What influences apple consumers’ preferences?
A perspective on intrinsic and extrinsic factors

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Outline

• How do we form preferences?
• Measures in sensory science
• Apple preferences
  – Intrinsic attributes
  – Extrinsic attributes
• Choosing imperfect apples and apple juice at the supermarket and at home
• Conclusions
How do we form preferences?

Expectations

Attitudes

Perception

Acceptance
How do we form preferences?

Expectations

Acceptance

Attitudes

Perception

- Product image
- Extrinsic attributes
- Intrinsic attributes information
- Appropriateness
- Previous consumption experience

Demography, Culture
Values, Lifestyle, Habits

Sensory properties
Memory, Physiology, Genetics
Familiarity
Context

Collecting consumer data

How much do you expect to like these cheeses?

Expectations

How much do you like these cheeses?

Perception

It is important to me that the cheese I buy is made of pasteurised milk

Acceptance
Measuring sensory perception

• Analytical methods
  Trained panel

Intensity of redness/bitterness/fruitiness...
Descriptive sensory analysis of apples

- Sensory map of samples and attributes (Principal Component Analysis, PCA)
  - Sample descriptions, Sample comparisons and Attributes correlations

Measuring sensory perception

• Analytical methods
  Trained panel

Intensity of redness/bitterness/fruitiness...

• Affective methods
  Consumers

How much do you like this apple?
Hedonic evaluation of apples

ARI: Ariane
FUJ: Fuji
GC: Gold Pink
GD: Golden Delicious
JON: Jonagold
JUN: Milwa
KAN: Nicoter
LIG: Ligol
PL: Cripps Pink
RUB: CIVni
WEL: Cpro-47

Fig. 4. Bidimensional preference map of components D1 and D2 with representation of each cultivar, the vector of maximum preference for clusters C2, C3, C4, C5 and C6 and isopreference curves according to circular model with ideal point for cluster C1. Additionally contour plot of estimated percentage of clusters above average preference is depicted. (ARI: Ariane; FUJ: Fuji; GC: Gold Pink; GD: Golden Delicious; JON: Jonagold; JUN: Milwa; KAN: Nicoter; LIG: Ligol; PL: Cripps Pink; RUB: CIVni; WEL: Cpro-47.)

Intrinsic and extrinsic attributes of apples

Point of sale
Packaging
Price

Appearance
Odour
Texture
Taste
Flavour

Cultivar
Origin
Organic
Eco-label
Technology

Nutrients information
Sensory information

Consumer characteristics
Preference mapping of apples

1. Sensory map: descriptive characteristics

![Graph showing sensory variables and apple cultivars](image)

**Fig. 2.** Principal component analysis of the sensory data: (a) 14 sensory variables (loading plot) and (b) six apple cultivars (score plot).

Preference mapping of apples

2. Relationship between sensory characteristics and preferences

Preference mapping of apples

3. Relationship between sensory characteristics, consumer characteristics and preferences

Preference mapping of apple juices

- Freshly squeezed juices were liked the most
- Cloudy fresh juices and clear juices from concentrate, were liked the least

**Reduced sugar content** (Rødbotten et al, 2009)

- Preference for sweeter samples, but “too sweet” when sweetness is in focus
- Half of the consumers preferred the samples with the highest acidity and the other half preferred the samples with the lowest acidity.
Familiarity

- We like what we know and we eat/drink what we like

New technology gives freshly-squeezed juice a long shelf life and can retain its natural flavour, but consumers are sceptical.

“If people like the way it tastes, many of the doubts will disappear.”

http://sciencenordic.com/fresh-juice-long-shelf-life-must-win-over-consumers
Organic and Eco-label

• **Eco-label**: apples grown with *environmentally sound practices*
  - Female respondents, with children, environmental and food safety concerns are more likely to pay a premium for eco-labeled apples
  - But premium is small!

