CONSUMER PERCEPTION OF FRESH MEAT QUALITY IN GERMANY

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Published in: British Food Journal Vol. 102 (2000), No. 3, pp 246-266

This study has been carried out with the financial support from the Commission of the European Communities, Agriculture and Fisheries (FAIR) specific RTD programme CT95-0046 “Quality Policy and Consumer Behaviour”. It does not necessarily reflect its views and in no way anticipates the Commission’s future policy in this area.

Abstract: In this article, the results of the consumer survey for Germany are presented. Extrinsic cues play an important role for quality selection in the shop. Here “country of origin” and “place of purchase” play a dominant role. To judge the eating quality of fresh meat, those experience quality attribute cues, which are hard to measure with characteristics, like flavour or smell seem to be the most important. For assessing the safety of meat, “country of origin” as an extrinsic credence quality attribute cue and “freshness” as an intrinsic credence quality attribute cue are of most importance. “Country of origin” is used by consumers not only to predict eating quality but as well to indicate safety. This holds not only for beef, but as well for pork and to a lesser extent to chicken. The most trusted source of information on the safety of meat is the butcher.

Keywords: Consumer Behaviour, Meat consumption behaviour, Germany

Consumer behaviour towards food is characterized by changing preferences. This especially applies to meat. In order to get an insight into the meat consumption behaviour, the process of quality and safety perception and the attitudes towards meat, a consumer survey was conducted in each of the partner countries in March 1997.

The main aim of this paper is to show the results of the survey for Germany and to compare them with general trends in meat consumption in Germany. A more detailed report dealing with general trends in food consumption in Germany is available. [1].

The report deals with the following subjects:

- "Quality in the shop"-perception
- "Eating quality"-perception
- Safety concerns
- "Rest of quality"-concerns
- Use of symbols and labels
- Trust in information

As far as statistical data is applied this paper is confined primarily to the regional states of the former Federal Republic of Germany (FRG).

The survey, conducted by MRC an Irish market research centre, is based on telephone interviews. The sample is defined as people who are main responsible for shopping in their household. The sampling method applied was pure random sampling.

1 MEAT CONSUMPTION IN GERMANY

The following sections introduce the meat consumption patterns in Germany and its development during the last decades. Against this background corresponding results of the consumer survey are illustrated.

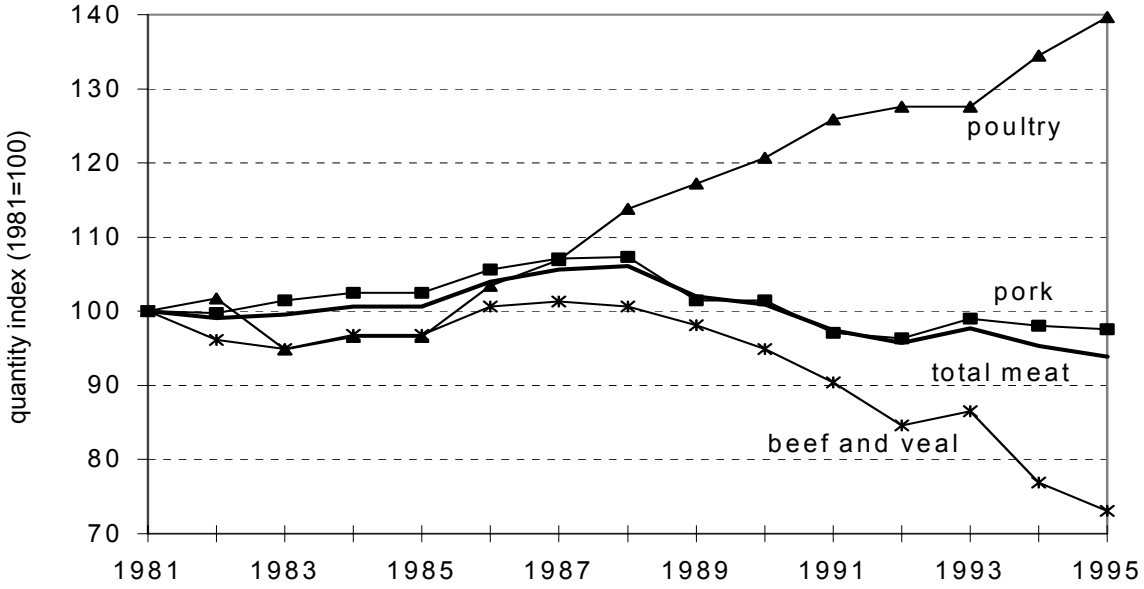
Food Consumption Trends

From the beginning of the 80's some trends in food consumption become evident in Germany: Increasing fruit, vegetable, cheese and fish consumption on the one hand and decreasing sugar and egg consumption on the other hand. Reasons for these trends, which are usually mentioned by experts, are increasing health concerns, increasing preferences for the Mediterranean diet, less demand for calorie intake, etc. Furthermore, changes in the socio-demographics of the German population have led to an increasing demand for convenience foods, ready-to-serve meals and food products in smaller packaging units.

The per capita consumption of **meat** had slightly increased until 1988 but more clearly decreased after 1988. Considering only the meat which is used for human nutrition, per capita consumption was 69.7 kg in 1988, but only 61.7 kg in 1996.[2] While pork and in particular beef and veal consumption have declined, poultry has increased considerably (see Figure 1).

Most national statistics per capita consumption are based on carcass weight which includes bones, losses, offal used as animal feed and so on. The proportion of carcass meat which is consumed by humans has declined dramatically during the last two decades so that the statistics based on carcass weight tend to overrate per capita meat consumption.

Figure 1: Per Capita Consumption Index for Selected Meat Products from 1981 to 1995[1]



Source: ZMP 1996 [3]

The development of total meat consumption does not correspond to the development of meat prices relative to food prices. Figure 2 illustrates price indices of several meat products in comparison with the price index of total food. It is obvious that since 1984 all these meat price indices have been below the food price index. All other factors influencing demand - such as demographics, lifestyles, health concerns, attitudes towards meat - have apparently outweighed the effects of declining prices and rising incomes which have driven down total consumption of meat and meat products.

But the development of the relative meat prices corresponds to some extent to the development of the meat consumption for the different meats. Poultry seem to become more and more important. Apart from decreasing prices it is the rising demand for convenience which makes poultry so popular [4]. But in spite of growing demand for poultry the quantity consumed in Germany is still far below the European average. Beef consumption is

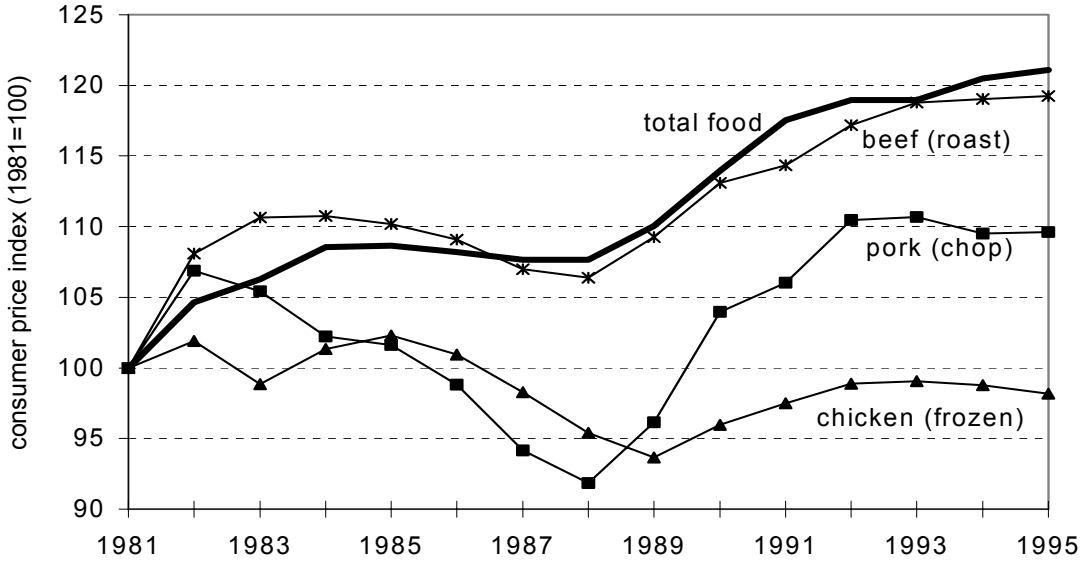
1 only human consumption

decreasing and relative beef prices increase. The same holds for pork though both the decrease in consumption and increase in relative prices is not as high as in the case of beef.

