CONFIDENCE IN THE BEEF PRODUCTION SYSTEM AS A KEY FACTOR TO MITIGATE THE IMPACT OF BSE ON BEEF CONSUMPTION

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Abstract

Recent food scares in the food market has caused a reduction in consumer's confidence in the food system that it has induced a significant reduction in consumption in a sector, the beef sector that was already characterized by a saturated trend in quantity terms. In this context, all participants in the beef production system are facing to a great challenge, to retrieve consumer's confidence in the food chain and to mitigate the reduction in beef consumption. The aim of the paper is to analyse the impact of consumer's confidence in the food system as well as other factors on the explanation of food consumption reduction. A structural modelling approach has been used to analyse factors affecting the reduction in beef consumption in two different regions characterised by different production systems and different marketing strategies (PGI beef label). Results indicate that main factor explaining the reduction in beef consumption is the confidence in the beef and a positive relation has been found. Moreover, confidence in a product is directly related to the perceived quality offered by farmers and other decision makers on the beef chain, and to the consumer involvement with the product. Therefore, the main implication is that participants in the food chain has to develop adequate communication strategies such as quality labelling in order to increase consumers perceive quality because, higher quality perception will recover consumers' confidence in beef, and therefore, it will mitigate beef consumption reduction.

Keywords: food confidence, consumer behaviour, structural equation modelling, beef sector, quality label

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1. Introduction

Food markets in developed countries, specially in Europe, are facing different commercial problems mainly related to consumers loss in confidence on the food chain. This lack of consumer confidence has had very important consequences in the food market as it has induced a significant reduction in consumption in a sector that was already characterized by a saturated trend in quantity terms.

In the last years, these problems have been more important in the beef sector in Europe where consumption has been reduced due to the BSE crisis[1]. In this context the beef sector is facing to a great challenge, to retrieve consumers confidence in the food chain. To do that, all participants in the food chain have to reinforce not only product quality systems and controls but also communication strategies to guarantee that food products are safe enough. They have to design the appropriate mechanism to inform consumers about the safety of food products and to persuade them to perceive those food products as safe enough. This strategy can be done through implementing a certification system where the quality label is the way to communicate consumers the safety characteristics of the product. Therefore, the aim of these strategies is twofold, to differentiate the product in this more saturated food market and, to create fidelity towards this labelled products based on a regular and homogeneous quality. If participants in the food chain, using this certification and labelling strategy, succesfully create a positive consumers' perception towards food products they will have an important commercial advantage to survive in the market even in difficult situations motivated by food scares.

Many authors have stated the importance of different product attributes on food consumers's quality evaluation (Bello and Calvo, 1998; Bernues et al., 2001; Bredahl, et al., 1998; Briz et al., 2001; Grewall, 1995; Grunert et al., 1996; Latvala and Kola, 2001; Steenkamp, 1990; Steenkamp and Van Trijp, 1996; Zeithaml, 1988). Food safety is one of the most important attributes nowadays and because of it is a credence attribute (it cannot be observed by consumers either before and after purchasing the product), producers have to guarantee and certify this attribute to consumers if they want to meet their needs. Therefore, the certification of the credence attributes will be very important in order to maintain or mitigate beef consumption reduction due to food safety problems (Álvarez et al., 2001; Calvo, 2001; Cartay, 2001; Fernández et al., 2001; Latvala and Kola, 2001; Stefani and Henson, 2001). One of these certification strategies is the quality labelling.

The objective of this paper is to analyse how important the confidence on the production system is in order to mitigate the reduction in consumption caused by food crises, specially in the in beef sector in Spain. In particular, differences in beef consumption reduction between two Spanish regions (Aragón and Navarra) are studied. Those regions show important differences in their beef production system and in their

[1] The impact of beef consumption reduction has been different among countries, but in all of them it has been high (France (40%), Germany (60%), Italy (42%), Portugal (30%), Spain (35%) AgraEurope, 2001).

retailing distribution strategies. In fact, Aragón has an intensive beef production system and only a small amount of beef production is sold with some of the quality labels. On the other hand, Navarra has an extensive beef production system and approximately half of the beef consumed in the region correspond to beef with some quality label. The most important quality label for beef in Navarra is the PGI "Ternera de Navarra". (Beriáin, 2002). Data come from a survey carried out among beef consumers in both regions.

