

Market Appeal of Hawaiian Koa Wood Product Characteristics: A Consumer Preference Study

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Abstract

Acacia koa is an endemic Hawaiian tree species whose wood is prized globally. Today, most woodworkers use koa wood from dead and dying old-growth trees. Wood from young-growth koa is thought to be less appealing to consumers because of its lighter color and lack of figure. A conjoint choice experiment was conducted to evaluate consumer preference of these koa characteristics and their willingness-to-pay. This experiment randomly combined different attributes: colors, figure, and prices and used six identically shaped bowls (an item likely to be purchased by Hawaiian residents and visitors) from which respondents selected their preference. The survey was conducted at Hawaii's Woodshow (129 respondents) to canvass consumers likely to be familiar with koa. Results were analyzed using latent class analysis software that separates respondents into distinct classes based upon preferences. The results identified three classes of respondents. Class 1 (32% of respondents) showed significant preference for lower prices and curly figure but not for color. Class 2 (42% of respondents) significantly preferred curly figure and medium or light colored koa bowls. Class 3 (27% of respondents) significantly preferred lower prices, medium color, and bowls with no curly figure. Koa woodworkers can use these results to design and create pieces for different market groups. Through substitution of young-growth koa for the decreasing supply of old-growth wood, the legacy of koa wood can be sustained.

Key words: *Acacia koa*, conjoint choice, Hawai'i, consumer preferences, willingness-to-pay, old-growth, young-growth

Introduction

Beauty is in the eye of the beholder. This especially holds true when considering wood products. Variation in wood characteristics such as color and figure make each piece unique. The appeal of one piece of furniture or household item made from wood over another is personal. While differences in consumer preference can vary by geographic location, *Acacia koa* is especially prized both in the Hawaiian Islands and globally. Its reputation comes primarily from pieces crafted from old-growth trees.

Many woodworkers and craftspeople in Hawai'i prefer to work with old-growth koa as their raw material for its color and figure (e.g., curl). This resource is dwindling in supply with limited amounts available in the foreseeable future. The koa wood being used now comes from dead and dying trees. Little data are available on second-growth koa wood properties and much anecdotal information as to its inferiority for woodworking is common. The ability to market products made from young-growth koa will promote active management in young-growth stands. Research conducted on genetic variation in wood quality, including color and grain, was reported by Simmons et al. (1991). Work by Dudley and Yamasaki (2000) found indications that figure may be under genetic control. Sun et al. (1996) recommended that more attention be paid to selection and silviculture in koa reforestation programs. Results point to the ability of land managers to select and manage for characteristics that match consumer preferences.

Color and figure have been identified as key attributes in creating and marketing koa products. In fact, it is thought that just the name koa has market recognition and creates desirability. Yet a lack of ability by consumers to identify wood species was documented by Bowe and Bumgardner (2004) and Bumgardner et al. (2007). Consumer preference research on other species has found other attributes that resonate with buyers. Secondary manufacturers using Eastern white pine (*Pinus strobus* L.) found that lumber quality and region of origin had the largest influence on purchasing decisions (Alderman et al. 2007). Consumers were willing to pay more for an end table made in Alaska over one manufactured in China (Donovan and Nicholls 2003). Along with name recognition and origin are appearance attributes such as color and figure. Bumgardner and Bowe (2002) found that consumers thought darker color woods reflected higher value than lighter color woods and the lighter color was perceived to be less expensive. In studying character-marked furniture made from red alder (*Alnus rubra*), Bumgardner et al. (2009) found a disconnect between retailer and consumer cues on willingness-to-pay. These past research studies suggest that there are opportunities for marketing koa products from both young- and old-growth trees.

Conjoint choice analysis is a technique that has the ability to determine how certain product attributes affect whether a consumer is likely to purchase an item and also quantify its significance (Green and Srinivasan 1978). This means of analysis in preference research is widely used for consumer and industrial goods (Green and Srinivasan 1990). Lihra et al. (2012) found that price drove decision when buying

furniture 50% of the time. Wang et al. (2004) used conjoint analysis to assess four attributes of fine furniture: design, price, density of character marks, and guarantee policy. They found that design was more important to consumers with price the second most important attribute.

This project was designed to evaluate purchaser perception of important attributes of koa wood, color and figure, and their willingness to pay, using a product likely to be purchased by a variety of consumers because of its versatility.

Materials & Methods

This study used the conjoint choice experiment method to indirectly obtain consumers' willingness to pay and preference for different attributes of a koa wood bowl. The attributes and levels were chosen based upon typical koa wood characteristics. Darker colors and a higher degree of figure (curl) are typically equated to wood coming from old-growth trees. It is perceived that wood which is darker in color and has more curl is more desirable to consumers. Lighter colored wood with less figure, typically harvested from younger koa trees or from the sapwood of older trees, is thought to be less desirable. This experiment randomly combined three different color levels, two levels of figure (non-curly and curly) and three prices using six identically shaped bowls as examples of each possible combination of color and figure (Figure 1). An 8-in diameter koa bowl was chosen to represent a koa wood product that is an item likely to be purchased by Hawaii'i residents for their own home, by visitors as a keepsake of their visit to the Hawaiian Islands, or as a gift. The color, figure, and price are classified as "attributes" and each attribute had different levels. Table 1 depicts the selected attribute levels that were used. Price levels were set by retail market value of similar bowls.