This long term development of the quantity-price relation gives support for a price sensitivity effect on the consumption pattern of the different meats. This long-term quantity-price equilibrium path seems to be caused by movements on the demand curve and shifts in the supply curve and not so much by shifts in the demand curve. For poultry production costs have decreased considerably in the last two decades. Accordingly prices decreased and consumption increased. In the case of beef, production costs seem to have increased more than in the case of pork. Accordingly prices increased and consumption decreased. But it is clear from figure 1 and figure 2 that relative prices alone cannot explain the changes in meat consumption. It is well known, that, at least in the case of the U.K. the importance of factors other than income and prices has increased in the last decades. [5]

The causes for the change in meat consumption has been a much debated issue in the agricultural economics literature. Economic demand models were specified to test econometrically for structural change [6]. Whether a structural change is supported by the empirical data or not is still an open question [7]. A structural change is defined as a change in preferences, taking care of consumption changes caused by price and income effects. Davis, arguing in the tradition of Popper and Lakatos, clearly demonstrates, that it is logically impossible to test for changes in preferences. This is due to the fact, that we cannot falsify a single hypothesis within the theoretical system, unless the theoretical system is of absolute truth, as confirmed by a superior being. The only valid form of hypothesis testing is to falsify all hypotheses making up the theoretical system [8].

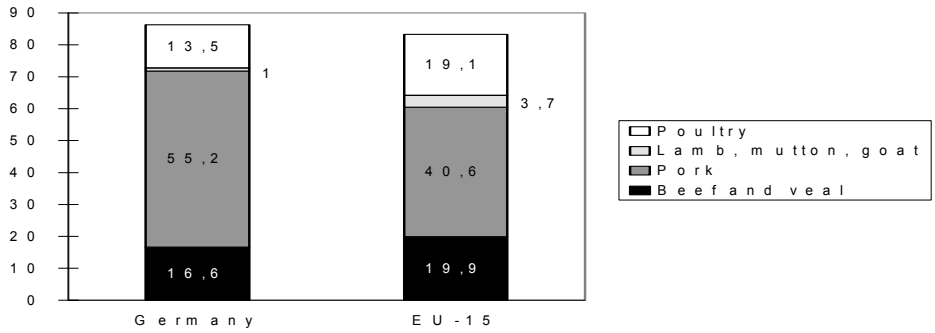
Figure 2: Price Index of Beef, Pork, Chicken and Total Food (without Beverages, Alcohol and Tobacco) (1981=100)



Source: Statistisches Jahrbuch für die Bundesrepublik Deutschland, various yearbooks [9] and Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten, various yearbooks [10]

The composition of the meat consumption in Germany compared to the EU-average can be seen in Figure 3. In Germany more than half of the meat consumed is pork. This is 40% above the EU-average. Furthermore, total meat consumption in Germany measured in carcass weight per head (86.3 kg) is higher than the EU-average (83.3 kg).

Figure 3: Meat Consumption in kg in Germany in 1995 Compared to the EU-average (carcass weight)



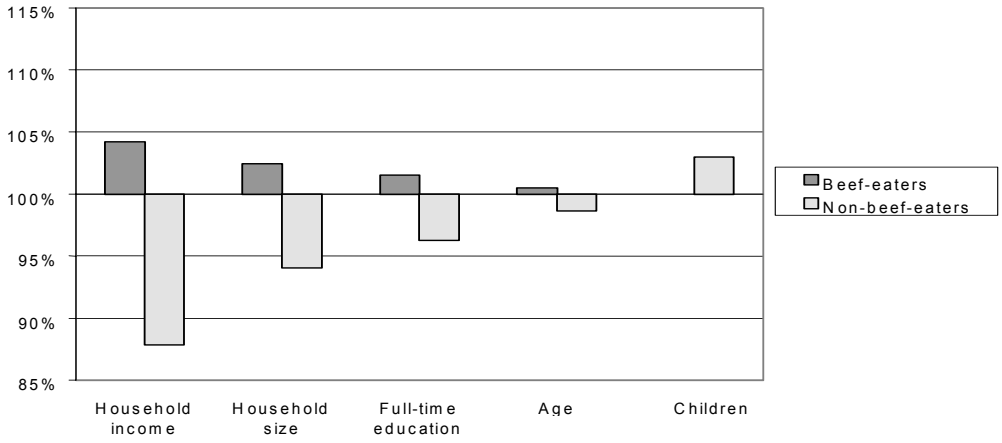
Source: ZMP 1996 [11]

Meat Consumption in the Sample

In order to get information on the consumption behaviour of the respondents, questions on the frequency of meat consumption in the households, on changes in meat consumption as well as on the place of purchase were included in the questionnaire. The results confirm that beef consumption is comparatively low in Germany. Only 40 % of the respondents eat beef at least once a week and nearly 30 % said they never eat beef.

The question arises whether the consumers who never eat beef are different from the 'beef-eaters'. It is highly probable that non beef eaters are mainly health concerned households with children, well educated and thus well informed about food. Figure 4 illustrates differences between both groups by means of relative deviations from the total average of the sociodemographic variables. Astonishingly there are only very slight differences between both groups. The respondents who do not eat beef have a lower household income on average, lower household size, lower level of education and slightly more children per household.

Figure 4: Differences Between Consumers and Non-Consumers of Beef - Relative Deviations from the Averages of the Socio-demographic Variables



In addition, the respondents were asked if they have changed meat consumption in the last five years. The majority of the consumers have not changed their meat consumption. But, more than half of them reduced beef consumption, a third reduced pork consumption while at

the same time a considerable proportion of these increased chicken consumption. This is confirmed with the data from secondary statistics.

The interviews were pursued one year after the announcement of the British Minister that a connection between BSE and Creutzfeld-Jacob Disease cannot ruled out. In Germany, the BSE topic has been already part of the media coverage since the beginning of the 90's. The extent of media coverage increased after the announcement of the British Minister, but several countries (Bundesländer) had already banned imports from the United Kingdom. The BSE crisis resulted in a pronounced short term decrease in beef consumption, but this effect only tested for some weeks or at most for few months. According to the data available, prices for fresh beef cuts even increased after March 1996. This does not extend to the carcass price, because the spread between prices received by farmers and gross retail prices increased dramatically as a result of the BSE crisis [12]. This could be explained with the lower revenue received from, how it is called in Germany, the fifth quarter of the carcass, offals, skin etc.

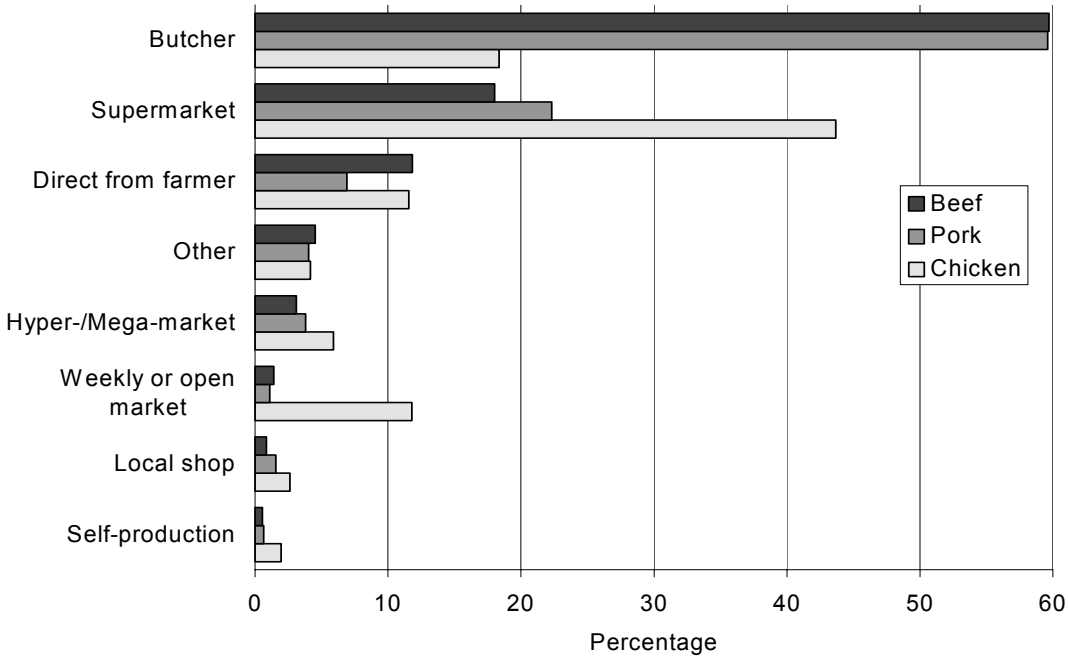
Figure 5: Changes in Meat Consumption in % (n=496)

	Beef	**Pork**	**Chicken**
More	3.0	8.8	28.6
Less	51.2	35.1	11.5
Unchanged	45.8	56.1	59.9

The market share of butcher shops in Germany has been decreasing and accounts, according to other available statistics, for roughly 30% of all meat product sales. Hper-, Mega-, and Supermarkets account to roughly 40% and discounters have a market share of 25%.13

About 60 % of the respondents mentioned the butcher as main place of purchase for fresh (raw) beef and pork meat (see Figure 6). The supermarket is of secondary importance for fresh (raw) beef and pork but the main place of purchase for (raw) chicken. Approximately 12 % of all respondents buy beef and chicken direct from farmer. Further, hyper- and megamarket, weekly market, local shop and self-production are of a certain importance for (raw) chicken but not for (fresh) beef and pork.

