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Consumer Evaluation of Pre-Cooked Lamb

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Summary

A cook-in-bag lamb in curry sauce product was evaluated by 166 consumers in three separate experiments. When the product was identified as lamb it received favorable evaluations for taste and tenderness. In blind testing a majority of participants were unable to distinguish the lamb product from a similarly prepared beef product. The hypothesis that the lamb and beef products were equally likely to be preferred could not be rejected.

Key words: Consumer evaluation, lamb shoulder, value-added

Introduction

Since 1970 per-capita lamb consumption in the U.S. has declined from about 3 lbs per person per year to just over 1 lb per person, and lamb now accounts for less than half of one percent of meat consumption. Economic studies suggest that lamb has the characteristics of an "inferior good" – one for which consumption declines as consumer income rises (Purcell 1989, Schroeder et al. 2001). Schroeder et al. (2001) estimated that a one percent increase in per capita income reduced lamb consumption by 0.54 percent. The negative income effect is attributed to substitution away from lamb in favor of other meats, primarily beef. The effect may in part be a result of increasing participation of women in the workforce – because lamb is not perceived to be a convenient product.

To improve demand for U.S. lamb, Schroeder et al. (2001) suggested that in addition to improving production efficiency and remaining price competitive with beef, the industry needed to develop products that are more compatible with high-income consumer lifestyles. In particular they concluded - "development of lamb products that are convenient to prepare, offer a high-quality eating experience, and that are well suited for food-away-from-home consumption is essential for halting declining lamb demand." In this study we examined consumer acceptability of pre-cooked, marinated lamb produced from shoulder meat – a lower value portion of the carcass.

Materials and Methods

Product

Boneless beef and lamb shoulders were cut into 2.54cm³ cubes. Lamb meat was trimmed by hand to reduce fat to 6% or less. Portions of 227 grams were combined in cook-in bags with the same amount of commercial curry sauce and vacuum sealed. The product was cooked in a smokehouse with the internal product temperature brought up to and maintained at 90°C for 2 hours. Following cooking the product was chilled using cool water to reduce temperature from 54.4°C to 26.7°C within 1.5 hours, and from 26.7°C to 4.4°C within 5 hours. Samples were stored at 4°C. Vander Wal (2002) provides additional detail on the product.

Evaluation

Three sessions, hereafter labelled A, B1 and B2, were conducted with different groups of participants. In Session A, participants were informed that the product was lamb and evaluated it for taste, tenderness and willingness-to-purchase. In Sessions B1 and B2, participants evaluated both the lamb and a similarly prepared beef product without the meats being identified. The objective of the dual design was to investigate not only the acceptability of the product but also whether participants could distinguish lamb from beef and to elicit their preference between them. Sessions B1 and B2 were essentially identical, the only difference being that in B1 participants evaluated two samples (one lamb and one beef), while in B2 they evaluated three samples (one lamb and two beef).

A total of 166 consumers participated. Participants were selected using random digit dialling or were recruited from the membership of local organizations – a mothers group and a church group. Questionnaire design was evaluated in a pre-test session with a group of 8 graduate students following which minor adjustments were made in question ordering and wording.

Results and Discussion

Session A – lamb product only

The 21 participants were members of a mother's club and the session was conducted following a regularly scheduled meeting of the group. The average age was 32 years with a range from 20 to 40 (Table 1). Sixteen participants had not consumed lamb during the past year, while the others reported between one and five consumptions. To ascertain preference for meat tenderness, participants were asked their preferred degree of doneness for steak. The median response was a value of 4 (mean = 3.62) representing 'medium well done' with only 2 respondents indicating 'medium rare' and none preferring 'rare'.

Participants were then asked to sample and evaluate the product (which was identified as lamb) for tenderness and taste. On a scale from 1 to 5 with 1 representing 'very tough' and 5 representing 'very tender' the average evaluation was 4.76. All responses were either 4's or 5's. To evaluate taste, participants scored the product on a scale from 1 representing 'do not like at all' to 5 representing 'like a lot'. The average response value was 4.19 indicating a very favorable evaluation for taste. Only 2 of the 21 participants scored the product a value of 3 - 'neither like nor dislike.' Because the group was comprised entirely of mothers, we included a question about whether they believed their children would like the product. On a scale from 1 = 'definitely not' to 5 = 'definitely yes' the average response was 3.10. Respondents who believed their children would not like the product (6 of 21) indicated that it would probably be too spicy or too salty for their taste.

Finally, participants were asked whether they would be likely to order a lunch/dinner entrée with this lamb product at a restaurant and whether they would be likely to purchase it at the grocery store for a price of $3.99/lb. The possible responses were 'probably not,' 'possibly yes,' or 'most likely yes.' Only 2 of the 21 participants indicated that they would 'probably not' order or purchase the product. These were the same individuals who had not given a favourable evaluation for taste. Of the remaining 19 participants, 12 responded 'most likely yes' to whether they would be likely to order the product in a restaurant, and 10 indicated 'most likely yes' to purchasing it at the store.