Thus, the paper is organised as follows. Section 2 presents the survey design and data collection. Section 3 describes the structural equation modelling approach used in this paper. Section 4 discussed main results, and finally Section 5 provides the concluding remarks and possible further refinements.

2. Survey design and data collection

Data come from a survey conducted to consumers in two Spanish regions: Aragón and Navarra in March 2001. Aragón was selected because it is a relatively important area of beef production with an intensive system and free of BSE scares. On the other hand, Navarra is also an important area of production with an extensive beef production system and with some BSE cases last year. Aragón has not a PGI beef quality label while in Navarra there exist one and the consumption of beef with this PGI label is around half of total beef consumption in this region (Beriáin, 2002) (Aragón is called in this paper "No PGI label Region or Region 1, and Navarra, "PGI label Region" or Region 2).

Samples in both regions were selected using a stratified random sample of food buyers on the basis of habitat (rural versus urban) and age. Four hundred respondents were randomly selected and personally interviewed in each region. Respondents were the main food purchasers of food products in the household. The first question in the questionnaire was whether the interviewer usually eats meat at home. If the answer was not, he/she was not interviewed. So, only non-vegetarian consumers were considered. This decision does not induce any bias on the results because in Spain the rate of vegetarian consumers is marginal.

In the first part of the questionnaire consumers were asked about their fresh meat consumption patterns: i) how often they eat different meat products (beef, chicken, pork and lamb, ii) current weekly beef consumption, iii) beef attributes perceptions, iv) whether they have reduced beef consumption, v) reasons of this reduction and substitution by other meats, vi) perceived beef consumption expertise. Moreover, they were asked about their perceived concern and guarantee towards beef production and their confidence on food safety of different meats (beef, chicken, pork and lamb). Finally, they were asked about socio-demographic characteristics and lifestyles[2] .

One of the more important diferences observed in consumers behaviour in both regions is the impact of BSE crisis in beef consumption (Table 1). In Aragón, the proportion of consumers who decrease beef consumption is higher than in Navarra (58% and 43%, respectively). However, the original level of beef consumption was similar (76% and 80%, respectively)[3].

[2] See the annex for a definition of the different scales used to measure consumers's perception.
[3] Results are similar to those gathered from secondary data sources.

Table 1. Beef consumption and beef consumption reduction due to BSE[4] in the two Spanish regions

Beef Consumption	Navarra	Aragón
Yes	80%	76%
No	20%	24%
Beef consumption reduction	**Navarra**	**Aragón**
Yes	43%	58%
No	57%	42%

The beef consumption reduction is the key point of this analysis as the main aim is to get some insight on whether confidence in the beef production system, and, indirectly, the quality labelling policy have influenced consumers reduction in beef consumption.

3. Methodology. Structural Equation Modelling

The methodological approach used in this paper is based on the structural equation modelling (SEM) (also called covariance structure analysis or latent variable analysis). Structural equation modelling is a multivariate technique that examines a series of dependence relationships simultaneously and it is particularly useful when one dependent variable can be an independent variable in following relationships (Hair et al., 1995). This technique combines aspects of the multiple regression (examining dependence relationships) and the factor analysis (representing unmeasured concepts or factors with multiple variables). The most important aspect to take into account in these models is that they are used as a confirmation of the structural theory behind the analysed phenomenon. As Bizquerra (1989) says, the utility of this modelling lies on its ability to evaluate a theory and not in the possibility to generate it.

The estimation of multiple interrelated dependence relationships is not the single element of structural equation modelling. SEM also has the ability to incorporate latent variables into the analysis. A latent variable is a hypothesized and unobserved concept that can only be approximated by observable or measurable variables. The observed variables are called manifest variables or observable variables (Hair et al, 1999). Each latent variable is related to a set of observable indicator variables, which are assumed to be measured with error. Using standard notation:

$$\eta = B\,\eta + \Gamma\,\xi + \zeta$$

where η is a vector of dependent latent variables, B is a matrix of coefficients relating the dependent latent variables one to each other, ξ is a vector of latent independent variables related to η by the matrix of coefficients Γ, and ζ is a vector of errors in the equations.