Figure 6: Place of Purchase (beef: n=355, pork: n=448, chicken: n=458)

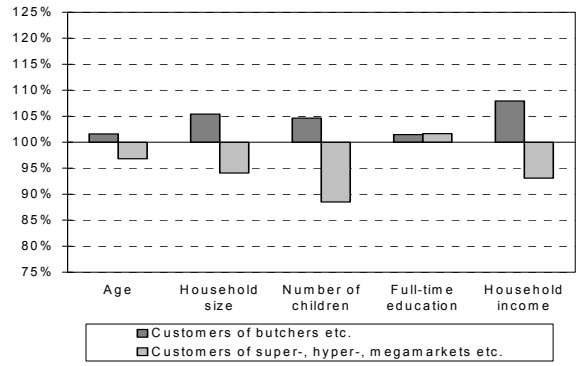


Since the role of butchers is a special feature in Germany it is interesting to search for differences between consumers who mainly purchase at the butcher's and those who prefer modern places of purchase such as supermarkets, hyper- and megamarkets. Figure 7 shows the differences by means of relative deviations from the total average of the

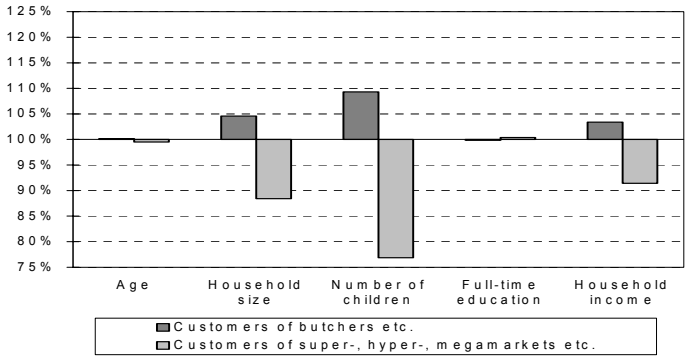
sociodemographic variables. For beef as well as for pork it is striking that consumers who prefer the butcher have an above average household income, more children and thus, larger households.

Figure 7: Differences between Respondents who buy beef and pork at the butchers (or similar) and those who buy beef at the super-, hyper- or megamarket

a) Beef



b) Pork



Who are the Heavy Meat Consumers?

So far we have only looked at different kinds of meat and not at meat in aggregate. To analyse the types of households, a meat consumption index is built which is at most 8 for a low meat consumer, 9 to 14 for a medium meat consumer and 14 and more for a heavy meat consumer. According to this definition in the survey 115 low meat consumers, 327 medium meat consumers and 46 heavy meat consumers could be identified.

When we have a closer look to the households of low meat consumers we find that they are characterized by below average household size and number of children. Heavy meat consumers comparatively are large households with an above average number of children under 16. This does not support the hypothesis that parents are concerned about bad effects of

meat consumption on their children's health and therefore reduce it. The low meat consumers have the highest educational level (assuming the age while stopping full-time education is an indicator of educational level) and the smallest household size.

2 QUALITY IN THE SHOP

German consumers are extremely sceptical about food **quality** and compared to consumers from other European Countries they are more suspicious in terms of food **safety**.

In this study the consumers were asked to rate the 'quality in the shop'-cues according to their helpfulness for assessing meat quality when they are shopping for meat. The results show that the country of origin and place of purchase are regarded as most helpful to assess quality of **beef** in the shop. The high importance of the country of origin for beef is to some extent caused by the BSE discussion. Colour, brand/label, leanness and marbling are next at a similar level of importance. More than 50 % respondents regard the price as not being helpful.

Nearly the same order was found for **pork**, with the difference that place of purchase is regarded as more useful than country of origin.

In the case of chicken, country of origin and place of purchase seem to have minor importance, though extrinsic cues in general are still regarded as more useful than intrinsic cues. Compared to beef and pork most quality cues are rated at a lower level of usefulness. Thus, quality assessment in itself seems to be more important for beef and pork than for chicken.

