

# **An International Comparison of Consumer Preferences for Pork Chops**

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## **Background**

Appearance characteristics are thought to be the main factors governing consumer choice of pork and principally comprise colour, amount of fat cover, marbling and drip. Preferences for pork characteristics have been determined separately in different countries in several local studies, but the practical limitations imposed by the short display-life of meats, make it inevitable that the people in different localities have assessed different meats. The meats also will have differed simultaneously in several of the above characteristics and the relative importance of those characteristics is uncertain. The conclusions from such studies are therefore limited when considering cultural and international dimensions.

These limitations, particularly so when surveying large numbers of people in different countries, have been overcome by using photographs varying systematically in four appearance characteristics. This approach is the first time a large scale systematic study has been conducted on meat appearance and consumer preference.

## **Objectives**

- To identify the most important characteristics of fresh pork which determine consumer preference
- To show any variations in preferences among consumers from different countries

## **Materials and Methods**

The methodology and chop characteristics are described in detail by Ngapo *et al.* (2002, 2004a). Briefly, photographs of 16 pork chops were computer-modified to give two levels of each of the characteristics: colour, fat cover, marbling and drip. The resulting 256 images were published as a book (Dransfield *et al.*, 2001) comprised of 6 series of which series 1+2, 3+4, and 5+6 each contain all 256 images. A series constitutes 16 (A4) pages or 8 double-pages. Every double-page contains the 16 different chop shapes and each chop represents one of the combinations of the four characteristics studied. Both the order of representation of the characteristics with respect to the chop shape and the position of the chops in a double-page are randomised. It should be noted that chop shape was not a factor studied, but a distraction and a means to realistically present a range of characteristics to the consumer.

Consumers, older than fifteen years of age and who eat pork, were chosen at random and asked to select their preferred chop from each double-page. The selection was

repeated 8 times completing one series. The consumers also completed a questionnaire asking socio-demographic and purchase- and eating-behaviour information. All series were used approximately equally throughout a survey period. The surveys were undertaken by 25 research groups in 23 countries and coordinated by the French group. These countries and the number of consumers surveyed in each were Argentina (505), Australia (498), Belgium (353), Brazil (710), Canada (Alberta and Quebec; 1053), China (544), Estonia (248), Finland (305), France (573), Germany (143), Greece (412), Ireland (300), Japan (645), Korea (1014), Mexico (751), New Zealand (327), Poland (480), South Africa (562), Spain (358), Taiwan (716), The Netherlands (873), USA (Iowa and Texas; 732) and Yugoslavia (488).

To facilitate comparison of results from the different countries, a sub-panel of 200 consumers was randomly selected from each country comprising 100 of each men and women, and each divided into 2 groups of 50 consumers of <35 and ≥35 years of age. For each country the chop choices were calculated for each gender x age group of the sub-panel and for the corresponding group of the entire panel. When significant differences ( $\chi^2$  test,  $P < 0.05$ ) were observed between the choices of the sub-group and the entire panel, a new sub-panel was randomly selected until no significant differences between choices of each of the four groups (2 gender x 2 age groups) and the corresponding groups in the entire panel were observed. The final 4 groups, of 50 consumers each, were combined giving sub-panels of 200 consumers, representative of the entire panel for a given country. Sub-panels were unable to be selected for Germany, Estonia and New Zealand and therefore results from the entire panels are presented.

Extensive reports of the global survey are in press (Ngapo *et al.*, 2005a, b) of which a preliminary report has been presented (Ngapo *et al.*, 2004b). In addition, detailed analyses of the French (Ngapo *et al.*, 2004a), Belgian (Verbecke *et al.*, 2005) and Greek (Fortomaris *et al.*, 2005) results have been reported and, more briefly, the results of the Korean (Cho, *et al.*, 2003), Brazilian (Cipolli *et al.*, 2003) and Quebec (Ngapo *et al.*, 2005c) surveys.

## Results

The characteristics of the images of the pork chops used in these surveys are given in Table 1. Visual differences in colour were mainly due to average differences of 8.6 units in lightness ( $L^*$ ) and 5.4 units in redness ( $a^*$ ). Subcutaneous fat cover of the fat chops was, on average, twice that of the lean chops. Drip was either absent or represented almost 6% of the surface area in the samples modified to show drip. Bone and loin muscle area were similar across appearance variables. Marbling was visually estimated at about 1.5% of the muscle area.

