The Appeal of Biodegradable Packaging to US Floral Consumers

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Abstract

Instead of plastic, some growers are now using containers manufactured with alternative materials that can be planted directly into the soil and will degrade over time, thus eliminating the need to dispose of pots in landfills. While previous studies have addressed aspects of the consumers’ willingness to pay for biodegradable containers, this study specifically addresses consumers’ perceived value for the containers themselves; that is, without the influence of the plant in the container. Analysis of the confidence intervals for wheat starch pots, rice hull pots, straw pots, coir pots and peat pots reveal that they overlap, which indicates the price premiums participants are willing to pay for these five types of biodegradable containers do not significantly differ from each other. Consumers express a positive willingness to pay for several types of biodegradable containers relative to the standard plastic pot. There are two distinct levels that emerged with the first tier including coconut coir and peat pots, which received ratings in the same range as rice hull, straw and wheat pots. A second, lower tier of similarly rated containers included the poultry feather, cow manure and recycled plastic pots.

INTRODUCTION

The vast majority of greenhouse and nursery crops produced today are grown in plastic containers. Botts (2007) reported that the manufacturer of nursery pots, flats and cell packs uses 145 million kg of plastic per annum. However, the consumer demand for product stewardship or environmentally conscious products and business practices is rapidly rising. Even mass-merchants like Walmart recognize that “being green” not only provides value to consumers but has the potential to positively impact profits (Robinson, 2008).

With the increased interest from lawn and garden retailers including Walmart, Lowes and Home Depot, several greenhouse producers are experimenting with growing plants in biodegradable containers. However, growers are concerned about the consumer response and wonder whether biodegradable containers will be readily accepted or whether they should pursue recycling strategies. Consumers are not homogeneous in their preferences, attitudes and purchases. Thus, there are groups of consumers who will respond more favourably to these alternative containers.

With regard to the adoption of sustainable strategies, horticultural businesses will need to consider what is best for their business and most preferred by their customers. What types of biodegradable containers do consumers prefer? Which consumers are more eager to adopt alternative types of biodegradable containers? Which production and marketing strategies (reuse plastic containers or offer biodegradable containers) are better for greenhouse, nursery and landscape professionals? Our objective was to find answers to these aforementioned questions.
MATERIAL AND METHODS

To address the issue of willingness to pay (WTP) for biodegradable containers, research was conducted using a combination of: (1) a hypothetical conjoint analysis using pictures of plants in biodegradable pots (10 cm chrysanthemums); and (2) a sealed-bid experimental auction using real plants in biodegradable pots to elicit consumers WTP for selected biodegradable containers including those made from rice hulls, straw and wheat starch (OP-47). Selected results of the conjoint analysis and experimental auction analysis have been reported on previously (Hall et al., 2010; Yue et al., 2010).

A third part of the study examined consumer reactions to the biodegradable pots themselves, without any plant material, to influence their reaction. The biodegradable pot types included those made from peat, coconut coir, poultry feathers, cow manure and recycled plastic. It is this part of the study that is reported on in this paper.

The data were collected using an internet survey developed by the researchers and implemented by Knowledge Networks during July 2009. Participants for this project were drawn from their web-enabled KnowledgePanel®, a probability-based consumer panel designed to be representative of the US population. Initially, participants were chosen by a random selection of telephone numbers or addresses (using address-based sampling). Persons in selected households were then invited by telephone and mail to participate in the web-enabled Panel. Even though 70% of the US population has internet at work or home (Internet World Stats, 2009), Knowledge Networks provides internet access to potential respondents that are without it, thereby eliminating that potential source of bias. People who already have computers and internet service are permitted to participate using their own equipment. Panelists then receive unique log-in information for accessing surveys on-line and then are sent emails three to four times during the survey time frame inviting them to participate in the research. According to McCullough (1998), web-based surveys are potentially faster to conduct than telephone or face-to-face interviews and they generate more accurate information with less human error.

In the survey, we asked what types and amounts of plants participants had purchased, at what types of stores they most often made those purchases, how much money they spent on plants and gardening supplies, the recycling behaviours of retailers where participants purchased most plants, participants’ own personal and household recycling behaviours, and the willingness to pay (WTP) questions. We asked the WTP questions because price has been shown to be a critical factor in a consumer’s buying decision. Even though our main objective was to compare consumer preferences for biodegradable versus traditional containers, price is essential given that many customers exhibit a tendency to purchase ordinary products with lower “environmental quality” because of cost and performance considerations or ignorance and disbelief (Ottman, 2008).

