MARKET INTERMEDIARIES' WILLINGNESS TO PAY FOR ROSACEOUS TREE FRUIT ATTRIBUTES

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RosBREED

Enabling marker-assisted breeding in Rosaceae

www.rosbreed.org

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RATIONALE

- Introduction of new cultivars with superior quality will help increase per capita consumption, benefiting consumer health and the profitability and sustainability of U.S. rosaceous fruit crop industries
- Knowing market intermediaries' willingness-to-pay (WTP) for specific crop attributes can help breeders identify the relative importance of traits and more efficiently and creatively allocate breeding program resources

OBJECTIVES

- Estimate market intermediaries' WTP for targeted traits
- Identify the relative importance of traits for each crop
- Compare the WTP for fresh and processed fruit
- Compare the WTP for fruit from different regions

DISCRETE CHOICE MODEL

- Suppose a choice set has M alternatives. The profit derived from the jth alternative for firm i can be represented as:

$$\Pi_{ij} = Z_{ij} + \varepsilon_{ij} = x'_{ij}\beta + \varepsilon_{ij}$$

- The probability that firm i will choose alternative j is:

$$\Pr\left(Y_i = j\right) = \Pr\left(\Pi_{ij} > \Pi_{ik}\right) \quad \text{for all } k = 1,2,\ldots,M, k \neq j$$

- The log-likelihood functions are:

$$\ln L = \sum_{i=1}^{N}\sum_{j=1}^{M} d_{ij} \ln \Pr\left(Y_i = j\right) \quad d_{ij} = \begin{cases} 1 & \text{if firm } i \text{ chooses alternative } j \\ 0 & \text{otherwise} \end{cases}$$

- Different assumptions on the error term lead to different models
- Conditional Logit, Mixed Logit, HEV, Multinomial Logit Model
- WTP = the marginal rate of substitution between that attribute and the price factor

WILLINGNESS TO PAY TABLES

Attributes for Fresh Apples	WTP($/lb)
External appearance-free from defects (from more than 3% per lot to less than 3% defects per lot)	0.123
Crispness (from not crisp to very crisp)	0.129
Firmness(from less than 14 lbs to more than 14 lbs)	0.009
Flavor-combination of sweetness, sweet/tart balance and aroma (from weak/mild flavor to full/intense flavor)	0.128
Size (from less than 2.9 inches (100 count) to more than 2.9 inches (100 count))	0.002
Shelf life at retail (from poor (less than 1 week) to good (more than 1 week))	**0.134**

Attributes for Processed Apples	WTP($/lb)
Size (from less than 2.5 inches to more than 2.5 inches)	0.001
Firmness(from less than 14 lbs to more than 14 lbs)	0.021
Aroma (from non characteristic to characteristic)	0.006
Tartness (Acidity) (from Low (Less than 0.3 g malic acid/100mL) to High (More than 0.3 g malic acid/100mL))	0.003
Sweetness (from Low (Less than 12 °Brix) to High (More than 12 °Brix))	0.027
Internal defects (from More than 3% per lot to Less than 3% per lot)	**0.028**

Attributes for Fresh Sweet Cherries	WTP($/lb)
External color (from light red to dark red)	0.259
Size (from less than 11 row to more than 10 row)	0.180
Firmness (from soft (less than 300 g/mm) to firm (more than 300 g/mm))	0.170
Sweetness-soluble solids (from low (less than 18 °Brix) to high (more than 18 °Brix))	0.344
Flavor-combination of sweetness, sweet/tart balance and aroma (from weak/mild flavor to full/intense flavor)	0.310
Shelf life at retail (from less than 1 week to more than 1 week)	**0.359**

Attributes for Processed Tart Cherries	WTP($/lb)
External color (from poor red color to characteristic red color)	**0.110**
Size (from Non-uniform to uniform)	0.047
External appearance (from more than 4% defects per lot to less than 4% percent per lot)	0.000
Pit removal (from poor to good)	0.101

Attributes for Fresh Peaches in CA	WTP($/lb)
External color (from not desirable (lack of skin blush/color) to desirable (cream/yellow background color with a red blush color))	0.076
Size (from size 80-56 to size 50 and larger)	0.017
External appearance-free of defects (from fair (<70% packout) to good (>85% packout))	0.041
Firmness (from Less than 10 lbs to more than 10 lbs)	0.098
Flavor-combination of sweetness, sweet/tart balance and aroma (from weak/mild flavor to full/intense flavor)	0.000
Sweetness-soluble solids (from low (less than 11 °Brix) to high (more than 11 °Brix))	**0.162**

Attributes for Fresh Peaches not in CA	WTP($/lb)
External color (from not desirable (lack of skin blush/color) to desirable (cream/yellow background color with a red blush color))	0.099
Size (from "Quarters" (2.25 inches diameter and up to 2.5 inches) to "Three-Quarters" (2.75 inches diameter and up to 3 inches))	**0.243**
External appearance-free of defects (from fair (<70% packout) to good (>85% packout))	0.061
Firmness (from Less than 10 lbs to more than 10 lbs)	0.205
Flavor-combination of sweetness, sweet/tart balance and aroma (from weak/mild flavor to full/intense flavor)	0.049
Sweetness-soluble solids (from low (less than 11 °Brix) to high (more than 11 °Brix))	0.166

Attributes for Fresh Strawberries	WTP($/lb)
Size (from less than 25g/fruit to more than 25g/fruit)	0.096
Internal color (too light or too dark color to ideal red color)	0.055
External color (from too light or too dark color to ideal red color)	0.067
Firmness (from soft to firm)	0.148
Flavor-combination of sweetness, sweet/tart balance and aroma (from weak/mild flavor to full/intense flavor)	**0.238**
Shelf life (from 4 days after harvest to 9 days after harvest)	0.043

CONCLUSIONS

- Traits that intermediaries are willing to pay to have improve:
  - Fresh apples: shelf life at retail, crispness, flavor, external appearance and firmness
  - Processed apples: internal defects, sweetness, firmness
  - Fresh sweet cherries: shelf life at retail, sweetness, flavor, external color, size and firmness
  - Processed tart cherries: external color
  - Fresh peaches in CA: sweetness, firmness and external color
  - Fresh peaches not in CA: size, firmness, sweetness and external color
  - Fresh strawberries: flavor, firmness and size
- Traits that are valued differs for fresh fruit and processed fruit:
  - Apple firmness: $0.01 for fresh, 0.02 for processed
  - Cherry external color: 0.26 for fresh, 0.11 for processed
  - Cherry size: 0.18 for fresh, 0.05 for processed
- Value of traits differs depending on region for fresh peaches:
  - External color: $0.08 in CA, $0.10 not in CA
  - Size: $0.02 in CA, $0.24 not in CA
  - Firmness: $0.10 in CA, $0.21 not in CA
  - Sweetness: $0.16 in CA, $0.17 not in CA

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