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What Factors Do Retailers Value When Purchasing Fruits? Perceptions of Produce Industry Professionals

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Abstract

The goals of this study were to identify the retail-purchasing factors deemed most and least important by grower/packer/shippers (GPS) and retailers when purchasing fruits (melons, pears, peaches/nectarines, tomatoes, strawberries, and blueberries), and to identify factors rated significantly different by these two groups. A major survey revealed that both groups agreed that fruits being free of defects and of appropriate firmness were among the most important factors for retailers, and also that aroma was among the least important factors. Points of departure between GPS and retailer self-assessments occurred with GPS rating price and size of fruit as more important than retailers, and GPS rating essential quality characteristics as less important than retailers. Given the link between high-quality, flavorful fruits and increased consumer consumption of fruit, industry professionals will benefit from increased research as well as expanded dialogue to bridge the gap between perception and reality.

Keywords: interviews, fruit quality, retail, growers

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Introduction

Supplying consumers with high-quality, flavorful fruit they enjoy eating and want to purchase again is an important factor for increasing fruit sales (Kader 2008; Mitcham 2010). It is also a multifaceted process beginning with variety selection and ending with consumer consumption. Maintaining fruit quality from farm to table means using best management practices that help ensure a quality fruit product is properly grown, picked, packed, distributed, displayed, and then stored by shoppers until consumption. Key issues related to fruit flavor and quality include harvest timing, packaging technology, modified atmosphere packaging, and cold chain management (Brecht et al., 2003; Toivonen, 2007). Quality assurance throughout the supply chain is critical to delivering consistently high-quality fruits to supermarkets (Kader 2001). Other than the time required for ripening climacteric fruits, during which potential quality is realized, the longer the period of time between harvest and consumption, the greater the reduction in fruit quality (Kader 2008).

Assessing fruit quality is complex and takes into account factors that are both intrinsic (i.e., appearance, flavor, color, shape, size, structure) and extrinsic (i.e., price, brand name, store, nutrition) (Ophuis and Van Trijp 1995). Kader (2000) categorized the major quality components of fruits as: appearance, texture, flavor, and nutritional quality. Baldwin et al. (2000) further broke down the perception of fruit flavor to include not only how the taste receptors on the tongue perceive flavor (i.e., sweet, sour, salty, bitter), but also the effects that aroma and texture and even temperature have on flavor perception. Shewfelt (1999) asserted that typically, quality has been seen as either product oriented (i.e., based on the accuracy of measurable attributes of a fruit) or consumer oriented (i.e., based on perceptions of consumer behavior and predicting product performance).

Although there has been considerable research conducted on the purchasing factors that are important for consumers (Crisosto, Crisosto, and Bowerman 2003; Gallardo, Kupferman, and Colonna 2011; Gilbert et al. 2014; Harker, Gunson, and Jaeger 2003) very little research has been conducted on the factors *retailers* use when purchasing fruit. One of the few relevant studies, conducted in Taiwan, concluded that retailers considered “procurement price, product quality, product consistency, and food safety” to be the most important factors when selecting produce suppliers (Lin and Wu 2011:1237). Similarly, an analysis of Malaysian retailers revealed that the most important factors retailers consider when selecting produce suppliers are produce quality, produce appearance, ability to consistently supply produce, and supplier competitiveness (Nawi and Mohamed 2013). Parker et al. (2006) also concluded that price and quality are the most important retail-purchasing factors and asserted that personal relationships are especially important between produce retailers and suppliers because of the inherent complexity and volatility of this market segment. Although these studies addressed the larger purchasing factors that non-U.S. retailers use when buying fruits, they did not examine the specific quality characteristics retailers consider when buying fruits.