Since the η latent variables are unobservable, indicators are required to measure them. Thus the structural equation model is associated with two measurement models which take into account errors in the measurement of the η and ξ variables. The first one is given by:

[4] One question in the survey identified consumers that had reduced beef consumption due to BSE.

$$x = \Lambda_x \xi + \delta$$

where x is a vector of indicators of the exogenous (independent) latent variables ξ, Λ_x is a matrix of factor loadings or structural coefficients between the exogenous latent variables and the x indicators; and δ is measurement error. The second is given by:

$$y = \Lambda_y \eta + \varepsilon$$

where y is a vector of indicators of the endogenous (dependent) latent variables η; and Λ_y is a matrix of factor loadings or structural coefficients between the endogenous latent variables and the y indicators; and ε is measurement error.

A structural equation model with latent variables can be seen as a composite of two models: a structural model and a measurement model. The structural model represents the relationships among the latent variables across the path diagram. In the path diagram a straight arrow indicates a causal relationship; and a curved arrow represented correlation between constructs, but not causation is implied (Hair et al., 1999). The measurement model specifies the rules of correspondence between manifest and latent variables. This submodel gives information about the reliability of each latent variable for the estimation of the causal relationships and to know if the observed variables serve to measure the latent variables (Jöreskog y Sörbom, 1993).

In the statistical analysis of structural equation models there are two main stages. In the first stage the model is estimated to derive estimates of the parameters that are not specified by the model. Empirical models were formulated using the package AMOS 3.6 and the parameters were estimated using a maximum likelihood function. In the second stage, the model is tested to ascertain whether it fits the data (Poulsen et al., 1996). The evaluation for goodness-of-fit criteria starts with an initial inspection for offending estimates (estimated coefficients in either the structural or measurement models that exceed acceptable limits). Once the model provides acceptable estimates, the goodness-of-fit must then be assessed at several levels: first for the overall model and then for the measurement and structural models separately. In this work the most commonly goodness-of-fit measures have been used: likelihood-ratio chi-square statistic (χ^2), goodness-of-fit index (GFI), root mean residual (RMR), adjusted goodness-of-fit index (AGFI) and comparative fit index (CFI) (Hair et al, 1999). Finally, the interpretation of the model is the most important stage to test whether the proposed model is according to the theory and the hypotheses state at the beginning.

3.1. Causal model defined in the study: 'Reduction in beef consumption'

Data to carry out the causal model analysis were collected through a personal survey conducted to consumers in spring of 2001. The causal model proposed in this study is based on the theoretical model of the consumer decision process and behaviour defined by Engel et al., (1993); and on the causal model developed by Henson and Northen (2000) who establish the process by which consumers assess the safety of beef.

In the causal model presented by Henson and Northen (2000) it is attempted to model the relationship between the use of different external indicators and consumer perceptions on beef safety using three latent variables or constructs: the experience of

In general terms, results indicate that important differences between the two regions exist, specially on the main factors determining the confidence in beef. In Navarra, the region with an extensive beef production system and regional quality label, the confidence is determined by the guarantee offered by beef, mainly because consumers feel confident with farmers and public programs. In Aragón, the confidence in beef is not so clearly related to the guarantee offered by farmers' management. Moreover, in both regions, the guarantee offered by farmer practises is more important than guarantee provided in the rest of the food chain to determine the total guarantee offered by beef and therefore, the confidence in beef. These results indicate that hypothesis 3 cannot be rejected.

In Navarra concerns on beef safety can be explained by the guarantee offered by farmers while in Aragón this relation is not significant. These results might be explained by the higher confidence of consumers in Navarra in farmers' management in relation to those in Aragón (less interested in the guarantee offered by their farmers). This difference is based on the mentioned differences between the two production systems and marketing strategies in both regions. However, in both markets it can be observed that as the concern on beef safety increases, concerns on both farmers management and on controls in the food chain also increase (indicating that hypothesis 2 is accepted). Moreover, hypothesis 4 has been accepted in both markets because the concern on beef safety increases as the guarantee offered by beef decreases. Finally, hypothesis 6 has also been accepted because the guarantee has a positive effect on the confidence in beef.

