other types – in other words, "plant people", at least in this study, were nondiscriminatory regarding plant types and exhibited a "snowball effect" in terms of the variety of plants purchased and amount spent. In this research, we determined that mental health and high future consequence ratings are positively correlated, meaning that the ratings of individual mental health among respondents were positively influenced by their outlook regarding future consequences. Respondents purchasing annual plants, in particular, exhibited a positive correlation with their mental health. Marketers could readily capitalize on this finding since annual plants, by definition from their life cycle, need to be replaced each year; they do not persist in the landscape. Marketing messages with positive mental health imagery and text might spur additional purchases.

Table 6. **OLS regression results for participants' consideration of future consequence ratings, plant types purchased, plant spending, willingness-to-pay estimates, and demographics on participants' mental health ratings from a 2021 online survey of U.S. consumers[z].**

Variable	Coef.	SD
CFC_low	0.125	0.084
CFC_high	0.169	0.076**
Annual	0.243	0.070***
Perennial	−0.098	0.054*
Woody	−0.030	0.140
Indoor	0.064	0.081
Pltspend21	0.000	0.000
Pltspend20	0.000	0.000
WTPest	−0.001	0.001
Age	0.012	0.002***
Male	−0.027	0.045
Bsdegree+	−0.030	0.049
Hispanic	−0.024	0.077
Income	0.001	0.001**
Urban	0.099	0.063
Suburban	0.127	0.056**
Constant	2.594	0.137***
Number of obs.	860	
F (16)	7.24	
Prob > F	0.000	

z***, **, * indicate significance at 1%, 5%, and 10% levels.

Interestingly, purchasing a houseplant was negatively correlated with low future consequence ratings, woody plant purchases were positively correlated with mid-level future consequence ratings, while indoor foliage plants positively impacted the probability of being in the high future consequences group and purchasing a woody plant had a negative impact. This last finding was particularly curious given that woody plants have longer life cycles, which would logically imply a longer-term frame of reference when consumers are purchasing them and thus ratings of future consequences would be higher. However, this might have been attributed to the "instant landscape" effect of purchasing larger-sized woody ornamental shrubs and trees, thus a desire for immediate gratification might have outweighed ratings of future consequence. Future research should explore this more.

From these results, the research team identified marketing messages that the green industry professionals can utilize when communicating with their customer base. Results indicate that plant purchases and plant spending are positively correlated regardless of plant type. Additionally, positive mental health and high levels of consideration of future consequences are positively correlated. Indoor foliage plant

purchases increased the probability of having high levels of consideration of future consequences while purchasing a woody ornamental plant had a negative impact on future consequences. Purchasing annual plants improved mental health ratings while purchasing perennial plants negatively impacted mental health ratings. Experiences with annual plants include quick growth pattern resulting in immediate positive response through flowering, fruiting, and increased in vegetative growth which result in positive mental health. We believe that because perennials and woody plants generally take longer to show change and grow or can be conversely thought of as "impact" from the person's effort, they generally don't contribute strongly to mental health. This is not to say that they create negative mental health impact, they just require longer care to see the impact of a person's labor. Encouraging consumers to purchase a suite of products that show immediate and long-term changes can improve this effect by creating an immediate connection to plants and mental health, which can improve the longer-term, slower responding connections. This can also be improved through communication on how the growth rate of the plant and managing expectations on how quickly they will see flowering, fruiting, growth of the plant, etc. for the consumers for perennials and woody plants. Retailers, growers, and suppliers within the green industry can utilize this information to generate marketing messages that resonate with their consumer base to help facilitate sales.

Understanding the extent to which the consumers assign importance to immediate vs. future consequences provides horticultural plants marketers with an opportunity to effectively position products that provide long-term or short-term benefits. Individuals with a greater future orientation can be targeted by communicating and emphasizing product attributes that provide health or well-being benefits in the long run. Thus, encouraging plant purchases and spending has the potential for positively impacting the entire ornamental plant industry regardless of the plant types sold.

Given the general finding that purchasing plants improves mental health rating, plant marketers should emphasize instant psychological gratification associated with the purchasing and care of indoor and outdoor plants. In addition, indoor foliage plants may be attractive to market segments that are highly considerate of future environmental consequences of their actions. Pairing indoor foliage plants with communications about sustainable production practices, air purifying potential, and reduced stress may be a means of leveraging this segment's interest in future environmental and health impacts.

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