Taste panel analysis of mandarin in Indonesia

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Abstract
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Mandarin production in West Timor is expanding based on a local variety, Keprok Soe. Little is known about the market perception of the product or the likely demand for greater quantities. In research to underpin the future marketing approach, consumer preference for Keprok Soe was compared with imported mandarins and another domestic variety using taste panel analysis by untrained panellists. Taste panels conducted in 2000 in Kupang and Surabaya suggested that Keprok Soe had potential to compete with imported mandarins in Surabaya. However, in Kupang, another domestic variety was more popular. Implications for the marketing of Keprok Soe are discussed.

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Introduction

Mandarins are widely consumed in Indonesia and are relatively expensive compared with other fruits. While Indonesia produces mandarins in several different regions, it also imports mandarins from other countries including China, Australia, and Israel. More recently mandarins from Pakistan have been available at very competitive prices. Generally, however, imported mandarins fetch a premium price.

Keprok Soe (literally mandarin from Soe) is grown in Soe, in West Timor in the Province of East Nusa Tenggara (NTT). Keprok Soe is admired by the local people for its good taste, attractive skin colour (predominantly gold) and relative ease of peeling. While farmers attribute the good taste of their product to organic farming practices, in practice the organic status of their fruit is often involuntary. Many farmers cannot afford to invest in farm inputs. Based on its good agronomic performance, the government of Indonesia has promoted Keprok Soe exclusively in West Timor since the 1990s by providing grafted plants of Keprok Soe to farmers. For the villages that grow Keprok Soe, it is important to their livelihoods, comprising between 30-75% of the income of subsistence farm households (Alpha Omega Foundation, 1999).

Increased Production. As NTT is one of the poorest provinces in Indonesia, aid funds have been injected into the area since the 1970s by Non-Government Organisations (NGOs) including the multinational Alpha Omega, the Japanese Office of Economic Co-operation Fund, and the American Winrock International. To develop mandarin plantations, funds have been used to supply more planting material and install irrigation equipment. Data from the Staple Plant Office in NTT (1997) indicate targeted growth in plantation area for citrus from 2,018 hectare to 6,628 hectare in 2003. Although it is difficult to predict accurately, a dramatic increase in out-turn of Keprok Soe can be expected in the near future. In spite of the pressure of this increased production, the future market for Keprok Soe has not been considered at the industry level.

Distribution of Keprok Soe. Currently, there are three channels for distributing Keprok Soe. Farmers sell directly to consumers at the weekly sub-district and district markets or at roadside locations with good traffic flow. Farmers also sell or forward-sell to local collectors, primarily for provincial markets in Kupang (the capital of NTT). Finally, through two inter-island traders, small quantities of good quality Keprok Soe are sold to other islands of Indonesia. With the expected future increase in production, the industry needs to focus on the potential to expand distribution channels in Kupang and to other more prosperous cities such as Surabaya and Bali.

Objectives of this research. This article reports one part of a preliminary market research project investigating market prospects for Keprok Soe. Through taste panel analysis by untrained panellists, consumer preferences for Keprok Soe were compared to those for imported mandarin and a popular local variety. Two cities were included in the study, Kupang, the capital of NTT province, and Surabaya, the second largest city in Indonesia. Currently, a modest amount of Keprok Soe is sold to Surabaya through one trader based at Kupang.

Taste panels have not been widely used in market research in Indonesia, especially in the fresh produce arena. There is general interest in better exploiting taste panel techniques for the purpose of market segmentation. Traditionally market segmentation has been based on demographic, geographic, behaviouristic, or more recently psychographic criteria (McColl-Kennedy and Kiel, 1999). *Sensographic segmentation*, though not new, has had wider application in processed food and drink market research, and some reports indicate that differences between consumer segments do have a genuine sensory basis (McBride, 1999).

This article extends the application of taste panels to the fresh fruit area. There is potential for taste panel findings to be utilised at an early stage in order to design production systems able to meet specific market requirements. With continuing advances in breeding, pre- and post-harvest technologies, fruit growers working in concert with R&D researchers have increasing capacity to meet market requirements through better management of varietal selection, farm inputs and tree manipulation.

This research may also assist in deciding how to position Keprok Soe in the fresh fruit market. Early impressions from the research were that lack of product consistency of mandarins in Indonesia creates risks and uncertainties for consumers and businesses purchasing the fruit. In this environment, branding a good consistent product should lead to a marketing advantage (Owen et al., 2000). Currently only limited amounts of Keprok Soe are sold beyond West Timor and the produce is known by only a few traders and consumers in other cities. Once the out-turn of Keprok Soe is large enough to sell more to other cities, a decision might be needed at the industry level to brand the product overtly as Keprok Soe, rather than as keprok from Soe. Such a strategy would require an ongoing commitment to good, consistent quality of the fruit.