Finally, the reduction in beef consumption can be explained by consumers' involvement with beef in both regions, but this factor has been revealed more important in the case of Aragón. This result means that in Aragón the confidence in beef depends mainly on consumers' product involvement while in Navarra, the guarantee offered by farmers is also an important aspect. In other words, in Navarra, farmers marketing strategy (promotion of beef with PGI quality label) has successfully created a positive consumers acceptability of beef even after the BSE crisis mitigating its effect on beef consumption. Then, the reduction in beef consumption in Navarra, the region with BSE animals, has been lower.

The perception of beef can be explained in both markets by intrinsic and extrinsic attributes, but the former are more important in building consumer valuation; therefore, hypothesis 1 has been accepted. Moreover, beef perception affects significantly the guarantee offered by the beef (hypothesis 5 has been accepted).

Finally, as result of previous statements, hypotheses 7 and 8 have been accepted in both regions. Consumer involvement with beef has a positive effect on confidence in beef and the impact of beef confidence on beef consumption reduction is also positive, that is, decreases in beef confidence induce a reduction in beef consumption.

Table 3. Results of the causal model of the reduction in beef consumption.

			NAVARRA			ARAGON		
Latent variable	**Latent variable**	**Observable variable**	**SRW**	**S.E.**	**C.R.**	**SRW**	**S.E.**	**C.R.**
Intrinsic attributes		Feeding type	0.47	*	*	0.54	*	*
		Animal age	0.54	0.220	5.493	0.60	0.191	6.041
		Health benefit	0.69	0.208	6.179	0.58	0.166	5.892
		Expert ecommendation	0.69	0.239	6.198	0.57	0.175	5.835
		Protein content	0.71	0.221	6.253	0.67	0.175	6.423
Extrinsic attributes		Fat content	0.57	*	*	0.47	*	*
		Label	0.63	0.189	6.080	0.68	0.300	5.264
		Designation of origin	0.56	0.116	5.743	0.51	0.243	4.670
		Geographic origin	0.55	0.152	5.659	0.47	0.225	4.426
Guarantee offered by farmer management		BSE	0.54	0.100	7.388	0.77	0.098	10.964
		Public information	0.58	0.099	8.031	0.69	0.088	9.766
		Hormones	0.69	0.095	9.428	0.70	0.090	9.919
		Animal feeding	0.78	*	*	0.76	*	*
		Farmers management	0.55	0.093	7.572	0.65	0.091	9.122
		Antibiotics	0.50	0.094	6.808	0.65	0.088	9.034
		Public controls	0.51	0.101	6.992	0.71	0.097	9.960
Guarantee offered by the food chain		Veterinary control	0.78	0.381	5.796	0.81	0.193	7.493
		Slaughterhouse contr	0.87	0.440	5.381	0.80	0.187	7.525
		Shops manipulation	0.42	*	*	0.56	*	*
Concerns on farmer management		BSE	0.65	*	*	0.54	*	*
		Public information	0.59	0.110	7.327	0.55	0.161	5.786
		Hormones	0.60	0.096	7.404	0.66	0.179	6.472
		Animal feeding	0.71	0.092	8.451	0.71	0.166	6.698
		Farmers management	0.53	0.102	6.654	0.53	0.160	5.643
		Antibiotics	0.59	0.106	7.305	0.55	0.152	5.763
		Public controls	0.64	0.106	7.782	0.60	0.173	6.092
Concerns on food chain practises		Veterinary control	0.71	*	*	0.80	*	*
		Shops manipulation	0.72	0.149	7.479	0.64	0.124	6.733
Confidence in beef		Lamb confidence	0.45	0.091	5.396	0.49	0.040	7.203
		Pork confidence	0.48	0.103	5.665	0.61	0.040	9.342
		Beef confidence	0.82	*	*	0.95	*	*
Interest in cooking		New recipes	0.65	*	*	0.83	*	*
		Like cooking	0.63	*	*	0.76	*	*
Active		Like travelling	0.49	*	*	0.55	*	*
		GMF_health concern	0.56	*	*	0.56	0.103	6.542
		Enjoy cuisine				0.55	0.119	6.748
		Social concern				0.64	0.114	7.640
Eating concerns		Healthy diet	0.56	0.080	7.112	0.68	0.091	8.261
		Diet_health concern	0.74	0.097	8.739	0.63	0.116	9.547
		Fruit_veg. consumpt	0.47	0.075	6.096	0.59	0.096	7.369
		Food intake informat.	0.76	*	*	0.67	*	*
Consumer's beef perception	←Intrinsic attributes		0.58	*	*	0.57	*	*
Guarantee offered by farmers	←Beef safety concerns		-0.54	0.060	-5.149	-0.33	0.070	-2.896
Guarantee offered by beef	←Guarantee farmer manag		0.52	*	*	0.49	*	*
	←Guarantee food chain		0.23	*	*	0.35	*	*
	←Cons beef perception		0.64	*	*	0.62	*	*
Beef safety concerns	←Concerns farmer manag		0.59	*	*	0.44	*	*
	←Concerns food chain		0.57	*	*	0.63	*	*
Consumer's involvement with beef	←Eating concerns		-0.68	0.156	-2.096	0.40	0.318	1.302
	←Active		0.58	0.211	1.695	-0.36	0.395	-1.142
	←Interest in cooking		0.24	0.085	1.247	0.11	0.053	1.664
		Consump. frequency	0.60	*	*	0.86	*	*
		Consump. quantity	0.63	*	*	0.68	*	*
		Expertise	0.33	0.057	3.950	0.74	*	*
Confidence in beef	←Cons involvem. w. beef		0.52	0.160	4.887	0.66	*	*
	←Guarantee beef		0.51	0.040	4.281	0.45	0.060	4.944
Reduction in Beef Consumption	←Confidence in beef		-0.52	0.066	-6.001	-0.68	0.027	-10.746
	CRONBACH' ALPHA VALUES		**GOODNESS-OF-FIT INDEX**					
	NAVARRA	**ARAGON**	**NAVARRA**			**ARAGON**		