Given the relative scarcity of research on factors related to retail-purchasing practices and quality considerations in the produce industry, this study fills a hole in the current research literature. Using quantitative data from a major survey of industry stakeholders in the United States, this research examines how grower/packer/shippers (GPS) perceive retail-purchasing practices and

how retailers perceive their own buying practices related to fruits. This research was the result of a United States Department of Agriculture, National Institute of Food and Agriculture funded partnership between the University of California, Davis and the University of Florida: “Increasing Consumption of Specialty Crops by Enhancing their Quality and Safety.” The larger project focused on removing the barriers to using postharvest handling methods that ensure consistently great-tasting fruits and vegetables are marketed, and increasing consumer consumption of fruits and vegetables.

The overall objective of this study was to compare the perspectives of grower/packer/shippers and retailers on what factors shape the fruit-purchasing practices of US-based retailers. The fruits included in this study were melons, pears, peaches/nectarines, tomatoes, strawberries, and blueberries. The primary research questions were:

1. Across all fruits, what retail-purchasing factors were perceived as most and least important by GPS and retailers?
2. How did GPS and retailer assessments differ when rating the importance of retail-purchasing factors?

Methods

The project team members, including horticulturists, post-harvest technologists, agricultural economists, food and food safety scientists, and social scientists, worked in collaboration with produce industry representatives to develop two stakeholder surveys, one tailored to fruit grower/packer/shippers and the other tailored to retailers. Many of the survey questions were refined versions of open-ended interview questions administered to produce industry experts and key decision makers (See Diehl et al. 2013). The interview questions, along with the resulting analysis of responses, provided the foundation for generating closed-ended questions, which were scaled to allow for the quantitative analysis of responses. The draft surveys were created based on interview responses and team analysis, and then piloted and refined based on industry feedback. The final versions of the survey were designed to collect demographic information and company characteristics; attitudes toward delivering riper fruits to supermarkets; barriers to delivering riper fruits to supermarkets; supply chain challenges; current postharvest handling practices; consumer-buying factors; retail-purchasing factors; factors related to grower selection of varieties; importance of postharvest handling practices; and industry training needs related to fruit harvesting and handling.

The survey distribution strategy focused on industry associations as the means through which industry representatives could be contacted. An analysis was conducted to determine all of the top states of production for each of the fruits being addressed (melons, pears, peaches/nectarines, tomatoes, strawberries, and blueberries), and state, regional, and national organizations and associations were then identified based on existing industry contacts and a systematic Internet search. In sum, thirty-two organizations agreed to participate in the mixed-mode survey distribution process. The distribution protocol for the mail survey involved three contacts, the initial mailing of the survey, a reminder postcard, and a final mailing of the survey. The distribution protocol for the Internet survey also involved three contacts, an initial e-mail with a survey link, a reminder e-mail with a survey link, and a final e-mail with the survey link.

Three-thousand, six-hundred and sixty-four individuals (fruit growers, packers, shippers, and retailers) were contacted via e-mail or mail, and 557 surveys were completed for a response rate of 15.2%.

Table 1 summarizes the demographic information regarding respondents, with 534 respondents represented in this dataset, based on having answered the relevant questions for this study. Of these respondents, 175 identified themselves as growers and 298 identified themselves as grower/packer/shippers. These groups were collapsed into a single category of GPS for the purpose of these analyses ($n = 473$) and were compared to retailers ($n = 61$). For the GPS category, respondents identified growing the following fruits, with many growing more than one fruit type: melons ($n = 94$), pears ($n = 81$), peaches/nectarines ($n = 87$), tomatoes ($n = 89$), strawberries ($n = 170$), and blueberries ($n = 170$). For the data presented in this study, GPS were asked to provide ratings only for the fruits they grow.