Session B – lamb and beef

In sessions B1 and B2 we investigated whether subjects could distinguish the lamb product from a similarly prepared beef product, and their preferences between them. Session A provides little or no indication about commercially viability, since in the market the lamb product would compete with similar beef based products (e.g., beef tips in gravy). If subjects exhibited a strong and consistent preference in favor of the beef product we would have to conclude that the likelihood of the lamb product being commercially successful would be relatively low.

Session B1: (1 lamb sample, 1 beef sample)
Random digit dialling was used to recruit subjects from the general population of Manhattan, Kansas. Subjects were offered $40 to participate in a "preference experiment," to be held at a later date in the meat laboratory on the university campus. Individuals who agreed to participate were asked to indicate which of the scheduled sessions (sessions were scheduled several times daily between February 27 and March 3, 2002) would be most convenient for them. Reminders were mailed to participants one week prior to the sessions.

Upon arriving, subjects were paid $40 cash and were asked to complete a short demographic questionnaire. After completing the questionnaire, subjects first participated in a study examining preferences for different types of steak before participating in the lamb-beef study. A total of 98 individuals took part. Forty six percent were female. The average age was 35 years with a range from 18 to 90. As in Session A, a majority (63%) indicated no lamb consumption during the previous year and among those who had consumed lamb the median number of consumptions was two. The median response for preferred degree of steak doneness was a value of 3 representing 'medium.'

Participants were asked to taste two samples – labelled A and B[1] - and indicate whether they considered A or B more tender, or whether they found them similar with regard to tenderness. Forty percent rated the beef sample more tender, thirty percent rated the lamb sample more tender, and thirty percent rated the samples as similar. Participants were then asked which sample they preferred, or whether they

liked or disliked both equally. Two respondents indicated that they disliked both samples, while eighteen liked both equally. Of the remainder, 41 preferred the beef sample (17 'definitely preferring', and 24 'slightly preferring') and 37 preferred the lamb (8 'definitely, and 29 'slightly'). The hypothesis that the samples were equally likely to be preferred cannot be rejected.[2]

Next, participants were asked to identify which sample – A or B – they thought was lamb. Responses were recorded on a scale from 1 to 5 with a value of 1 indicating the consumer "definitely" thought the beef sample was lamb, 3 indicating that the consumer could not distinguish between the samples, and 5 indicating that the respondent "definitely" identified the lamb sample as lamb. Thirty-six subjects correctly identified the lamb, although only 12 of the 36 were certain about that choice. Thirty-one subjects could not distinguish between the samples, while 21 mistakenly thought that the beef sample was lamb.

When asked if they would order the product they preferred in a restaurant, on a 3 point scale with 1 indicating "probably not", 2 "possibly yes", and 3 "most likely yes", consumers preferring lamb scored an average of 2.43 while the corresponding score for individuals preferring beef was 2.36. When then asked if they would purchase their preferred product in a retail store for $2.99/ lb, the average score for lamb was 2.23 and for beef 2.35. Subsets of consumers were asked about purchases at $4.99/lb. At the higher price, the likelihood of purchase declined for both products – to an average score of 1.70 for lamb and 1.69 for beef. Overall the results suggest similar preferences for the beef and lamb products, similar likelihoods of purchasing the preferred product, and similar levels of price sensitivity.

Session B2: (1 lamb sample, 2 beef samples)
The 47 participants were members of a church group. Sixty-two percent were female and the average age was 42 with a range from 11 to 77. Thirty-five participants (75%) had not consumed lamb during the past year. The median preferred degree of doneness for steak was a value of 4 representing 'medium well done.'

Participants were asked to taste and evaluate three samples, two beef and one lamb

(as in Session B1 the products were not identified). When asked which sample they considered most tender, 26 of the 47 (55%) selected one of the two beef samples. Of the others, only 4 indicated that the lamb product was most tender while 17 found all three samples similar. Participants were then asked which sample they preferred, or whether they liked/disliked all samples equally. Again, 26 of 47 indicated preference for a beef sample – though these were not all the same individuals who found a beef sample more tender. Eight individuals preferred the lamb sample while twelve liked all three samples equally. Only one individual disliked all the samples. As in session B1, the hypothesis that beef or lamb were equally likely to be preferred cannot be rejected.[3]

When participants were asked to identify which of the three samples they thought was lamb, 26 individuals (55%) indicated that they could not tell, 9 (19%) correctly thought that the lamb sample was lamb, while 12 (26%) mistakenly thought that one of the beef samples was lamb.

Finally, respondents were asked whether they would be likely to purchase sample C (the lamb sample) in a supermarket at $4.99/lb. Bearing in mind that for a majority of participants this was not the preferred sample and that the offer price was relatively high, we were somewhat surprised that twelve of the forty-seven respondents indicated that they would possibly (7) or definitely (5) purchase the product.