The WTP questions included eight types of pots in pictures with the raw materials comprising each pot clearly labeled. The eight alternatives included pots made from recycled plastic, wheat starch, rice hulls, straw, coconut coir, the resin from poultry feathers, cow manure and peat moss. Each WTP question stated: “In the following questions, please identify how much more or less you are willing to pay for the potting container form compared to a plastic potting container.” Survey participants were then asked to select one answer from -$1.50 to $1.50, with increments of $0.50.

RESULTS AND DISCUSSION

Table 1 shows the summary statistics of survey participants’ socio-demographic background information. Fifty-two percent of the participants were female; the average age of participants was 47 years old; the average education level was “high school to some college”; the average household income was between $35,000 and $65,000; and 84% of the participants lived in a single-dwelling residence.

The estimation results from the random effect two limit tobit model are shown in Table 2. The variable for recycled plastic pots was dropped (the associated coefficients are set to zero) and used as the base for estimation. Therefore, the coefficients can be
explained as the price premium participants were willing to pay for pots as compared with recycled plastic pots. The intercept is the price premium participants were willing to pay for recycled plastic pots compared with virgin plastic pots and the price premium was 9.2 cents on average.

Relative to recycled plastic pots, participants were willing to pay a significantly higher premium for pots made from wheat starch, rice hulls, straw, coir and peat. But participants WTP for pots made from the resin of chicken feathers and pots made from cow manure were not significantly different from their WTP for recycled plastic pots.

As for the price premiums compared with recycled plastic pots, participants were willing to pay 19.5 cents more for pots made from wheat starch, 15.1 cents more for pots made from rice hulls, 13.7 cents more for pots made from straw, 14.4 cents more for pots made from coir, and 15.2 cents more for pots made from peat. The price premiums compared with virgin plastic pots were the aforementioned premiums plus the 9.2 cents (the price premium for recycled plastic pots relative to virgin plastic pots). Therefore, compared with virgin plastic pots, participants were willing to pay 28.7 cents more for pots made from wheat starch, 24.2 cents more for pots made from rice hulls, 22.9 cents more for pots made from straw, 23.6 cents more for pots made from coir and 24.4 cents more for pots made from peat.

It should be noted that these WTP estimates are lower than those reported for either the conjoint analysis or experimental auction portion of the study because these estimates represent consumer perceptions of the value of the biodegradable pots themselves, without any plant material present to influence their perceived value. Obviously, a flowering plant in the pots would increase the perceived value of the different pots in different ways and has been shown to do so (Hall et al., 2010; Yue et al., 2010).

Table 2 shows the confidence intervals of the price premium relative to recycled plastic pots. The confidence intervals for wheat starch pots, rice hull pots, straw pots, coir pots, peat pots overlap, which indicates the price premiums participants are willing to pay for these five types of biodegradable pots do not significantly differ from each other. From the results, we can see that consumers did express or state a positive willingness to pay for several types of biodegradable containers relative to the standard virgin plastic pot.

There were two distinct levels or tiers that were evidenced, with the first including coconut coir and peat pots, which received ratings on the same level as rice hull, straw, and wheat pots. A second, lower tier of similarly rated pots included the poultry feather, cow manure and recycled plastic pots (relative to virgin plastic). The stated price premiums expressed by consumers for the lower-tiered pots were all in the range of $ 0.10 per pot. The price premium associated with the first tier of biodegradable containers was about 2.5 to 3 times the lower level tier, depending on the container type.

We also estimated the model by including participants’ socio-demographic variables. The only significant variable that affected participants WTP was participants’ gender. Female participants were willing to pay more for those aforementioned pots compared with virgin plastic pots than male participants.

DISCUSSION

The research findings from this project are important in terms of providing guidelines relative to future merchandising strategies for biodegradable containers by floriculture industry firms. Green industry businesses need to be consistent with their message regarding these and other environmentally-friendly products. Additionally, the value proposition of biodegradable products has to be clear and devoid of greenwashing (the misrepresentation of product attributes). They must perform as well or better than less environmentally-friendly products. Lastly, understanding why customers are buying green products and the premiums they are willing to pay for more sustainable options will influence pricing strategies for industry firms. If the point of differentiation of biodegradable containers can be successfully communicated to end users (making the
demand for these products more inelastic), total revenue for industry firms will increase via any price premiums, even if total units sold decreases.