Beef perception= 0.797 Guarantee beef=0.864 Concern beef=0.755 Confidence in beef=0.703 Involvem with beef=0.692	Beef perception=0.783 Guarantee beef=0.860 Concern beef=0.838 Confidence in beef=0.615 Involve . Beef=0.695	$\chi^2(898)=2154.22$ p=0.000 GFI= 0.697 AGFI= 0.666 RMR= 0.231 CFI= 0.610	$\chi^2(988)=2437.01$ p=0.000 GFI= 0.675 AGFI= 0.644 RMR= 0.223 CFI= 0.564

* Regression weights have been fixed to 1 to get the identification of the model

5. Concluding remarks

Food scares that have taken place in the last years have increased consumers' concerns on food safety. The short-run impact has been the reduction in the consumption level of some food products directly related to those food scares. Beef is a good example in Europe as well as in Spain. In last months, public and private promotion strategies have been oriented to the creation of guarantee labels (traceability) to overcome consumers' concerns. This paper has investigated main determinants of beef consumption reduction to assess the potential impact of such programs to recover consumers' confidence in beef, and therefore, consumption.

A structural modelling approach has been used to analyse all interrelationships in the consumer decision process. Two different regions in Spain have been considered to take into account different production systems and different marketing strategies followed by farmers. Results indicate that confidence in a product is directly related to the perceived quality offered by farmers and other decision makers involved at different levels of the beef chain. The second main factor explaining confidence is the consumer involvement with the product being consumed although its relative importance is lower. The main implication of the paper is that persuading in the development of a quality label and adequate communication strategies about how the meat is produce could recover consumers' confidence in beef in the near future and therefore, consumption. This result is more evident in the region where this quality label already exists.

Further research in other regions or countries with alternative production systems could reinforce the idea that unless consumers perceive a safe guarantee related to beef production and marketing systems they do not increase their consumption. Finally, alternative methodologies could be used to check for results presented in this paper.

References

Álvarez, M.J.; Álvarez, S.; Albardiaz, M.A. (2001). Sistemas de calidad en productos alimentarios de origen animal: caso de 'Ternera de Navarra'. IV Congreso Nacional de Economía Agraria, Pamplona (Spain), September.

AMOS. Users' Guide Version 3.6. SmallWaters Corporation (1997)

Andersen, E.S.(1994). "The evolution of Credence Goods: A Transaction Approach to Product Specification and Quality Control". MAPP Working Paper 21, Aarhus School of Business.