Figure 8: Helpfulness of 'Quality-in-the-Shop'-Attributes - Beef

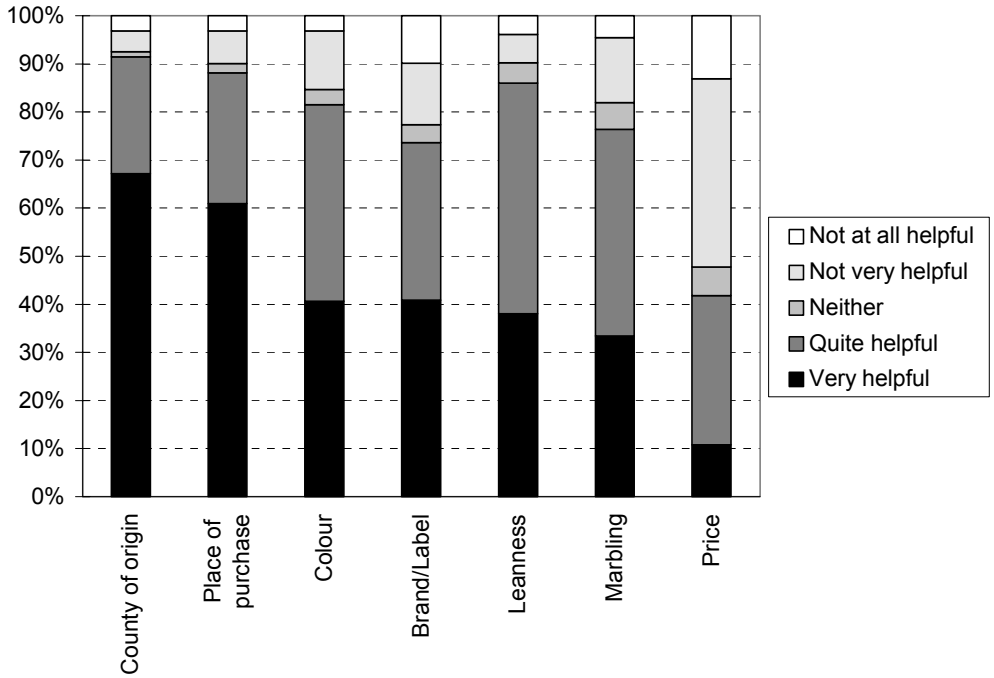


Figure 9: Helpfulness of 'Quality-in-the-Shop'-Attributes - Pork

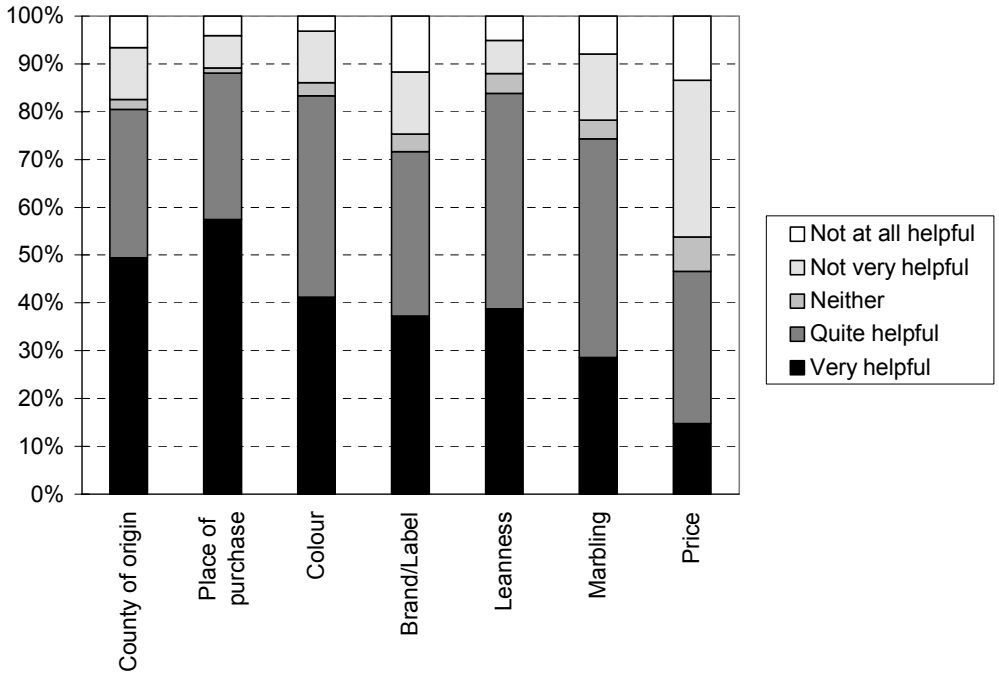
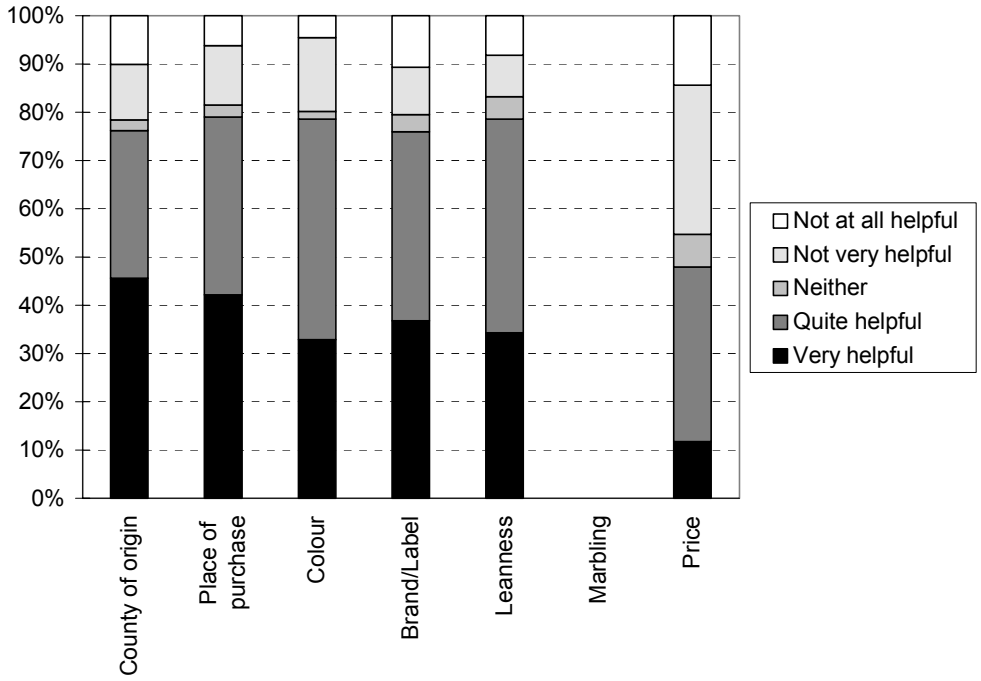


Figure 10: Helpfulness of 'Quality-in-the-Shop'-Attributes - Chicken



Since the differences between some cues, for example between country of origin and place of purchase in the case of beef, are very slight we cannot be sure that they are significant. A Wilcoxon Signed Rank Test is performed to test for this. The result of the tests shows the following order of the attributes according to their importance (most helpful comes first). If there is one attribute written below the other it means that there is no significant difference (at a confidence interval of 5 %) between both (or more).

Beef

'Country of origin' is the most important attribute for assessing beef quality in the shop. Place of purchase comes next. It is not surprising that brands and quality assurance labels are only of secondary importance for the consumers. They play only a minor role in signalling quality. Like for all other meats price as an indicator of quality is of least importance.

Country of Origin	>	Place of Purchase	>	Leanness Colour	>	Brand/Label Marbling	>	Price

To examine if people who think one can assess meat quality by visual inspection have a different quality perception to those who cannot, the respondents have been divided into two groups: those who replied "agree strongly" or "agree a little" to the attitudional statement "You can assess the quality of beef in the shop just by looking at it" and in those who answered "disagree a little" and "disagree strongly".

Applying the Wilcoxon test, the following ranking shows significant differences:

Those who agree (n=99):

Country of Origin Place of Purchase Colour Leanness	>	Marbling Brand/Label	>	Price

Those who disagree (n=178):

Country of Origin Place of Purchase	>	Brand/Label Colour Leanness Marbling	>	Price

This result clearly demonstrates, that those consumers judging themselves as a kind of expert in evaluating the eating quality while shopping use the intrinsic quality cues "colour" and "leanness" as indicators for eating quality together with other extrinsic cues. Those claiming to have little expertise rely exclusively on extrinsic quality cues for quality selection in the case of fresh beef meat.

Pork

For pork the order is similar, but 'Place of purchase' is on the top. The test shows that 'Country of origin', 'Leanness' and 'Colour' have the same importance, sharing the second rank.

Place of Purchase	>	Country of Origin Leanness Colour	>	Brand/Label Marbling	>	Price

Chicken

The Wilcoxon test shows there are no significant differences in the helpfulness of all attributes with the exception of the price. Consumers seem to be less involved in quality assessment of chicken.

Country of Origin Place of Purchase Brand/Label Leanness Colour	>	Price

Differences Between the Meats

So far, we have discussed the usefulness of quality attribute cues while shopping as indicators for assessing the eating quality for each type of meat separately. To analyse if the importance of each attribute cue is really different between beef, pork and chicken (an assumption which was made when the questionnaire was designed) a t-test is performed. It will test whether the differences between the average importance are significant at a confidence interval of 5 %.

There are no significant differences in the importance of the following indicators:

The colour for assessing the quality in the shop between beef and pork on the one hand and beef and chicken on the other hand. By way of contrast, colour of chicken is significantly less important than colour of pork.

The marbling between beef and pork (chicken was not considered in this question), brand or quality label between beef, pork and chicken as well as the usefulness of the price for quality assessment for these three meats.

No differences between beef and pork was found for leanness but it is less important for chicken. The place of purchase is regarded as equally important for assessing the quality of beef and pork while it is less important for chicken.

The most salient result is, that there are significant differences in that the **country of origin** is more important for beef than for pork and chicken. But there is no significant difference between pork and chicken, in this regard.

3 EATING QUALITY

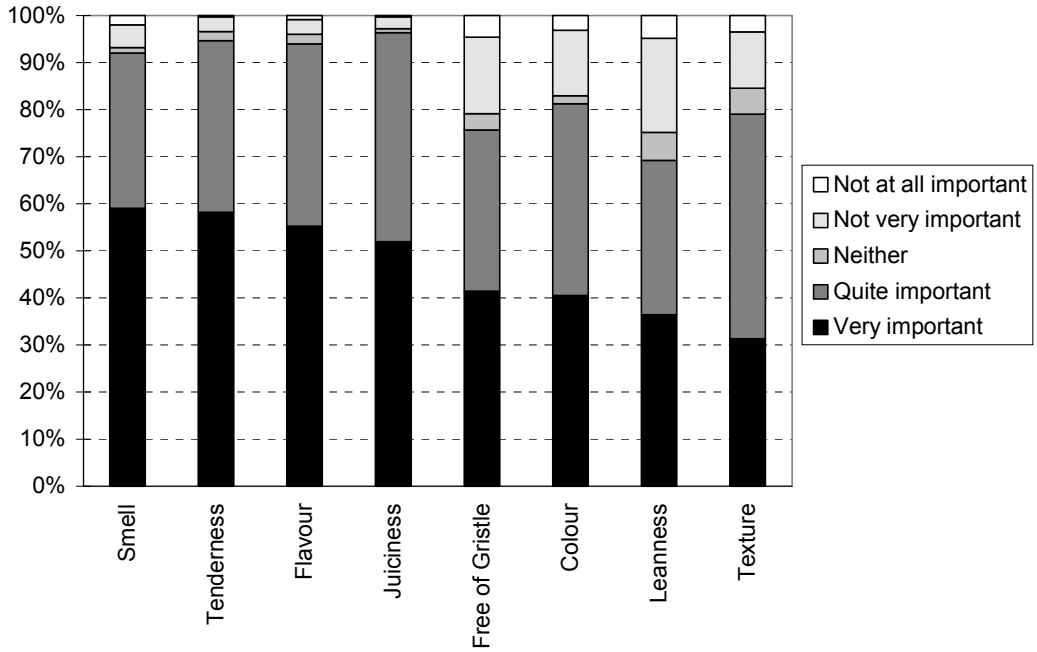
From the focus group discussions the attributes smell, tenderness, flavour, juiciness, free of gristle, colour, leanness and texture were identified as the most important ones determining the eating quality of meat, which is the second stage of the quality assessment process. In the consumer survey the respondents were asked for the importance of each experience quality attribute for each type of meat.