**Literature Cited**


**Tables**

Table 1. Summary statistics of socio-demographic background information associated with participants in a 2009 survey of sustainable behaviours, attitudes and preferences.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Variable description</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Participant’s gender was female, 1=yes, 0=no</td>
<td>0.52</td>
<td>0.50</td>
</tr>
<tr>
<td>Age</td>
<td>Participant’s age</td>
<td>47.22</td>
<td>16.57</td>
</tr>
</tbody>
</table>
| Education         | Education was reported by 1 to 4 with four levels:  
|                   | 1=less than high school; 2=High school;  
|                   | 3=some college; 4=Bachelors degree or higher                                        | 2.70  | 0.92      |
| Household size    | Number of people in the household                                                     | 2.69  | 1.39      |
| Household income  | Household income was summarized into 8 categories:  
|                   | 1=$15,000 or less; 2=$15,001-$25,000;  
|                   | 3=$25,001-$35,000; 4=$35,001-$50,000;  
|                   | 5=$50,001-$65,000; 6=$65,001-$80,000;  
|                   | 7=$80,001-$100,000; 8=over $100,000                                                 | 4.60  | 2.18      |
| House type        | Participant lived in a house, 0=yes, 1=no                                             | 0.16  | 0.37      |

The population was consumers who have purchased plants from four states: Indiana, Michigan, Minnesota and Texas. The survey sample size was 1,113, of which there were 834 valid responses. The rest were not included in the analysis since they had not purchased plants in the past year.
Table 2. Results of the estimation of the price premium associated with selected biodegradable plant containers results using a random individual effect two limit tobit model by including socio-demographic variables.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
<th>Std. Err.</th>
<th>Confidence intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.092</td>
<td>0.022</td>
<td>(0.049, 0.136)</td>
</tr>
<tr>
<td>Wheat</td>
<td>0.195***</td>
<td>0.022</td>
<td>(0.153, 0.238)</td>
</tr>
<tr>
<td>Rice</td>
<td>0.151***</td>
<td>0.022</td>
<td>(0.109, 0.194)</td>
</tr>
<tr>
<td>Straw</td>
<td>0.137***</td>
<td>0.022</td>
<td>(0.094, 0.179)</td>
</tr>
<tr>
<td>Chicken feather</td>
<td>-0.011</td>
<td>0.022</td>
<td>(-0.054, 0.031)</td>
</tr>
<tr>
<td>Cow manure</td>
<td>0.004</td>
<td>0.022</td>
<td>(-0.038, 0.046)</td>
</tr>
<tr>
<td>Coir</td>
<td>0.144***</td>
<td>0.022</td>
<td>(0.102, 0.186)</td>
</tr>
<tr>
<td>Peat</td>
<td>0.152***</td>
<td>0.022</td>
<td>(0.110, 0.195)</td>
</tr>
<tr>
<td>Gender</td>
<td>0.036**</td>
<td>0.017</td>
<td>(0.002, 0.069)</td>
</tr>
<tr>
<td>Age</td>
<td>-0.008</td>
<td>0.020</td>
<td>(-0.048, 0.031)</td>
</tr>
<tr>
<td>Education</td>
<td>0.011</td>
<td>0.018</td>
<td>(-0.025, 0.047)</td>
</tr>
<tr>
<td>Household size</td>
<td>-0.020</td>
<td>0.020</td>
<td>(-0.059, 0.019)</td>
</tr>
<tr>
<td>Household income</td>
<td>0.002</td>
<td>0.019</td>
<td>(-0.036, 0.041)</td>
</tr>
<tr>
<td>House type</td>
<td>0.000</td>
<td>0.019</td>
<td>(-0.037, 0.037)</td>
</tr>
<tr>
<td>$\sigma_u$</td>
<td>0.458***</td>
<td>0.013</td>
<td>(0.432, 0.483)</td>
</tr>
<tr>
<td>$\sigma_e$</td>
<td>0.434***</td>
<td>0.004</td>
<td>(0.426, 0.443)</td>
</tr>
</tbody>
</table>

* *** significant at the 1% level; ** significant at the 5% level and * significant at 10% level.