Bello, L.; Calvo, D.(1998). "Propuesta de un Modelo Positivo del Proceso de Compra de Carne de Ternera y Evaluación de las Preferencias de los Consumidores". *Economía Agraria,* 183, 201-220.

Bello, L.; Calvo, D. (2000). "The importance of Intrinsic and Extrinsic Cues to Expected and Experienced Quality: an empirical application for beef". *Food quality and Preferences,* 11, 229-238.

Beriáin, M.J. (2002). Monográfico Especial Vacas Locas. Diario de Navarra, 22 January, 2002.

Bernués, A.; Olaizola, A.; Corcoran, K. (2001) "Importance of extrinsic attributes of red meat as indicators of quality in Europe*71st EAAE Seminar*-The Food Consumer in the Early 21st Century. Zaragoza (Spain), April.
Bizquerra, R. (1989). "Introducción conceptual al análisis multivariante". Ed:PPU.
Bredhal, L.; Grunert, K.G.; Fertin, C. (1998). "Relating Consumer perceptions of Pork Quality to physical product characteristics". *Food Quality and Preferences,* 9 (4), 273-281.
Briz, J.; Mahlau, M.; De Felipe, I. (2001). "Changes in Spanish beef chain". *71st EAAE Seminar*-The Food Consumer in the Early 21st Century. Zaragoza (Spain), April.
Calvo, D. (2001). "¿Cómo minimizar el riesgo percibido y recuperar la confianza del consumidor en el sector de vacuno?". *IV Congreso Nacional de Economía Agraria*, Pamplona, September.
Cartay, R. (2001). Soupçon, panique et risque dans la chaîne agroalimentaire. Le cas des vaches folles. V Symposium AIAE2. Bologna (Italy), September.
Caswell, J.A (2001). "Food Safety and the U.S. Consumer". *71st EAAE Seminar*-The Food Consumer in the Early 21st Century. Zaragoza (Spain), April.
Engel, J.F.; Blackwell, R.D.; Miniard, P.W.(1993). "Consumer Behavior". Ed: Dryden Press.
Fernández, M.; González, M.; Arruñada, B. (2001). "Mecanismos de garantía de calidad en agroalimentación: el caso del sector cárnico.". IV Congreso Nacional de Economía Agraria, Pamplona (Spain), September.
Grewal, D. (1995). "Product Quality Expectations: towards an understanding of their antecedents and consequences". *Journal of Business and Psychology,* 9 (3), 225-240.
Grunert, K.G.(1997). "What's in a Steak? A Cross-Cultural Study on the Quality Perception of Beef". *Food Quality and Preference,* 8 (3), 157-174.
Grunert, K.G.; Baadsgaard, A.; Larsen, H.H. and Madsen, T.K.(1996). "Market orientation in Food and Agriculture". Kluwer Academic Publishers. Boston.
Hair, J.F.; Anderson, R.E.; Tatham, R.L. and Black, W.C. (1995). "Multivariate Data Analysis with Readings". Englewood Hills, NY: Prentice-Hall.
Hair, J.F.; Anderson, R.E.; Tatham, R.L. and Black, W.C. (1999). "Análisis multivariante", 5ª ed. Prentice Hall Iberia, S.R.L. Madrid.
Henson, S.; Northen, J.(2000). "Consumer assessment of the Safety of Beef at the Point of Purchase: a Pan-European Study". *Journal of Agricultural Economics,* 51 (1), 90-105.
Jöreskog, K.G.; Sörbom, D. (1993). "Lisrel 8: Structural Equation Modelling with the SIMPLIS Command Language". SSI, Chicago.
Latvala, T.; Kola, J. (2001). "Measuring consumers benefits of credence characteristics of beef: ex ante valuation". *71st EAAE Seminar*-The Food Consumer in the Early 21st Century. Zaragoza (Spain), April.
Poulsen, C.S.; Juhl, H.J.; Kristensen, K.; Bech, A.C. and Engelund, E. (1996): "Quality Guidance and Quality Formation". *Food Quality and Preference,* 7(2), 127-135.
Steenkamp, J-B.E.M. (1989). "Product Quality: An Investigation into the Concept and how it is Perceived by Consumers". Assen: Van Gorcum.
Steenkamp, J-B. E.M. (1990). "Conceptual Model of the Quality Perception Process". *Journal of Business research,* 21, 309-333.
Steenkamp, J-B.E.M.; Van Trijp, H.C.M. (1996). "Quality Guidance: a consumer-based approach to Food Quality Improvement using Partial Least Squares". *European Review of Agricultural Economics,* 23 (2), 195-215.
Stefani, G.; Henson, S. (2001). Assessing the value of labels about food safety attributes. *71st EAAE Seminar*-The Food Consumer in the Early 21st Century. Zaragoza (Spain), April.
Zeithaml, V.A. (1988). "Consumer perceptions of Price Quality and Value: a Means-End Model and Synthesis of Evidence". *Journal of Marketing,* 52 (3), 2-22.