Although the answer 'don't know' was included (allowed) in the questionnaire it is not considered in the following analyses, because of its negligible meaning in most of the cases. The only exception is texture, where a lot of respondents answered 'don't know' (3.1 % for beef, 3.1 % for pork and 5.5 % for chicken). This could indicate that this meat attribute didn't mean much to the respondents.

Figure 11 to Figure 13 show the rating of the importance of several intrinsic meat attributes for eating quality. The consumers have a strong tendency to percieve each experience attribute as very or quite important.

In Figure 11, which shows the results for beef, we can see that the first four attributes are rated very similar. Over 50 % of all respondents consider smell, leanness, flavour and juiciness very important, over 90 % consider these aspects at least quite important. The attributes free of gristle, colour and leanness, which about 40 % of the consumers consider very important, are next. Only 30 % rated texture as very important but nearly 40 % consider it quite important.

Figure 11: Importance of Eating Quality Attributes - Beef



Also for pork smell, tenderness, flavour and juiciness is important (very important or quite important) for more than 90 % of the respondents, as can be seen in figure 12. All in all the rating is very similar to the rating for beef.

Figure 12: Importance of Eating Quality Attributes - Pork

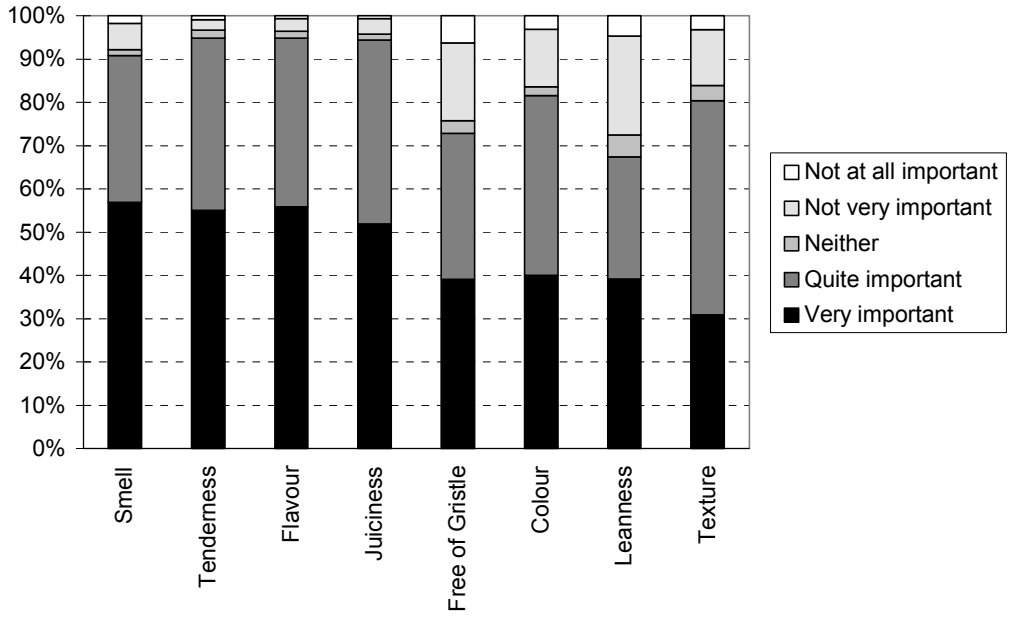
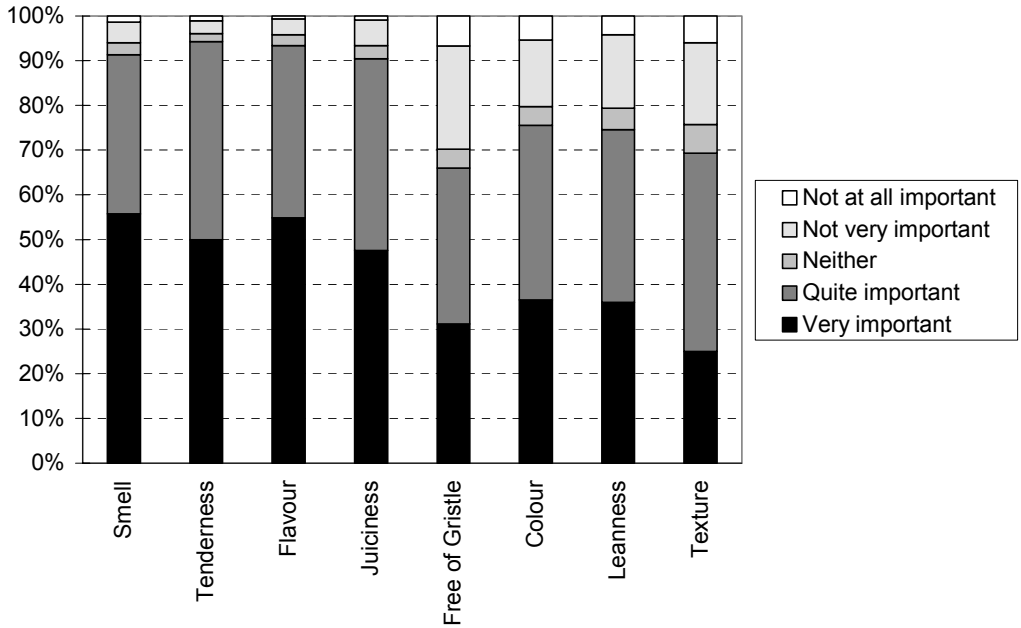


Figure 13: Importance of Eating Quality Attributes - Chicken



Since the intrinsic experience quality attributes differ even less clearly from each other in terms of importance than the search quality attribute cues, a Wilcoxon test is performed.

Ordering of attributes according to importance (statistically significant):

Beef:

Tenderness		Colour		
Smell	>	Free of Gristle	>	Leanness
Flavour		Texture		
Juiciness				

Pork :

Flavour Tenderness Smell Juiciness	>	Colour	>	Free of Gistle Texture Leanness

Chicken :

Flavour Smell Tenderness Juiciness	>	Colour Leanness	>	Free of Gristle Texture

There seems to be a tendency to rate the attribute cue the higher, the more it is a subjectively perceived contruct and the less, the more it is measurable with objective physical methods.

4 SAFETY PERCEPTION

Similar to quality perception consumers use indicators to assess the safety (which is also a hypothetical construct) of meat. From the focus group interviews seven relevant indicators were selected. The respondents were asked how helpful each of these indicators are in assessing the safety of beef, pork and chicken. If we have a look to the numbers of respondents who answered 'don't know' it becomes obvious that only a very few consumers do not have a clear opinion to these indicators. The indicators with the highest number of 'don't knows' are 'feed' (beef: 9, pork: 13 and chicken: 6) and 'organically produced' (beef: 8 and pork: 14), indicators which require extensive information to understand them.

Figure 14, Figure 15 and Figure 16 show the answers to the question on helpfulness of safety indicators for beef, pork and chicken. Country of origin is the most important safety indicator

for beef. 70 % of the respondents regard origin as being very helpful. It is by far less important for pork and chicken where only 50 % of the consumers consider origin to be very important for assessing the safety.

Freshness is the most helpful safety indicator for pork and chicken.