Table 1. Demographic characteristics of sample

	N	%		
Gender				
Male	446	84.8		
Female	80	15.2		
Ethnicity				
Caucasian	489	92.8		
Hispanic/Latino	16	3.0		
Other	22	4.2		
Education				
HS Degree or Less	49	9.3		
Some College, No Degree	89	16.8		
Associate's Degree	47	8.9		
Bachelor's Degree	248	46.9		
Graduate or Professional Degree	96	18.1		
Industry Role				
GPS	473	88.6		
Retailer	61	11.4		
	Mean	SD	Minimum	Maximum
Age (years)	52.9	11.60	22	86
Industry Experience (years)	24.8	13.98	<1	63

The current study focuses on the perspectives of GPS and retailers on retail-purchasing practices for the fruits included in the study—melons, pears, peaches/nectarines, tomatoes, strawberries, and blueberries. The main variables of interest were GPS assessments of the importance of retail-purchasing factors (“When RETAILERS buy [x fruit] from suppliers, how important are the following factors?”) and retailer self-assessments of the importance of retail-purchasing factors (“When YOUR COMPANY buys [x fruit] from suppliers, how important are the following factors?”). In both cases, the factors were: color, defects, firmness, size, price, shelf life, aroma, brix, supplier reputation, flavor, shrinkage, and resist damage. Both questions were rated on a 10-point Likert scale with only the endpoints labeled (with 1 being not at all important and 10 being extremely important).

For the first research question, simple mean scores were calculated for all fruit-purchasing factors for both grower/packer/shippers and for retailers. These means were arrayed from most important to least important to facilitate the identification of factors deemed to be especially important or unimportant. For the second research question, means scores were calculated for each group and for each fruit-purchasing factor. One-way between groups analysis of variance (ANOVA) was used to test whether there were statistically significant differences between grower/packer/shippers and retailers on each of the fruit-purchasing factors. While there is strong debate in the literature about whether it is appropriate to treat Likert items as continuous variables (Jamieson 2004; Norman, 2010), the use of more scale points (in this case, 10 points on the Likert scale), increases the ability to analyze the variable with statistics designed for continuous variables (Leung 2011). Further, Norman (2010), in a review and analysis of the relevant literature concludes that parametric statistics are “robust” in the face of violations of statistical assumptions (p. 625) and that “parametric statistics can be used with Likert data, with small sample sizes, with unequal variances, and with non-normal distributions, with no fear of ‘coming to the wrong conclusion’” (p. 631).

Results

The first research question was: *Across all fruits, what retail-purchasing factors are perceived as most and least important by grower/packer/shippers (GPS) and most and least important by retailers?* To answer this question, mean ratings of importance were calculated for GPS and retailers on each retail-purchasing factor and each fruit; these means were then combined into an overall average across all fruits for each respondent group and this was used to determine the overall rank of each factor (See Table 2). It is important to note again that the ratings presented here compare retail self-assessments of the importance of purchasing factors with GPS perceptions of how important each of these factors is to retailers (not GPS self-assessments of how important these factors are to them).

When assessing retail-purchasing practices, GPS believe the following factors are the *most* important to retailers (in descending order): Free from defects ($M = 8.98$); Price ($M = 8.93$); Size ($M = 8.43$); and Firmness ($M = 8.38$). GPS believe that the following factors are *least* important to retailers: Shrinkage ($M = 7.78$); Flavor ($M = 7.40$); Brix (% soluble solids content) ($M = 6.82$); and Aroma ($M = 6.35$).

When self-assessing their own buying practices, retailers rated the following factors as *most* important (in descending order): Free from defects ($M = 8.95$); Color ($M = 8.60$). Supplier reputation ($M = 8.53$); and Firmness ($M = 8.45$); Retailers reported that the following were the *least* important factors: Brix ($M = 7.93$); Resistance to handling damage ($M = 7.90$); Shrinkage ($M = 7.83$); and Aroma ($M = 7.18$).

Table 2. Mean ratings, average ratings, and overall rank of retail-purchasing practices across fruits as perceived by GPS and retailers pertaining to buying-factors.

