Ethical concerns about pork production: a comparison of elicitation techniques

Abstract

Results of consumer studies are often criticised by supply chain participants, as studies generally show a high degree of ethical concerns about agricultural production methods while actual market shares for products responding to such concerns remain at a very low level. The current paper demonstrates the effect of the elicitation technique used on the level of concerns. We distinguish between "citizen-methods" and "consumer-methods". The first category includes an open-ended question, a budget allocation task, a willingness to pay task and a single attribute rating task. The "consumer-method" is a customised conjoint analysis task. In the budget allocation and willingness to pay tasks specified areas of concern are food safety, sensory quality, the environment, animal welfare and naturalness. In the single attribute rating task and the conjoint analysis a total of 24 pork production attributes is considered. Data were gathered in November 2001 through a computerised questionnaire. There were 1444 respondents. Results show that with the "citizen-methods" animal welfare and food safety are people's major concerns. However, when asking to make specific trade-offs (i.e. in the "consumer-method"), aspects of sensory quality and price become the most important attributes. Although conclusions are nuanced for specific segments, results support the use of conjoint analysis for the elicitation of ethical concerns as these results seem to more accurately reflect market circumstances.

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Keywords
Citizen, Consumer, Customised conjoint, Willingness to pay

Introduction

In making decisions, consumers trade-off multiple aspects, for instance price against expected quality, and origin against the applied level of animal welfare. In their role as citizens, people do not explicitly need to make these trade-offs. Concerns expressed by "citizens" may therefore differ from the concerns expressed by their "consumer" counterparts. Supply chain participants, although they will have some interest in *citizens'* opinions, are primarily looking for *consumers'* preferences. In this paper we argue that as long as consumer studies do not explicitly include trade-offs in their research design, results reflect citizen opinions instead of consumer preferences. Following this line we distinguish between "citizen-methods" and "consumer-methods". The goal of this paper is to demonstrate the effect of the elicitation technique used on the level of concerns. We focus on pork production in the Netherlands. Our research design includes multiple attributes covering all stages of the production chain and various concerns including price.

Materials and methods

Data were gathered through a computerised questionnaire. Besides introductory questions and questions on socio-economic characteristics, the main parts of the questionnaire were (1) the elicitation of concerns with various "citizen-methods"; and (2) a customised conjoint analysis task for the trade-off, or, "consumer-part".

The first "citizen-method" was a frank and open-ended question in the very beginning of the questionnaire (after some introductory questions): "Are you concerned about certain aspects of the pork sector in the Netherlands [yes/no]? If so, please specify your concerns". In addition, there was a question in which a hypothetical budget had to be allocated to various areas of concern in the pig sector, i.e. food safety, sensory quality, the environment, animal welfare and naturalness. Naturalness was described as down-to-earth, traditional and uncomplicated. Next, after some other questions in between, we had a willingness-to-pay (WTP) task. This task started by establishing an individual's reference price. The WTP was then elicited for "pork that is produced in such a way that specific concerns are dealt with following latest scientific developments and according to government and consumer organisations". Concerns referred to the same 5 areas mentioned in the budget allocation question, i.e. food safety, sensory quality, environment, animal welfare and naturalness. We framed the WTP questions in two different ways with one consisting of one question and the other of two questions. Respondents were randomly assigned to one of the two ways:

(1) For this pork, I am willing to pay *extra*: + ... Euro/kg
(2.a) Up to this *total* price I am *certainly* buying the pork: ..... Euro/kg
(2.b) From this *total* price on I am *no longer* buying the pork: ..... Euro/kg

This way of framing led to 5 and 10 WTP-questions for method (1) and (2) respectively. Method (2) and the estimation of a reference price both aimed at triggering people's personal situation and own budget limitations (as if they were in their role as consumer). Still, because respondents were not asked to make specific trade-offs among attributes, we classify WTP as a "citizen method".

As for the customised computerised conjoint analysis (CCC), CCC as described by Hensel-Börner & Sattler (1999) was used as a starting point, but, due to the large number of attributes (i.e. 24), some modifications were necessary. The CCC task in our questionnaire consisted of two main parts, i.e. a self-explicated task and a conjoint task. Modifications mainly refer to the second part. The self-explicated part is a single attribute rating task in which, for each attribute, both the attribute *levels* are evaluated and the *attribute* itself. For the attribute levels, respondents first had to indicate their most and least preferred levels. Next, the other levels (if any) had to be rated in between these two extremes, which were set to 10 and 0 respectively. The importance of the attribute itself was derived from the perceived importance (on a scale from 0 to 100) of the difference between the extreme levels. Results from the single attribute rating task are discussed together with the other "citizen-methods" (section 3). In the conjoint task, (i) we asked for graded paired comparisons, not for single profile evaluations; ii) we included most important attributes, as well as an attribute of moderate importance; and iii) the attributes Taste and Price were always included in the conjoint task, but were left out in the self-explicated task.