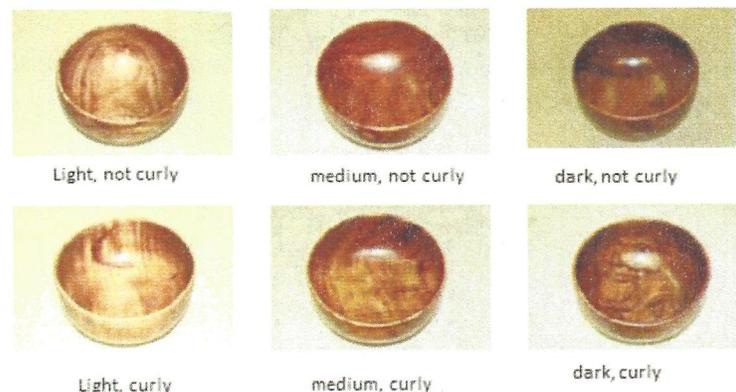


Figure 1. The six koa bowls on display at Hawaii's Woodshow in Honolulu, HI. Photo credit: William Weaver.

Attributes	Price per bowl	Color of bowl	Figure of bowl
Levels	\$400	Light	Not Curly
	\$500	Medium	Curly
	\$600	Dark	
	\$700		

Table 51: Attributes and levels used to create the conjoint choice experiment profiles

The discrete choice analysis survey design was created using Sawtooth Software⁴ using the three attributes and their associated levels found in Table 1. The survey was comprised of 12 choice tasks each containing a scenario of three different koa bowl attributes. Each choice task consisted of a level from each attribute for a total of 24 possible combinations. Two survey versions were created to cover all possible attribute-level combinations and each respondent was asked to complete one survey containing 12 choice tasks. Respondents chose their preferred bowl from each task. They were also asked to select their favorite bowl and indicate the maximum they would be willing to pay for it.

Figure 2 shows an example choice task that was presented to respondents. This method forces the respondent to make trade-offs among varying product attributes and levels therefore determining which attributes and levels they prefer. From the survey results, estimates on consumers' willingness to pay for one attribute over another can be calculated.

Profile 1. If these koa bowls were your only options, which would you choose?

Attribute	Option A	Option B	Option C
Figure	Not curly	Curly	Not curly
Color	Light	Medium	Dark
			
Price(\$)	\$500	\$700	\$400

Figure 52. Example choice task created by Sawtooth Software that was presented to respondents. Each respondent must choose only one koa bowl, Option A, B, or C, based upon the attributes they prefer.

The survey also contained demographic questions to see what additional factors, if any, influence preference. Other questions relating to consumer actions were asked such as if they had ever purchased koa products before and where they would prefer to buy the products.

⁴ Sawtooth Software, Inc. Orem, UT. <http://www.sawtoothsoftware.com/>

Surveys were conducted at Hawaii’s Woodshow in Honolulu, HI (Labor Day weekend 2014) to capture consumers familiar with koa. The survey was administered to attendees willing to participate. A brief description of the project background was given to respondents prior to their answering the survey. Demographic information was also collected from respondents.

Results were analyzed using latent class analysis that aggregates responses and separates them into classes based upon expressed preferences. Latent GOLD® software⁵ was used for the analysis. The criterion used to select the optimal number of preference classes is based on the Bayesian Information Criterion statistic (BIC).

Results and Discussion

Response

There were a total of 129 complete surveys. Response rate was about 80%.

Demographics

Respondents answered questions relating to demographics, their knowledge of koa, and whether they had experience working with koa. Of the 129 respondents from Hawaii’s Woodshow, 84% lived in Hawai’i and 16% were visiting. Eighty-five percent of the Hawaiian residents have lived in Hawai’i for more than 5 years. Fifty-one percent of the people surveyed were female and 49% surveyed were male. Figure 3a depicts the age breakdown of respondents. Over one-third of the respondents were between the ages 60 and 69. Almost 50% of respondents had an annual household income of at least \$90,000 and only 14% of respondents had an annual household income of below \$30,000 (figure 3b).