Table 1. Mean Composition of the 256 Pork Chop Images.

	Light	Dark
Colour $L^*$	64.3	55.7
Colour $a^*$	18.3	23.7
Colour $b^*$	20.8	18.8
(% chop surface area)	Fat	Lean
Cover fat	16.9	7.9
Drip	5.4	5.7
Bone	15.7	16.1
Loin muscle	39.2	43.9

Using the 8 replicates from each consumer, the frequency of choice for the 4 characteristics was calculated. For the 2 levels of each characteristic, the choice was classed as consistent when the same level was chosen at least 6 times from the 8 replicates, otherwise the choice was deemed inconsistent. Three classes were therefore produced for each characteristic. The consistent choices from all of the countries combined showed that 4% of consumers used none of the four characteristics in their choice of pork chop, 23% used one characteristic, 41% used two, 26% three and 5% used all four (Figure 1). The frequencies of number of characteristics used by US consumers followed a similar trend.

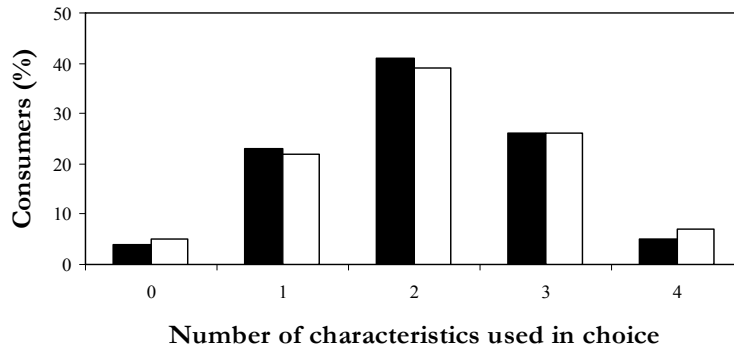


Figure 1. Number of Characteristics the Consumer Used in Their Choice (all countries combined ■, USA □).

In choosing pork chops, the US consumers most consistently used colour and fat cover, with only 41% choosing inconsistently for each (Figure 2) and suggesting that these characteristics were the most important of the four characteristics studied. Of the consistent colour choices, both dark (28% consumers) and light (31%) red pork were important for different consumers. Of the consistent fat cover choices, more than seven times as many consumers preferred the lean than the fatty fat cover. Marbling and drip (58 and 57% inconsistent choices, respectively) were of less importance in choice. The same number of consumers chose marbled and non-marbled meat, whilst five times as many consumers chose images with no drip over those with drip.

The frequency of choice was subjected to a correspondence analysis (SAS, 1999) to determine the relationships among countries. The first 2 dimensions of the correspondence analysis accounted for 80% of the total variation and are shown graphically in Figure 3. The positions of the countries are given relative to 8 of the choice options (the 4 inconsistent options are not given for clarity, but are included in the analyses). Countries shown close to a given choice have a greater percentage of consumers who chose consistently that characteristic as its preferred appearance. Conversely, large distances from a choice characteristic usually denote preference for the other option of the characteristic. Inconsistent choices tend to be found in the central region of Figure 3.

Large differences in preferences were found between individuals, groups of people and between countries. Compared to the other consumers, more of the Australian and Irish consumers preferred non-marbled, light red pork, that is, they are positioned in the lower left quadrant. The Irish consumers also preferred no drip. Those in Estonia preferred light red pork without drip. More people from Korea and Japan tended to prefer the fat and marbled options and are positioned in the lower right quadrant of Figure 3. More people in Taiwan preferred the dark red pork whilst the Dutch preferred lean meat with little overall preference for colour. Most countries tended to group close to the 'centre' of Figure 1 showing that

preferences for colour, marbling and drip were not strongly in favour of any one option but they were more consistent in their choice of the leaner option.