Figure 14: Helpfulness of Safety Indicators - Beef

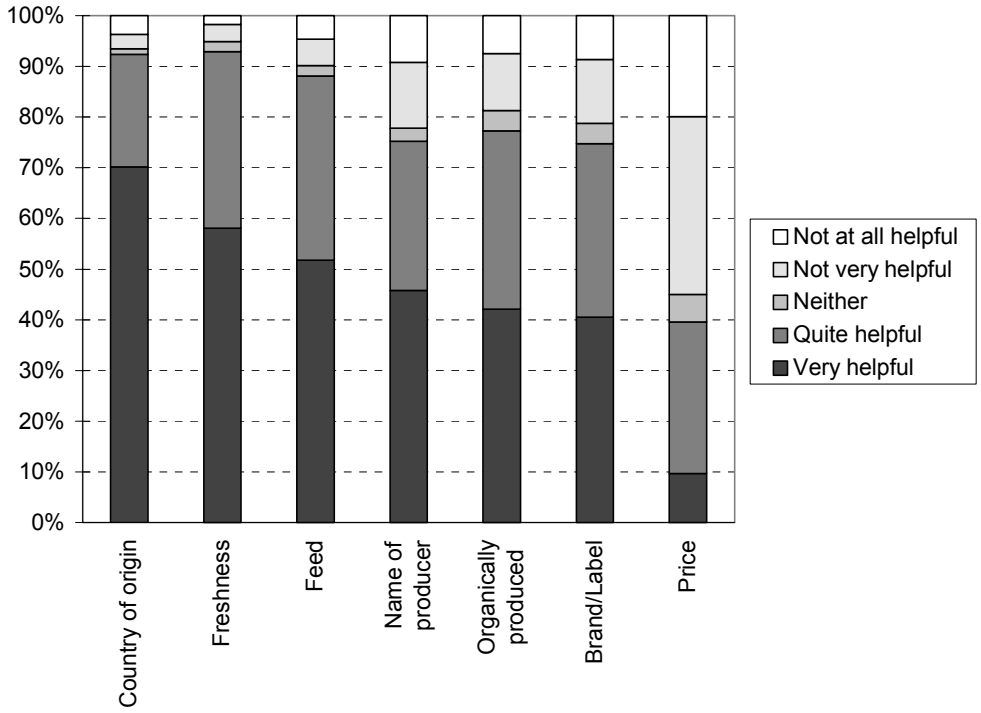


Figure 15: Helpfulness of Safety Indicators - Pork

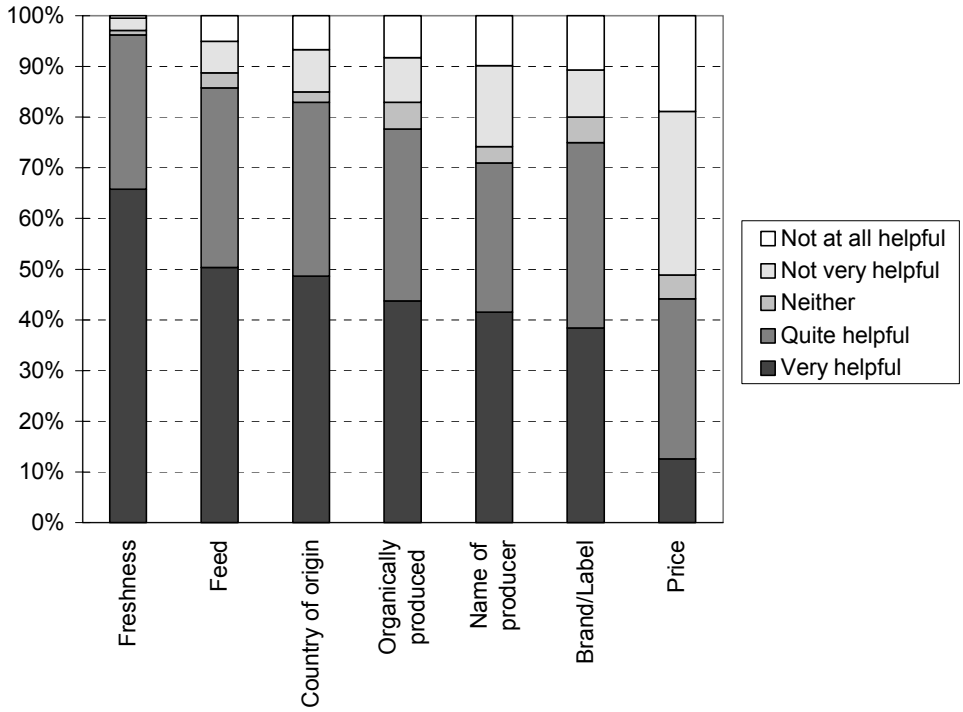
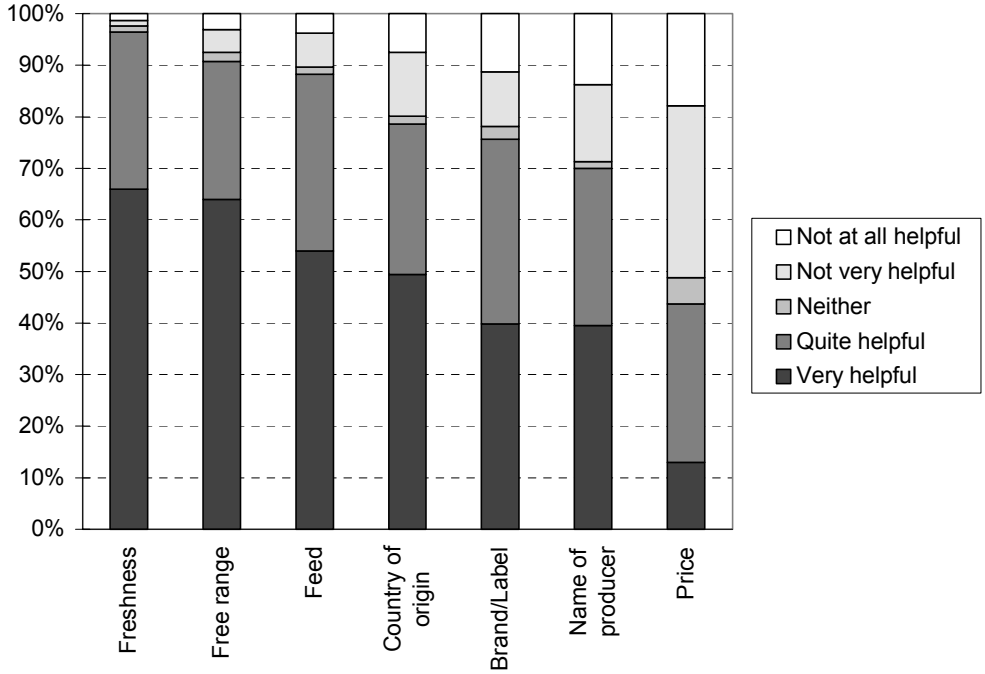


Figure 16: Helpfulness of Safety Indicators - Chicken



To test for statistical significant differences, the Wilcoxon test was performed.

Beef:

Country of Origin > Freshness > Feed > Name of Producer > Price
Organically Produced

Pork:

Freshness > Feed > Name of Producer > Price
Country of Origin

Chicken:

Freshness > Free Range > Feed > Country o. Origin > Brand/Label > Name o. Producer > Price

5 CONCERNS ABOUT MEAT

To investigate how concerned consumers actually are when buying beef, pork and chicken nowadays the respondents were asked to rate five given concerns. Figure 17, Figure 18 and Figure 19 show the results. BSE is the most threatening topic for beef, followed closely by hormones, antibiotics and salmonella. Fat or cholesterol seem to be of minor importance. Antibiotics and hormones are the most important concerns for pork followed closely by salmonella. Fat or cholesterol is a little more important than in the case of beef. For chicken, salmonella or other bacterica is the most important concern.