Procedure

Prior to running the taste panels, two mini-focus groups were conducted in Kupang and Surabaya in June 2000. The aim was to gain a general insight into people's preferences for mandarins and to identify salient attributes for mandarins. Based on the focus group findings, a structured questionnaire was developed for the taste panel evaluations.

The focus group in Surabaya consisted of a convenient sample of six participants (four males and two females – all hotel staff) and the one in Kupang consisted of eight participants (four males and four females - all staff members from the University of Nusa Cendana). Since focus group methodology is uncommon in Indonesia, the choice of a convenient sample in both instances ensured that the nature of the research was well understood by participants.

Findings from both focus groups were that the important characteristics for evaluating internal quality were good taste (ie sweetness), soft texture (fewer and softer attached fibres or 'feathers'), appearance and overall quality including freshness and juiciness. Gold skin colour was preferred as an indicator of ripeness and sweetness, despite consumers' experience of many Indonesian varieties which remain green when ripe. Based on these findings, fruit attributes included in taste panel evaluation were fruit segment appearance, taste, texture, overall quality and skin colour. Each attribute was rated on nine point hedonic scale, with '1' being least preferred and '9' most preferred.

The test samples used for the taste panel in Surabaya were imported mandarins (purchased locally but origin unidentified); Kintamani, a domestic variety sold in the Surabaya market; and Keprok Soe (sent by air parcel from Kupang). Mandarins used in the Kupang taste panel were imported mandarins (origin unidentified and sent by air parcel from Surabaya); Siam, another domestic variety sold in the Kupang market; and Keprok Soe. While identification of the country of origin of the imported mandarins would have been preferable, the inability to identify the source of the mandarins was not viewed as a major weakness of the research. Imported mandarins in Indonesia share certain characteristics. They are all gold in skin colour, while most domestic mandarins are green. Because most imported mandarins have been stored for some time, they often share a fermented taste and softened texture. In addition, Indonesians tend to see imported mandarins as one undifferentiated group of fruit.

Untrained consumers, rather than trained panellists, were used because the emphasis was on consumers' *subjective liking*, not quality control. When performed properly with a good understanding of terms and procedures by panellists, such panels can produce reliable descriptive data (Curphey, 1999). In Surabaya, 48 untrained taste panel participants (64.6% male, 35.4% female) were drawn from staff members and students of the University of Augustus XVII. In Kupang, there were 45 participants (53.3% male, 46.7% female) from staff members and students of the University of Nusa Cendana. Using university-affiliated participants reduced the likelihood of suspicion and rejection that might otherwise be found in the general public. The evaluation was conducted in a large room at each campus, and jointly administered by researchers from the University of Queensland and the University of Nusa Cendana. Instructions were given in Bahasa Indonesian individually to each participant before the test as she or he entered the room. Participants were well spaced physically to avoid them influencing each other.

Participants were first given a segment of three mandarins of different origin, but they were not aware of the origin of the fruit as each segment was coded with a three-digit random number. Instructions were given to taste any one segment first and rate the items related to its internal attributes: appearance, taste, texture and overall quality. Participants were then asked to rinse their mouth and taste the second segment and so on. After completing the assessment for internal quality, participants were guided to a different area to rate their preference for skin colour. Three 'typical' mandarins of different origins were presented for evaluation on skin colour. Again the three whole fruit were coded with random numbers. Other external fruit qualities, such as size, shape, shininess, vary greatly among fruit from the same origin, and were not evaluated in this process.

Data were matched (same person rating mandarins of three origins) and ordinal level in measurement. Non-parametric Friedman significance tests were performed by using Chi-square statistics at 0.05 level.

Results

In Surabaya (Table 1), panellists rated taste (7.33) and texture (7.02) and skin colour (7.77) of imported mandarins favourably, with significantly higher ratings than for fruit from other sources. The findings explain the premium prices received for imported mandarins in the

Indonesian market. Keprok Soe was rated significantly best for segment appearance (7.38). This was perhaps related to its juiciness, freshness and the finer 'feathers' (surface fibres). Keprok Soe also was rated best, but insignificantly, for overall quality (6.83).