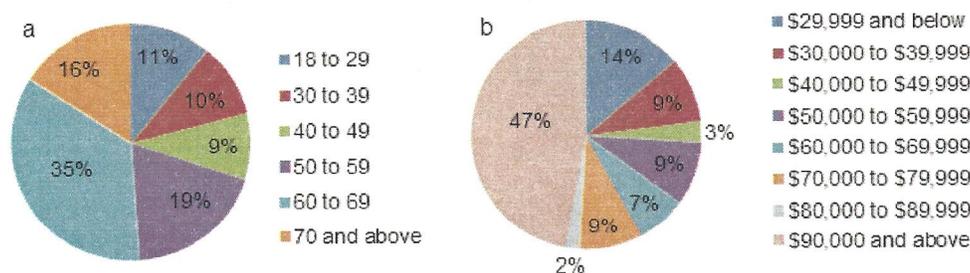


Figure 53. (a) Age distribution and (b) annual household income of respondents from Hawaii’s Woodshow.

The majority of respondents, 84%, had graduated with at least a Bachelor of Science degree and within this group, the majority had a higher income and education level, and was older. Also, 73% had purchased a koa wood product in the past. Twenty-eight percent of respondents were woodworkers with 40% selling their work. This respondent group was very familiar with koa wood (95%). None of the respondents’ socio-

⁵ Statistical Innovations, Belmont, MA. <http://www.statisticalinnovations.com/>

demographics were found to influence their attribute preference in the survey based on Latent GOLD® software results.

Model results

The software identifies consumer groups or clusters (called classes) based on product attributes preferences. The model containing three classes was chosen as the best for characterizing consumer preferences based upon the Bayesian Information Criterion (BIC) statistic. Table 2 is a summary of which attribute parameters were statistically significant at the 0.05 level as shown by part worth utilities. The negative sign for a part worth utility indicates a non-preference for a certain attribute and in the case of price, a lower price for the bowl.

Attribute (class size)	Class 1 (32%)	Class 2 (42%)	Class 3 (27%)
Price	-0.397*	-0.025	-0.189*
Color			
Light	-0.158	1.458*	-0.144
Medium	0.166	0.561*	0.406*
Dark	-0.009	-2.019*	-0.262*
Figure			
Non-curly	-1.187*	-0.831*	0.243*
Curly	1.187*	0.831*	-0.243*

* significant at the $p < 0.05$ level

Table 2. Model estimates for consumer preferences as shown by part worth utilities. () is statistically significant at the 0.05 level, (-) symbol indicates a negative preference.*

Table 3 lists the attribute importance for each class. Class 1 (with 32% of the respondents) had no significant preference in color but preferred having a lower price and curly figure. This class had a significant non-preference for bowls that were non-curly. While figure was the most important attribute to this class, price still somewhat important accounting for almost a third of their decision and color was the least important. Class 2 accounted for 42% of respondents and color was most important to them; they significantly preferred light or medium colored koa bowls and bowls with curly figure. They significantly did not prefer darker color and non-curly bowls. Color was almost twice as important to them as figure. Price was not a significant factor. The third consumer class was made up of 27% of respondents who significantly preferred lower prices, non-curly bowls, and medium color. Class 3 significantly did not prefer darker color and curly figured bowls. Color was the most important attribute followed closely by price and then figure.

Attribute (class size)	Class 1 (32%)	Class 2 (42%)	Class 3 (27%)
	-----percent-----		
Price	30.6	1.5	33.0
Color	8.3	66.6	38.8
Figure	61.0	31.9	28.2

Table 3. Attribute importance by percent for each class. Highlighted boxes indicate the attribute of highest importance to each class.

Figure 4 shows the maximum price that consumers are willing to pay for a bowl. Just over half of the respondents would pay less than the minimum level set for this study. This could provide market opportunities for using young-growth koa wood for those who are price conscious but would like to own a koa product.

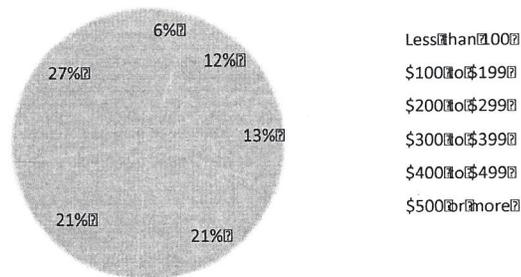


Figure 4. Maximum price respondents would pay for their favorite bowl.

Summary and Conclusions

The study drew from a small, knowledgeable portion of the population. For Class 1 (32% of the sampled population) figure was the most important attribute. Price influenced about one-third of their decision. The largest group represented (42% of respondents) preferred medium and light colored, curly figured koa bowls and had no price preference. They did not prefer dark color. About one quarter of the respondents (27%) preferred bowls with medium color, non-curly figure, and having a lower price. They also did not prefer dark color.

If these results hold for the larger population, stores or woodworkers, depending on which consumer group they market to, would either need to have a competitively priced bowl; or one light or medium in color; and could either be figured (curly) or not (non-curly). The majority of respondents preferred the light or medium color, which is often associated with young-growth koa. The desire to have a piece of Hawaiian culture could be met using materials that are not necessarily reflective of old-growth characteristics.