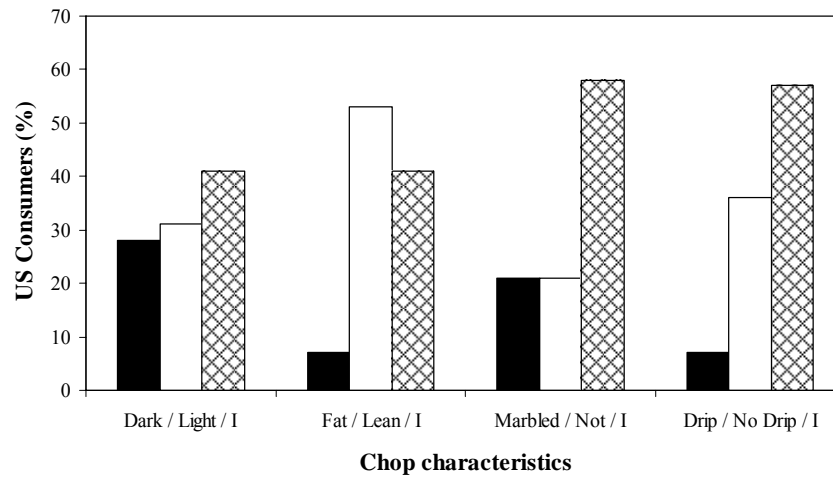


Figure 2. US Consumers' Selection of Chop Characteristics (inconsistent choices are denoted by "I").

### Discussion

This unique study of preferences for appearance characteristics, in which consumers in 23 countries viewed exactly the same appearance characteristics, has shown that choice of pork is influenced by its colour, fatness, marbling and drip and that preferences differed considerably between countries. The range of characteristics chosen for the study was not exceptional and can be found in the market within Europe.

Using replicate choices, the study was able to show those characteristics which were consistently chosen and those which were not. This is a unique consumer study conducted with replication, but without the consumers knowing it. Consistency is interpreted as a measure of importance to the individual, who presumably paid more attention to those characteristics to be able to give a consistent choice. So it was shown that, overall, fatness and colour were the most important appearance characteristics and marbling and drip were less important.

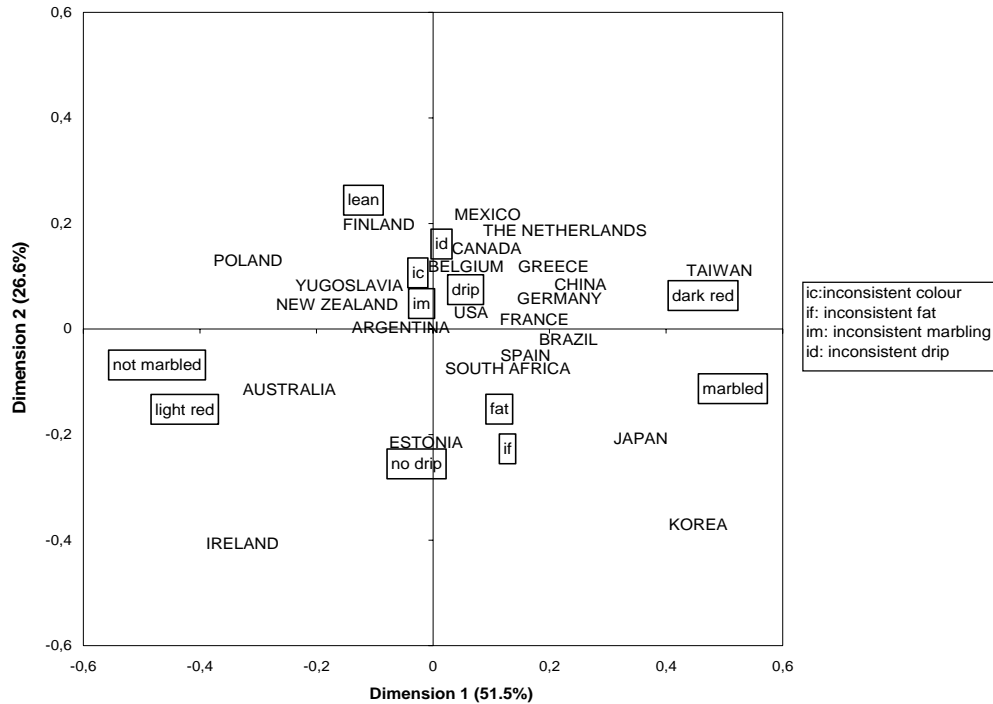


Figure 3. Preferences for 4 Pork Characteristics from Surveys Conducted in 23 Countries.

## Conclusions

- Significant differences were found for consumer choice of pork chops based on four appearance characteristics. The greatest differences were for external fat cover with preferences for both fat and lean chops differing among countries. The second criterion for selection was for colour where both dark and light red chops were often preferred by different people within a country.
- Significant market segmentation exists in preferences on a global scale and pork producers should be aware and prepared to respond to such market opportunities.

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