Category	GPS		Retailer		Average	Rank
	Mean	Rank	Mean	Rank		
Color	8.0	5	8.2	2	8.27	5
Defects	8.9	1	8.9	1	8.98	1
Firmness	8.4	4	8.4	4	8.38	4
Size	8.7	3	8.3	6	8.43	3
Price	9.2	2	8.0	7	8.93	2
Shelf life	8.2	6	8.2	8	8.27	6
Aroma	6.3	12	7.3	12	6.35	12
Brix	7.8	11	8.3	9	6.82	11
Supplier Reputation	7.7	7	8.5	3	8.22	7
Flavor	7.8	10	8.6	5	7.40	10
Shrinkage	7.6	9	8.0	11	7.78	9
Resist Damage	7.9	8	7.7	10	7.92	8

The second research question was: *How do GPS and retailer assessments differ when rating the importance of retail-purchasing factors?* To address this question, ANOVA was used to determine significant differences between GPS and retailers on the ratings of importance for all fruits included in the study. Several patterns of findings emerged from this analysis (Table 3). GPS consistently perceived that the following factors were *less* important for retailers than retailers reported for themselves: aroma, flavor, and brix. GPS also consistently reported that price was *more* important to retailers than retailers reported for themselves. The following sections present the specific statistical tests, organized around these major areas of findings.

Table 3. Significant differences between GPS and retailer perceptions on retail-purchasing factors, based on between-groups ANOVA analysis.

Category	Melons	Pears	Peaches	Tomatoes	Strawberries	Blueberries
Color	-	-	-	-	-	-
Free of Defects	-	-	-	-	-	-
Firmness	-	-	-	-	-	-
Size	-	-	GPS> Retail	-	-	-
Aroma	Retail>GPS*	Retail>GPS**	Retail>GPS**	-	-	-
Brix	-	Retail>GPS*	Retail>GPS*	-	Retail>GPS*	Retail>GPS*
Flavor	Retail>GPS*	Retail>GPS***	Retail>GPS***	Retail>GPS*	Retail>GPS*	Retail>GPS*
Shrinkage	-	-	-	-	-	-
Shelf life	-	-	-	-	-	-
Resistance to handling damage	-	-	-	-	-	-
Price	Retail>GPS***	Retail>GPS*	Retail>GPS***	Retail>GPS**	-	Retail>GPS***
Supplier Reputation	Retail>GPS*	-	-	-	-	-

Note: Results are presented only for statistically significant differences for each fruit and each factor, and are arranged to show which group rated the buying factor higher.

* < .05, ** < .01, *** < .001

Aroma

Retailers consistently rated the importance of aroma as a retail-purchasing factor higher than the GPS assessments of retailers. This pattern was true for all fruits, with statistically significant differences for melons, pears, and peaches/nectarines (Table 4). This result may seem perplexing since, as seen in the first research question above, aroma was rated as the least important retail-purchasing factor by both GPS and retailers; however, the comparison of means reveals that GPS rated this factor even lower on the 1-10 scale than did retailers.

Table 4. Means, standard deviations, and statistical tests for between-groups ANOVA based on GPS and retailer assessments of the importance of the retail-purchasing factor ‘aroma’.

Fruit	GPS Perception of Retailers		Retail Perception of Selves		Statistic
	M	SD	M	SD	
*Melons	6.3	2.54	7.3	1.76	F (1,131) = 5.24 p = .024
**Pears	5.6	2.55	6.9	2.11	F (1,116) = 8.72 p = .004
**Peaches/Nectarines	6.0	2.29	7.4	2.03	F (1,117) = 10.53 p = .002
Tomatoes	6.5	2.51	7.0	1.99	F (1,117) = .89 p = .348
Strawberries	7.4	2.13	7.5	1.89	F (1,188) = .12 p = .732
Blueberries	6.3	2.35	7.0	2.20	F (1,183) = 2.90 p = .090

Note: * < .05, ** < .01, *** < .001

Brix

As with aroma, when assessing retail-purchasing factors, retailers consistently rated brix as a more important retail-purchasing factor than GPS rated it as a factor for retail-purchasing decisions (Table 5). This difference was statistically significant for pears, peaches/nectarines, strawberries, and blueberries.