No major gender differences were found (Table 2). Females rated Keprok Soe significantly highest on overall quality (6.88). Similarly, males rated Keprok Soe the highest on overall quality (6.81), though the difference was not significant between the mandarins of the three origins. Both groups rated imported mandarins highest on taste, but Keprok Soe was second ranked for females and lowest ranked for males.

In Kupang (Table 3), interestingly the panellists rated the competing domestic variety best overall though only segment appearance (7.49) was significant. Keprok Soe was significantly best in skin colour (7.82). Surprisingly, imported mandarins were rated lowest on all attributes except skin colour. It may be that imported mandarins have not become popular in Kupang because further transport costs from other cities in Indonesia mean they are quite expensive. Hence their characteristics are unfamiliar.

When comparing ratings by males and females (Table 4), there was again some indication that females favoured Keprok Soe relative to the preferences of males. Females rated Keprok Soe highest on texture (7.10) and overall quality (6.81), though the ratings of mandarins of different origins were not significantly different for either attribute. Other highest ratings by each gender group remained the same as for the whole sample. Both groups rated the competing domestic variety, Siam, highest on taste, but Keprok Soe was again second ranked for females and lowest ranked for males.

Conclusion

Taste panel findings in Surabaya were consistent with the perception that consumers view imported mandarins as superior in terms of taste, texture and skin colour, all important attributes for mandarin according to focus groups. Given consumers' concern over consistent quality, particularly sweetness, the high ratings of imported mandarins might also reflect better performance in relation to this important attribute. While Keprok Soe is not yet widely available in Surabaya, a potential advantage of being fresher and juicier is evident in consumers' favourable ratings for segment appearance and overall quality of Keprok Soe.

The contrast in findings between Surabaya and Kupang is intriguing. In Kupang, imported mandarins were the least favoured among the three. There are several possible explanations. Kupang is a less prosperous city than Surabaya. Since few mandarins are currently imported into Kupang, consumers might not be used to the stored fermented taste of imported fruit. It is possible that the preference for imported fruit in Surabaya and possibly in other bigger cities of Indonesia, is due to *subjective* and complicated associations between imported fruit, premium price and social status. In Kupang, this association does not arise. This explanation could be subjected to further testing in more cities.

Keprok Soe was rated best on skin colour in Kupang, but generally rated between the other domestic mandarin and the imported fruit on the selected attributes. That more consumers

favoured the competing domestic variety poses a challenge to Keprok Soe in the Kupang market as its production increases. Given the geographic proximity of Soe to Kupang, one strategy to improve consumer satisfaction is to harvest the fruit at a riper stage, improving sweetness. This would require improved logistical supply chain co-ordination in the industry.

The research suggests that imported mandarins will generally be considered superior to Keprok Soe in bigger cities in Indonesia. The current organic production of Keprok Soe has not been promoted as an advantage to the health-conscious market segment of consumers. The same niche market for organic produce found in developed countries (Batt and Giblett, 1999) may well exist in growing economies such as Indonesia, and could be investigated as an alternative marketing strategy for Keprok Soe relative to imported fruits in larger cities.

It is clear from these results that the marketing of increased quantities of Keprok Soe may not be straightforward. As supply increases the unit price would be expected to decrease, with unwelcome impacts on the household incomes of the small farmers producing mandarins. Keprok Soe does not enjoy clear consumer preference in either of the markets where increased consumption needs to be achieved. With the injection of international aid funds in NTT, perhaps future emphasis is required on research and development of techniques to produce fruit with higher sugar content and tenderised fruit texture. Equally relevant is an emphasis on harvest and post-harvest handling and better supply chain co-ordination that improves the overall quality and provides consumers with sweeter, fresher and juicier fruit.

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Table 1
Preferences in Surabaya for attributes of mandarin from three origins

	Keprok Soe Mean (s.d.)	Domestic mandarin Kintamani Mean (s.d.)	Imported mandarin Mean (s.d.)	Friedman test χ^2 significance
Fruit segment				
Appearance	**7.38 (1.16)**	6.63 (1.35)	5.56 (2.14)	17.49 (0.000)*
Taste	5.88 (1.78)	5.90 (1.59)	**7.33 (1.53)**	22.69 (0.000)*
Texture	6.04 (1.62)	5.48 (1.65)	**7.02 (1.42)**	21.02 (0.000)*
Overall quality	**6.83 (1.14)**	6.06 (1.78)	6.63 (1.75)	4.18 (0.124)
External attributes				
Skin colour	6.42 (1.37)	5.75 (1.55)	**7.77 (1.39)**	49.98 (0.000)*