Figure 17: Concerns - Beef

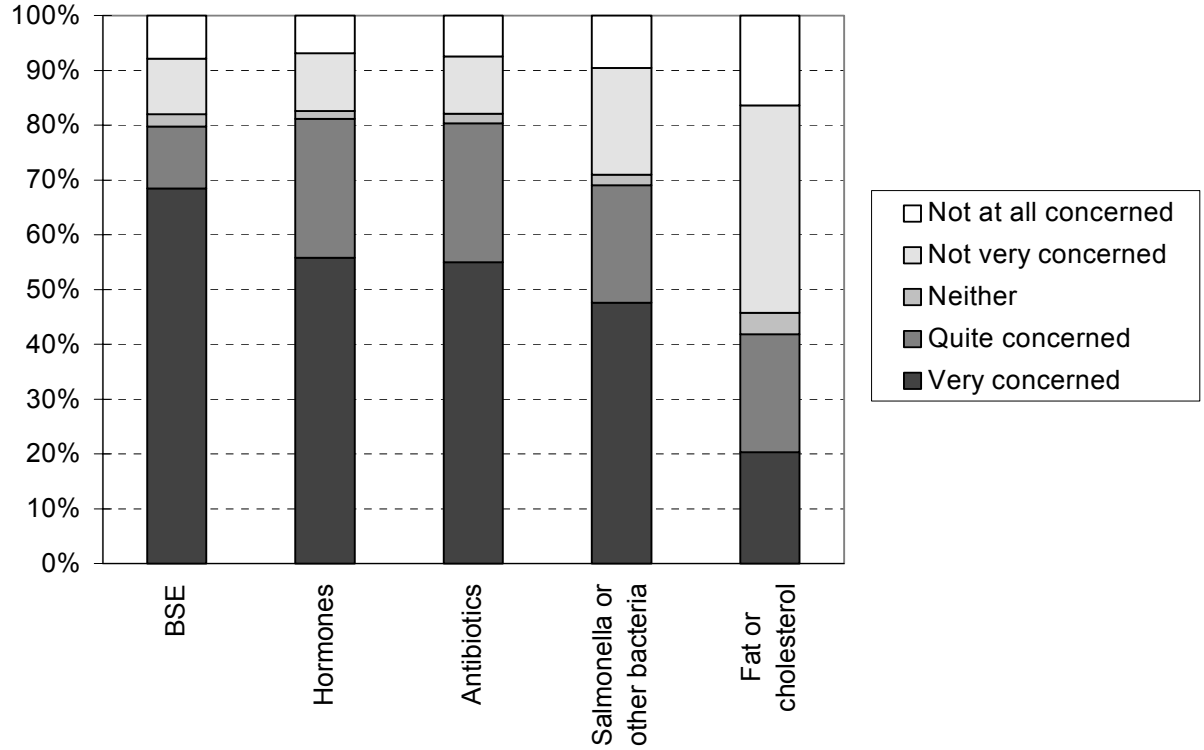


Figure 18: Concerns - Pork

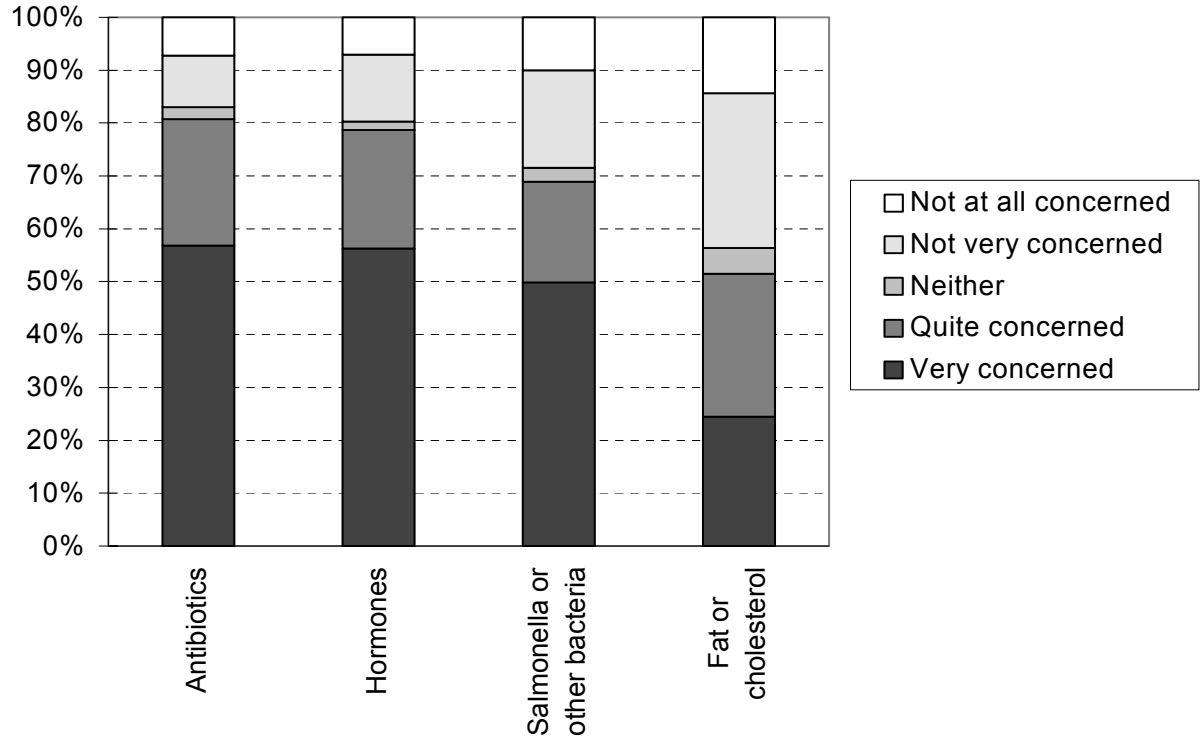
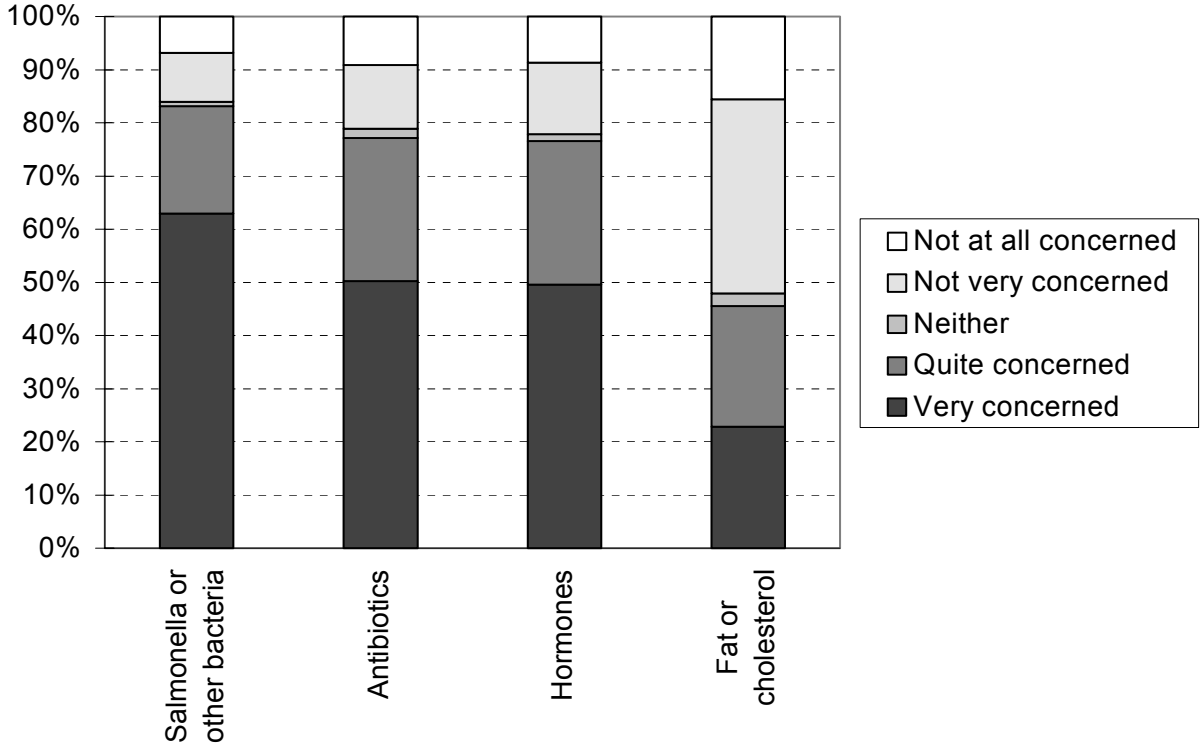


Figure 19: Concerns - Chicken



While figures 17 to 19 demonstrate the level of concerns, a Wilcoxon test has been performed also in this case to come up with a ranking. The following ranking results:

<u>Beef:</u>

BSE
Hormones > Salmonella > Fat/Cholesterol
Antibiotics

<u>Pork:</u>

Antibiotics > Salmonella > Fat/Cholesterol
Hormones

Chicken:

Salmonella > Hormones > Fat/Cholesterol
Antibiotics

6 INFORMATION ON MEAT

From a consumer survey, commissioned by the DLG (Deutsche Landwirtschafts-Gesellschaft) follows that two thirds of the respondents do not feel sufficient informed about food quality [14]. They feel confused by the flood of unclear information. The results show that the most used sources of information about food are labels, marks (on the product), leaflets and advertisements in newspapers. Advertisements in journals, radio and television are less used.

In 1993 and in 1996 the CMA (Centrale Marketing-Gesellschaft) asked 1000 or 1100 consumers respectively in an open-ended question which information they wish about food. Figure 20 shows the top ten of all information mentioned. Guarantee of quality and freshness, date of expire and country of origin are the currently most desired information. While the date of expire is in 1996 less important than in 1993, country of origin and guarantee of quality have clearly gained in importance.