Table 5. Means, standard deviations, and statistical tests for between groups ANOVA based on GPS and retailer assessments of the importance of the retail-purchasing factor ‘brix’.

Fruit	GPS Perception of Retailers		Retail Perception of Selves		Statistic
	M	SD	M	SD	
Melons	7.8	1.86	8.3	1.48	F (1,132) = 2.38 p = .125
***Pears	6.2	2.58	7.9	1.73	F (1,114) = 15.09 p < .001
**Peaches/Nectarines	7.1	2.04	8.2	1.54	F (1,115) = 9.60 p = .002
Tomatoes	6.3	2.58	6.7	2.36	F (1,114) = .84 p = .360
***Strawberries	7.0	2.30	8.5	1.66	F (1,188) = 14.30 p < .001
***Blueberries	6.5	2.38	8.0	1.80	F (1,182) = 13.86 p < .001

Note: * < .05, ** < .01, *** < .001

Flavor

For all six fruit types, retailers rated the importance of flavor higher than GPS rated flavor as a retail-purchasing factor, with all differences being statistically significant (Table 6).

Table 6. Means, standard deviations, and statistical tests for between-groups ANOVA based on GPS and retailer assessments of the importance of the retail-purchasing factor ‘flavor’.

Fruit	GPS Perception of Retailers		Retail Perception of Selves		Statistic
	M	SD	M	SD	
*Melons	7.8	2.23	8.6	1.42	F (1,134) = 5.42 p = .021
**Pears	6.9	2.41	8.2	1.77	F (1,115) = 9.18 p = .003
***Peaches/Nectarines	7.1	2.52	8.5	1.53	F (1,117) = 10.70 p < .001
*Tomatoes	7.2	2.71	8.2	1.66	F (1,116) = 4.30 p = .040
*Strawberries	7.8	2.18	8.6	1.75	F (1,187) = 4.80 p = .030
*Blueberries	7.6	2.09	8.3	1.93	F (1,183) = 4.37 p = .038

Note: * < .05, ** < .01, *** < .001

Price

GPS rated price as a more important retail buying-factor for all fruits than retailers rated price. Statistical significance exists for five of the six fruits, the exception being strawberries (Table 7).

Table 7. Means, standard deviations, and statistical tests for between-groups ANOVA based on GPS and retailer assessments of the importance of the retail-purchasing factor ‘price’.

Fruit	GPS Perception of Retailers		Retail Perception of Selves		Statistic
	M	SD	M	SD	
***Melons	9.2	1.25	8.0	1.806	F (1,134) = 18.98 p < .001
*Pears	8.6	1.41	8.0	1.82	F (1,118) = 4.33 p = .040
***Peaches/Nectarines	9.1	1.23	7.9	1.88	F (1,116) = 17.78 p < .001
**Tomatoes	9.0	1.64	8.0	1.83	F (1,117) = 8.28 p = .005
Strawberries	8.6	1.82	8.2	1.80	F (1,188) = 1.57 p = .212
***Blueberries	9.1	1.08	8.3	1.81	F (1,183) = 13.51 p < .001

Note: * < .05, ** < .01, *** < .001

Discussion

For the first research question addressing which retail-purchasing factors are most and least important based on grower/packer/shipper assessments of retailers and retailer self-assessments (See Table 2), there was agreement on fruits being free of defects and having appropriate firmness as among the most important, and that aroma was the least important factor. However, there were also some interesting points of departure, with GPS rating price and size as more important retail-purchasing factors than retailers self-assessed, and GPS rating flavor, brix, and supplier reputation as less important than retailers self-assessed.