N=48, 31 (64.6%) male, 17 (35.4%) female
*significant at 0.001 level
Degrees of freedom = 2
Highest score in bold

Table 2
Gender preferences in Surabaya for attributes of mandarin from three origins

		Keprok Soe Mean (s.d.)	Domestic mandarin Kintamani Mean (s.d.)	Imported mandarin Mean (s.d.)	Friedman test χ^2 sign Mean (s.d.)
Fruit segment					
Appearance	Male	**7.13 (1.23)**	6.61 (1.36)	5.81 (2.02)	5.86 (0.053)
	Female	**7.82 (0.88)**	6.65 (1.37)	5.12 (2.34)	14.63 (0.001)*
Taste	Male	5.65 (1.58)	6.06 (1.55)	**7.45 (1.41)**	17.80 (0.000)*
	Female	6.29 (2.08)	5.59 (1.66)	**7.12 (1.76)**	6.20 (0.045)*
Texture	Male	5.68 (1.64)	5.45 (1.79)	**7.10 (1.33)**	15.38 (0.000)*
	Female	6.71 (1.40)	5.53 (1.42)	**6.88 (1.62)**	7.89 (0.019)*
Overall quality	Male	**6.81 (1.05)**	6.13 (1.61)	6.68 (1.83)	2.19 (0.335)
	Female	**6.88 (1.32)**	5.94 (2.11)	6.53 (1.62)	2.07 (0.356)
External attributes					
Skin colour	Male	6.19 (1.28)	5.42 (1.46)	**7.81 (1.19)**	39.61 (0.000)*
	Female	6.82 (1.47)	6.35 (1.58)	**7.71 (1.72)**	11.48 (0.003)*

N=48, 31 (64.6%) male, 17 (35.4%) female
* significant at 0.05 level
Degrees of freedom =2
Highest score in bold

Table 3

Preferences in Kupang for attributes of mandarin from three origins

	Keprok Soe Mean (s.d.)	Domestic mandarin Siam Mean (s.d.)	Imported mandarin Mean (s.d.)	Friedman test χ^2 significance
Fruit segment				
Appearance	6.98 (1.14)	**7.49 (1.01)**	5.67 (2.20)	15.84 (0.000)*
Taste	6.45 (1.81)	**7.04 (1.31)**	6.34 (2.57)	1.09 (0.581)
Texture	6.87 (1.49)	**6.89 (1.48)**	6.60 (2.29)	0.27 (0.874)
Overall quality	6.78 (1.38)	**6.96 (1.55)**	6.09 (2.67)	1.65 (0.438)
External attributes				
Skin colour	**7.82 (0.89)**	6.40 (1.30)	7.42 (1.47)	29.84 (0.000)*

N=45, 24 (53.1%) males, 21 (46.9%) females
* significant at 0.001 level, highest significant means highlighted
Degrees of freedom = 2
Highest score in bold

Table 4
Gender preferences in Kupang for attributes of mandarin from three origins

		Keprok Soe Mean (s.d.)	Domestic mandarin Siam Mean (s.d.)	Imported mandarin Mean (s.d.)	Friedman test χ^2 sign Mean (s.d.)
Fruit segment					
Appearance	Male	6.88 (1.32)	**7.33 (1.17)**	5.63 (1.94)	9.71 (0.008)*
	Female	7.10 (0.89)	**7.67 (0.80)**	5.71 (2.47)	6.82 (0.033)*
Taste	Male	6.21 (1.77)	**7.00 (1.50)**	6.79 (2.32)	3.34 (0.188)
	Female	6.75 (1.86)	**7.10 (1.07)**	5.80 (2.80)	1.91 (0.385)
Texture	Male	6.67 (1.63)	**7.04 (1.49)**	6.63 (2.28)	0.85 (0.654)
	Female	**7.10 (1.30)**	6.71 (1.49)	6.57 (2.36)	0.09 (0.957)
Overall quality	Male	6.75 (1.59)	**7.17 (1.55)**	6.38 (2.43)	2.37 (0.306)
	Female	**6.81 (1.12)**	6.71 (1.55)	5.76 (2.95)	2.37 (0.306)
External attributes					
Skin colour	Male	**8.00 (0.78)**	6.46 (1.35)	7.46 (1.06)	18.69 (0.000)*
	Female	**7.62 (0.97)**	6.33 (1.28)	7.38 (1.86)	12.46 (0.000)*

N=45, 24 (53.1%) males, 21 (46.9%) females
*significant at 0.05 level, highest significant means highlighted
Degrees of freedom =2
Highest score in bold