Statistical Analysis

Regression analysis was used to investigate whether demographic and other variables had an influence on: a) subjects' ability to identify lamb, and b) subjects' preferences between lamb and beef. Ability to identify lamb was defined with a variable that took a value of 1 if a subject indicated that a beef sample was 'definitely lamb,' a value of 2 if a subject indicated that beef was 'probably lamb,' a value of 3 if they indicated that they were unable to distinguish the samples, a value of 4 if they indicated that the lamb sample was 'probably lamb,' and a value of 5 if they indicated that the lamb sample was 'definitely lamb.' Thus higher values of this variable indicate increasing ability to correctly identify lamb. The set of explanatory variables included the respondent's gender and age, lamb consumption in the previous year, and a dummy variable

to distinguish participants in Session B2 from those in Session B1.

Results of the regression model are presented in Table 2. They suggest that females are better able to identify lamb. Lamb consumption and age have insignificant effects, while participants in Session B2, which included three samples compared to two in Session B1, are less likely to correctly identify the lamb sample.

To analyze preferences between the lamb and beef samples we defined the dependent variable to take a value of 1 if the subject "definitely preferred' a beef sample, a value of 2 if they 'slightly preferred' a beef sample, a value of 3 if they expressed no preference, a value of 4 if they 'slightly preferred' the lamb, and a value of 5 if they 'definitely preferred' the lamb. Thus higher values of the variable indicate increasing preference for lamb over beef. The set of explanatory variables included those used in the previous model in addition to: a) the subject's preference for meat doneness, and b) a dummy variable for subjects who indicated that the lamb sample was the more tender than the beef sample(s).

The results in Table 2 indicate that the only variable with a statistically significant influence on preference was whether respondents had judged the lamb sample to be more tender. Thus the tenderness attribute would appear to be the main determinant of preference. If samples were equally likely to be preferred we would expect a negative coefficient for participants in Session B2 due to the presence of the additional beef sample. In fact we do see a negative impact but it is not statistically significant. The negative coefficient for 'Preference for doneness' suggests that respondents who prefer meat cooked to a lower level of doneness may be more likely to indicate preference for the lamb sample – however the coefficient is not statistically significant in this sample.

Conclusions

We interpret our results as both confirming the quality of the pre-cooked lamb product and suggestive of a high level of acceptability to consumers. When the lamb product was identified to participants it received very favorable evaluations for both taste and tenderness, and a majority of the participants indicated they would be willing to purchase it at $3.99/lb. When we compared the lamb with a similarly prepared

beef product, the results suggested similar preferences for both products, and, with a beef based product currently in the marketplace they suggest that the lamb-in-curry-sauce product could be commercially viable. However, these results are from blind tests in which we found that most participants were unable to distinguish beef from lamb – had we identified the products in the comparison, factors such as prior perceptions about lamb quality or prior experiences with lamb may have had a significant influence on the outcome.

Our results also point to the importance of the tenderness attribute of the product. We found that individuals who preferred lamb over beef (or vice-versa) were significantly more likely to have adjudged the lamb (or beef) product to be more tender. This points to the potential value of additional work with consumers to determine an optimal level of product tenderness.

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1   The A/B product designations were switched for different sessions

2   Ignoring respondents not expressing a preference and collapsing 'definitely preferring' and 'slightly preferring' into a single category gives a value of 0.205 for the Chi-square statistic, with a critical value of 3.84 for rejection of the hypothesis that beef and lamb are equally preferred.

3   Chi-square statistic = 1.49 with a critical value (p=.05) of 5.99.

Table 1. Participant's characteristics

Variable	Session A	Session B1	Session B2
Number of participants	21	98	47
Gender (% female)	100%	46%	62%
Average age (years)	32.1	35.1	41.6
Lamb consumption (% <u>not</u> consuming lamb in past year)	76.2%	63.3%	74.5%
Preference for doneness (1 = rare, 5 = well done)	3.62	2.99	3.54

Table 2. Regression results[a]

	Variable definition	Model 1[b] Ability to ID Lamb	Model 2[c] Preference for Lamb
Intercept		3.030 (14.63)***	3.221 (8.42)***
Female	= 1 if female	0.310 (1.92)*	0.083 (-0.40)
Age	Age in years	0.005 (1.14)	-0.004 (-0.67)
Consume lamb	# times lamb consumed in past year	0.008 (0.44)	0.004 (0.18)
Session B2	= 1 if participant was in Session B2	-0.470 (-2.71)***	-0.232 (-1.02)
Preference for doneness	1 = participant prefers rare, 5 = participant prefers well done		-0.113 (-1.12)
Lamb more tender	= 1 if subject rated lamb more tender than beef		0.530 (2.11)**

[a] N=145. Data is from Sessions B1 and B2. Values in parentheses are t-statistics;

[b] Dependent variable measures ability to identify lamb. Values range from 1 (Incorrect - respondent identified beef as 'definitely lamb'), to 5 (Correct - respondent identified lamb as 'definitely lamb')

[c] Dependent variable measures preference for lamb. Values range from 1 (respondent definitely preferred a beef sample) to 5 (respondent definitely preferred the lamb sample).

*, **, *** denote statistical significance at the 10%, 5%, and 1% levels.