• **Organic** label generates higher Willingness To Pay (WTP)
  - Food quality and security, trust in the certification

• Is organic a credence or an «intrinsic» attribute?
  - **Organic** Golden Delicious vs. integrated fruit farms
  - 14% firmer fruit flesh; 31% higher P-content; 19% higher phenols (mainly flavanols);
  - 15% higher taste scores
  - Organically grown apples can have an outstanding inner quality

Point of sale (POS)

- “Integrated production” certified apples
- Farm shops vs. supermarkets
- Health is main value of buyers
- Interactions between market channel characteristics and product attributes.
- POS influences the perception and the motivation structure of the respondents for fresh apples.

Role of consumer characteristics

- **Culture**
  - For Argentineans quality was more related to visual characteristics, whereas for French it was driven by flavor.

- **Frequency of consumption:**
  - Frequent consumers know more varieties and are more attentive to flavor.
  - Less frequent consumers know fewer apple varieties and are more attentive to appearance.

- **High Private Body Consciousness (PBC) individuals** rely more strongly on the sensory characteristics when forming preference ratings.


Role of context

• Choosing *suboptimal food products* at the supermarket and at home
• Food waste reduction

*products of deviating appearance or close to best-before date*
Consumer study

- N=4250
- Denmark, Germany, Netherlands, Norway, Sweden
- Behavior depends on context (Store vs. Home)
## Study – choice task

<table>
<thead>
<tr>
<th>Store (evoked context)</th>
<th>Home (evoked context)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imagine that you’re in a supermarket, ready to select an apple. Given an identical price, which one would you choose?</td>
<td>Imagine that you’re in your home, ready to select an apple. <em>Which one would you choose?</em></td>
</tr>
<tr>
<td>For which <strong>discount</strong> would you purchase this apple? (0-100%)</td>
<td>In your household, how probable is it that this apple would be discarded in the garbage? (0-100%)</td>
</tr>
</tbody>
</table>
Study – choice task

1. Fruits and vegetables
2. Dairy products (date labelling)
3. Damaged packaging
Results (Suboptimal choice %)
Results (% discount/prob waste)

- Store
- Home
Results on personal characteristics

**Store** suboptimal choice

- Age: -.09**
- Egoistic orientation: -.07**
- Perceived effectiveness: .08**
- Perceived waste importance: .13**

**Home** suboptimal choice

- Age: -.12**
- Commitment to sustainability: .13**
- Perceived own waste: -.15**
- Do shopping/cooking: .06**

Suboptimal Choice (Store)
Suboptimal Choice (Home)
Results summary

• 4x more suboptimal choices at home than in supermarkets
• 50% discount expected (20% on curved cucumber, 70% on bruised apple)
• 25% waste probability in households

• Who chooses suboptimal products?
  • Younger consumers (from range 18-70 y.o.)
  • **Supermarket**: Consumers with higher perceived personal impact on environmental issues and higher altruistic personality
  • **Household**: Consumers who do the shopping & cooking, and with higher involvement with sustainable issues
# Conclusion: Sensory drivers of preference

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Texture</th>
<th>Odour</th>
<th>Taste</th>
<th>Flavour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Fresh</td>
<td>Juicy Crispy</td>
<td></td>
<td>Sweet</td>
<td>Fruity Apple</td>
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<tr>
<td></td>
<td>Firm</td>
<td></td>
<td>Acid Sour</td>
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<tr>
<td>Fluffy</td>
<td>Skin toughness</td>
<td></td>
<td></td>
<td>Tartness Stale</td>
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<tr>
<td></td>
<td>Mealiness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Floury Granular</td>
<td></td>
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</tbody>
</table>
Conclusion: What influences apple consumers’ preferences?

- **Product image**
  - Apple variety

- **Extrinsic attributes**
  - Price, Organic, Technology

- **Intrinsic attributes information**

- **Appropriateness**
  - Choice situation
  - Point of Sale

- **Previous consumption experience**

- **Demography, Culture**
  - Gender, culture
  - Values, Lifestyle, Habits
  - Purchase frequency

- **Sensory properties**
  - Red, sweet, crispy

- **Memory, Physiology, Genetics**

- **Familiarity**
  - New breeds, red juice

- **Context**

**Flowchart**

- **Expectations**
- **Attitudes**
- **Perception**
- **Acceptance**
Thank you!
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References