Annex

Scales employed to measure different perception questions

Scale to measure consumers' lifestyles:

Consumers were asked to rate their agreement with the following statements (1=agree strongly; 2=agree; 3=Indifferent; 4=disagree; 5=disagree strongly):

I periodically control my health status (Health control)
I follow a healthy diet (Healthy diet)
I practice sports every week (Sports regularly)
I enjoy good food and cuisine (Enjoy cuisine)
I am concerned on social problems (Social concern)
I frequently eat fruit and vegetables (Fruit&Veg consumption)
I disposal garbage in different containers (Selective garbage disposal)
I am concern on the impact of the diet in my health (Diet-health concern)
I moderately eat red meat (Moderate meat consumption)
I like cooking (Like cooking)
I like trying new recipes (new recipes)
I keep myself informed on food intake (food intake information)
I like travelling (Like travelling)
I usually eat out of home (eating away from home)
I concern on Genetically Modified Food (GMF) effects on human health (GMF-health concerns)

Scale to measure consumers' product attributes acceptability:

Consumers were asked to rate their agreement with the following statements (1=agree strongly; 2=agree; 3=Indifferent; 4=disagree; 5=disagree strongly):

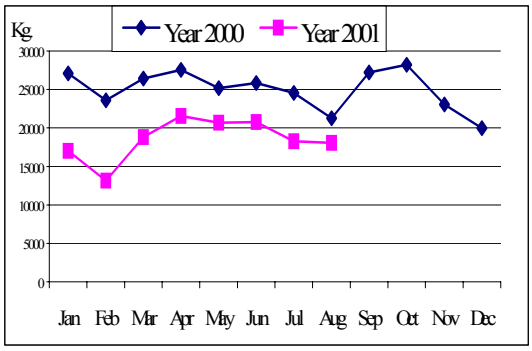
Price
Geographic origin
Feeding type of animal (Feeding type)
Breed
Organic production
Health guarantee
Label
Fat content
Animal age
Freshness
Designation of Origin (DO)
Protein content
Health benefit
Expert recommendation

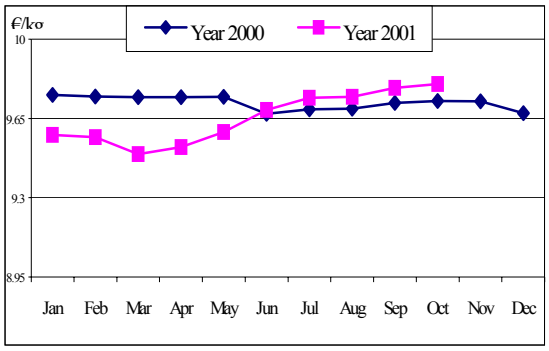
Two scales to measure consumers' guarantee towards beef production and consumers' concerns towards beef production:

Consumers were asked to rate their agreement with the following statements (1=agree strongly; 2=agree; 3=Indifferent; 4=disagree; 5=disagree strongly):

EEB risk (EEB)
Public information (Public information)
Hormones (Hormones)
Animal feeding (Animal feeding)
Farmers' management (Farmers' management)
Antibiotics (Antibiotics)
Veterinary inspection in the farm (Veterinary control)
Slaughterhouse controls (Slaughterhouse controls)
Public control and inspection (Public controls)
Manipulation and refrigeration in shops (Shops manipulation)

Figure 1A. Evolution of beef consumption and prices in Spain





Source: Ministerio de Agricultura, Pesca y Alimentación de España Source: Boletín del Información Comercial Española (ICE)