Figure 20: Information about food

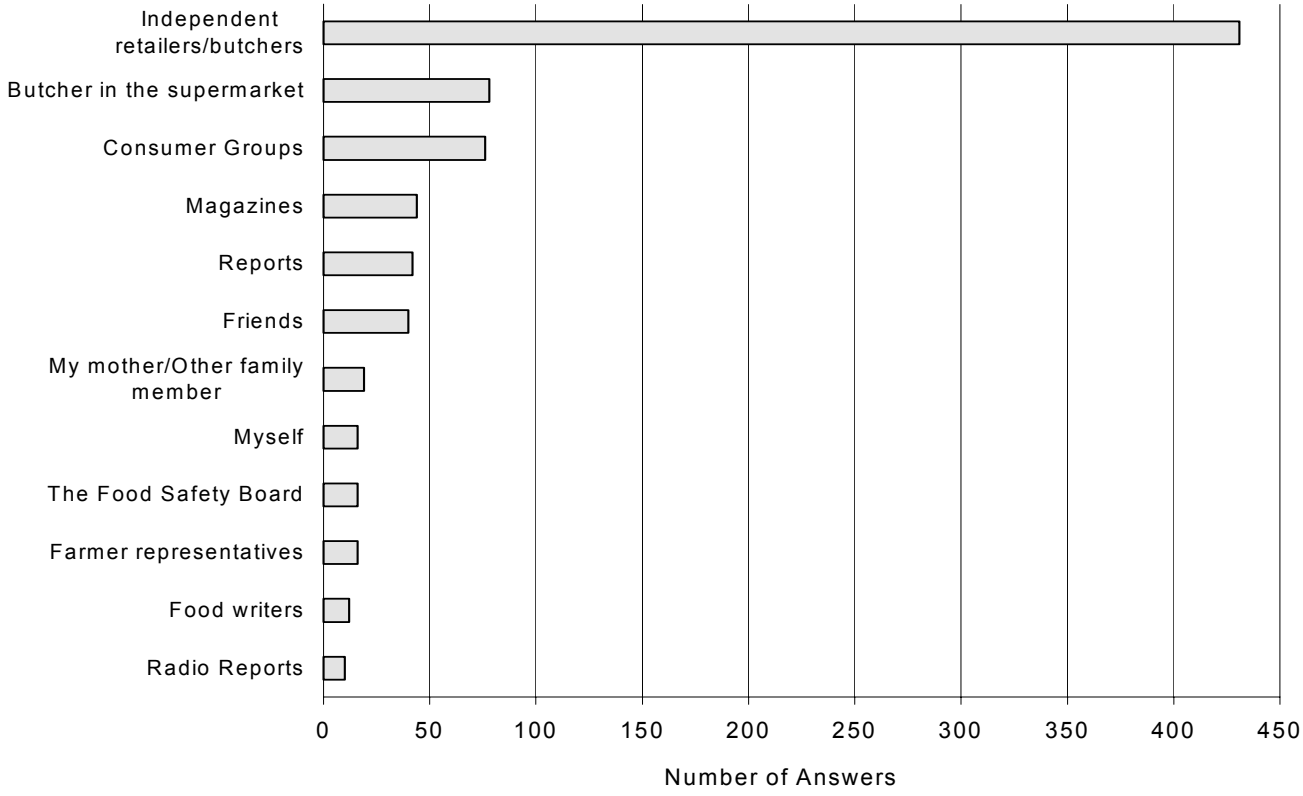
I wish information about	5/1996 %	6/1993 %	Change (1993 to 1996) in percentage points
Country of origin	47	24	+23
Guarantee of quality	57	36	+21
Quality mark, quality seal	34	24	+10
Price	46	38	+8
Appearance	28	30	-2
Guarantee of freshness	57	63	-6
Fat, calories	37	43	-6
Taste	29	34	-5
Vitamine	28	34	-6
Date of expire	50	65	-15

Source: CMA 1996 [15]

In an open-ended question, the interviewees were asked who they most trust when looking for information on the safety of meat. The number of answers was restricted to three at the most. Figure 20 illustrates the absolute frequencies of answers for information sources which were mentioned by more than 10 respondents.

Butchers and independent retailers are by far the most trusted source for information on the safety of meat. This supports the outstanding importance of butchers for German consumers. Official institutions such as government, department of agriculture, department of health have no importance at all, likewise meat industry and meat companies.

Figure 20: Trust in Information



Conclusions:

Two attribute cues appeare to dominate the quality selection taking place while shopping for beef meat: the country of origin and the place of purchase. Both are extrinsic search quality attribute cues. Since most of the consumers did not regard themselves as being capable to predict the quality of meat just by looking at it, they apparently would rather trust an expert or rely on extrinsic cues. Also for pork, the place of purchase is the most important feature. In the case of chicken, there are no significant differences between the characteristics apart from the price.

The results of the survey show that the price of meat is of minor importance to the respondents in assessing the eating quality, as well as the safety, of beef, pork and chicken. This does not mean that consumers do not care about the price, but that they do not necessarily assume that a higher price automatically means higher quality. According to the attitudional statements, not covered here, the majority of the respondents may believe that one has to pay a higher price to get good quality meat, but the reverse (getting good quality for a higher price) is not necessarily valid.

The price has apparently lost its function as an indicator of quality, especially in the food market. Though it is a popular argument in economic theory, that the price itself may act as a signal for quality.

In the second stage of the quality assessment process, 'tenderness', 'flavour', 'smell' and 'juiciness' belonged to the most important eating attributes for all of the three meats.

For assessing the safety of beef, 'country of origin' is perceived to be the most important, indicator, followed by freshness. Freshness is most important for pork as well as for chicken. Astonishingly 'feed' belonged to the three most important safety indicators for all of the three meats.

A separate analysis of quality perception of consumers who regard themselves as being able to predict meat quality by visual inspection showed that these consumers rely on intrinsic cues more than on extrinsic.

As shown by the literature, German consumers tend to be very suspicious about meat quality and primarily associate negative issues with meat.

The results of the survey illustrate that BSE is the greatest concern in the case of beef, and salmonella in the case of chicken. For beef and pork, antibiotics and hormones are equally important concerns. Fat/cholesterol does not play a big part for all of the three meats.

Only very few consumers mentioned specific quality labels and marks they normally look for when buying beef, pork and chicken. In view of all the private quality assurance programmes, labels, marks and brands which mainly refer to pork and beef, these results point to an insufficient information policy.

It is important to stress, that “country of origin” is used as a main search quality attribute cue to predict eating quality and as an important credence quality attribute cue to indicate food safety. Here the consumer seems to attach to this cue more information, than objectively justified. This problem is further strengthened, if it is taken into account, that “country of origin” may be used as a way to discriminate against imports.

In terms of trust in various information sources, butcher shops are distinctly placed of all other information sources. Most consumers want to know the origin of the meat they buy and have a strong preference for food which is produced locally, according to the attitudional statements, not covered here. Many consumers were not confident that food in the shops is safe. They mainly purchase beef (and to a lesser degree pork) at the butcher shop or directly from the farmer.

References:

1 . Becker, T., Benner, E. and Glitsch, K., "Consumer Behaviour Towards Meat in Germany - Results of a Consumer Survey-. Report for the Commission of the European Union, October 1997.

2 ZMP Bilanz Vieh und Fleisch 1996, Zentrale Markt- und Preisberichtstelle Bonn, 1996.

3 ZMP Bilanz Vieh und Fleisch 1996, Zentrale Markt- und Preisberichtstelle Bonn, 1996.

4 Anderson, E. W., Shugan, S. M., "Repositioning for Changing Preferences: The Case of Beef versus Poultry", Journal of Consumer Research, Vol. 18, September 1991, p. 219-232.

5 Bansback, B., "Towards a Broader Understanding of Meat Demand – Presidential Address", Journal of Agricultural Economics, 46 (3), 1995, p. 287-308.

6 Compare for example Chalfant, J. A., Alston, J. M., "Accounting for Changes in Tastes", Journal in Political Economy, vol. 96, no. 2, 1988, p. 391-410.

7 Heien, D. M., Chen, T.-N., Chien, Y.-L., Garrido, A., "Empirical Models of Meat Demand: How Do They Fit Out of Sample?", Agribusiness, Vol. 12, No. 1, 1996, p. 51-66.

8 Davis, G. C., "The Logic of Testing Structural Change in Meat Demand: A Methodological Analysis and Appraisal", American Journal of Agricultural Economy, November 1997, p. 1186-1192.

9 Statistisches Jahrbuch für die Bundesrepublik Deutschland, Statistisches Bundesamt, various yearbooks.

10 Statistisches Jahrbuch über Ernährung, Landwirtschaft und Forsten, Bundesministerium für Ernährung, Landwirtschaft und Forsten, various yearbooks.

11 ZMP Agrarmärkte in Zahlen, Europäische Union ´96, Zentrale Markt- und Preisberichtstelle Bonn, 1996.

12 Compare Loy, J.-P., "Auswirkungen der BSE-Krise auf die Verbraucherpreise für Rindfleisch in Deutschland", Schriften der Gesellschaft für Wirtschafts- und Sozialwissenschaften des Landbaus, Agrarwirtschaft in der Informationsgesellschaft, Kiel 1998 for a more detailed analysis of the consequences of the BSE crisis on the beef market.

13 Compare for example: Deutscher Fleischer-Verband (ed.). "Geschäftsbericht 1997. Frankfurt, October 1998.

14 Burger, H.-G., Wagner, P. and Müller, A., "Verbraucher mit Informationen über Lebensmittelqualität unzufrieden", Wirtschaft & Ware - Wöchentliche Beilage zum Milch - Fettwaren - Eier - Handel, No. 46, 19. April 1994, pp. 229-230.

15 CMA 1996, http/www.cma.de/topten.htm, September 1997