It is interesting that when GPS assess retail-purchasing practices, key measures of fruit quality and flavor components such as aroma, brix, and flavor are perceived to be of relatively low importance. Finally, the finding that shrinkage is a relatively unimportant factor for retailers is somewhat surprising at first glance given how much attention this issue receives in the produce industry. However, some large retailers charge suppliers for shrink which may account for this finding. The fact that retailers rate resistance to handling damage as relatively unimportant is also interesting, especially in light of the fact that being free from defects was rated as highly important.

For the second research question, addressing the significant differences between GPS and retailer assessments of retailer-purchasing practices, there were several interesting differences between the groups. In essence, GPS report that characteristics associated with flavor quality—aroma, brix, and flavor—are less important retail-purchasing factors than retailers themselves report. At the same time, GPS report that price is a more important retail-purchasing factor than retailers report. When viewed collectively, these findings represent an interesting disconnect between GPS and retailers, with GPS believing that essential quality characteristics are less important to retailers and that price is more important to retailers. While this study assesses the perception of retail-purchasing practices as reported by GPS and retailers, it does not address the extent to which retailers are actually considering these factors when purchasing fruits. It is not clear whether the perception of GPS or retailers is more accurate or whether the truth is somewhere in between.

This disconnect between GPS and retailers in terms of their perceptions has also been noted in a qualitative study of challenges in the fruit supply chain currently being conducted by the authors of this paper. When asked about retail-purchasing practices, for example, one grower/packer/shipper of melons said: “Very few retailers in the marketplace today are actually concerned enough about flavor that they take action to try to find it and have it in their stores . . . I think the overall trend is to not have riper, better tasting fruit, it’s to have cheaper fruit.” Other growers also noted that there had been a shift over time in the level of produce knowledge and experience of retail buyers, with a shift toward individuals who have less direct experience with farming and with produce. One grower/packer/shipper said:

It has gotten out of the hands of the produce people and into the hands of corporate merchandisers and it’s more of the corporate thing. They try to apply some of the same principles they use in dried goods and groceries to produce and they just don’t work. So, those non-produce people are calling the shots and that’s the problem in my opinion.

In contrast, our interviews with retailers indicate a strong interest in fruit quality in addition to price when purchasing fruit. For example, one retailer commented, "If it's the right thing to do and it costs us something, but it makes a really big difference on sales and customer experience then it's something that's going to make a lot of sense for us." Another retailer pointed out that:

[For] some retailers it's just about the price, but I believe wholeheartedly that when it comes to the produce department, it is quality first and price second. Now I don't say that and indicate that price doesn't matter, price does matter, but there's a relationship between quality and price. I believe our customer, my customer, comes into my store and if they can buy a bag of peaches and they go home a hundred percent of those peaches are edible and they are a good experience they are going to come back and buy more peaches.

Even though not all retailers share the same motivation when making fruit purchases, many retailers recognized that sales and repeat customer purchases are dependent upon offering consistently great-tasting fruit.

While this research provides useful information on what factors influence retail purchases of fruit, it also raises questions about the extent to which retailers value the importance of factors related to fruit quality, such as aroma, brix, and flavor. Given the perceptual disconnect between grower/packer/shippers and retailers, additional research and dialogue are needed to explore how much retailers truly value factors related to fruit quality. For fruit growers who are currently focused on producing high-quality, flavorful fruits, this dialogue may serve to connect them to retailers who are most interested in their products. For fruit growers who are not currently as focused on the flavor quality of fruits, this dialogue may suggest that they are missing a market opportunity. High-quality, flavorful fruit is a key to increasing consumer consumption and thereby sales of fruit (Kader 2008; Mitcham 2010; Diehl 2013), and our findings indicate that many retailers are receptive to increasing the emphasis they place on purchasing factors related to fruit flavor and quality. What remains to be seen is if actual fruit-purchasing behaviors of retailers are consistent with their self-assessments as presented in this study.

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