Based on the CCC-data, a segmentation analysis was carried out. For this, a mixture regression model (see Wedel & Kamakura 2000) was adapted to cope with customised-conjoint data. Six segments turned out to be convenient for interpretation: Environmentalists, Ecologists, Animal-friends, Health-concerned, Unpronounced and Economists, as described in detail by Meuwissen *et al.* (2004).

Data were gathered in November 2001. There were 1444 respondents, from which 1199 fully completed the CCC-part. Only this group is considered in this paper. Although there were vegetarians and people not consuming pork, the sample of 1199 includes only people consuming pork. 57% is male, the average age is 47.3 years and 13% is older than 65. Comparing the sample with the Dutch population, our respondents have on average more children and a much higher income and education. Also, in our sample people buy more expensive pork chops, buy more frequently at the butcher and consume relatively more labelled pork.

Citizen concerns

In response to the open-ended question, 513 respondents, i.e. 47%, indicated to be concerned about the production of pork (Table 1). Of this group, 43% specified concerns with respect to animal welfare, including terms such as "animal welfare", "housing", "handling", "diseases", "transport" and "export". Concerns about the environment, the industrialised character of pork production, and aspects of food safety ("hormones", "antibiotics", "medicines", "feed") were mentioned by 17%, 12% and 10% respectively. Aspects of sensory quality were not referred to at all.

In the hypothetical budget allocation both animal welfare and food safety were considered as important: both topics of concern would receive about 28% of the budget (Table 1). For the sensory quality of pork, people would only spend 12%.

Willingness to pay figures are in line with the budget allocation: for all WTP questions, numbers are highest for animal welfare and lowest for sensory quality. The $n_{>=0}$ between brackets (for "certainly" and "no longer" questions) also indicates that for animal welfare the number of people with a WTP>=0 is highest. For instance, for animal welfare, 393 respondents (i.e. 64%) stated a "certainly-price" equal or above their reference price, while for naturalness ($n_{>=0}$=372), environment ($n_{>=0}$=367) and sensory quality ($n_{>=0}$=344) this is 60%, 59% and 56% respectively. The relatively large numbers of people with negative WTPs may be due to the low-quality-low-price image of pork (Lans 2001). Considering the WTPs>=0, the average "certainly-price" for pork produced with improved animal welfare is 30.9%, while the average "no longer-price" is 53.7%. When comparing the average "cer-

Table 1: Citizen concerns about pork production.

	Spontaneous (% of resp.)	Budget allocation (% of budget)[1]	Willingness to pay (% in addition to reference price)[2]		
	(n=513)	(n=1199)	Certainly[2] (n=617)	No longer[2] (n=617)	Extra (n=608)
Animal welfare	43[3]	28.0[a]	30.9 ($n_{>=0}$=393)	53.7 ($n_{>=0}$=409)	44.8
Food safety	10	27.2[a]	27.9 ($n_{>=0}$=385)	49.7 ($n_{>=0}$=407)	42.1
Environment	17	18.5[b]	25.9[a] ($n_{>=0}$=367)	44.7[a] ($n_{>=0}$=401)	38.3[a]
Naturalness	-	14.0	24.9[a] ($n_{>=0}$=372)	45.8[a] ($n_{>=0}$=395)	39.6[a]
Sensory quality	-	12.3[b]	22.6 ($n_{>=0}$=344)	41.2 ($n_{>=0}$=383)	33.1
Bio-industry	12	-	-	-	-

[1]Aphabetical superscript characters indicate concerns for which means are *not* significantly different (P≤0.05).
[2]For the total-price-questions ("certainly" and "no longer"), a number of respondents indicated a price below their reference price resulting in a WTP<0. Only respondents with WTPs>=0 are included here.
[3]Includes "animal welfare", "housing", "handling", "diseases", "transport" and "export".

Table 2: Attributes and attribute levels per concern and mean attribute importances for single attribute rating and with trade-off analysis (n=1199). Rankings between brackets.	Single attribute rating ("citizen")	Including trade-offs[1] ("consumer")
Animal welfare		
Space (more; less)	5.22 (1)	5.20 (6)
Medicines (curative; preventive and curative; no; also for growth promotion)	5.18 (2)	5.30 (5)
Living surface (straw; concrete; grid floor; sand/mud)	5.15 (4)	5.38 (3)
Housing of pigs (individual; in groups)	4.75 (10)	4.63 (15)
Breeding goal (variety; productivity; disease resistance; sensory quality)	4.66 (12)	4.72 (9)
Housing of pigs (inside; outside; inside plus[2]; 50% inside-50% outside)	4.63 (13)	4.71 (11)
Castration to prevent strong meat odor (yes; no)	3.96 (19)	3.95 (22)
Teeth clipping to protect udder of sow (yes; no)	3.95 (20)	3.95 (21)
Tail docking to prevent tail biting (yes; no)	3.92 (21)	3.93 (23)
Food safety		
Bone meal in pig feed (yes; no)	5.16 (3)	5.34 (4)
Chance of Salmonella in pork (small chance; zero)	4.90 (5)	4.71 (10)
GM in breeding (yes; no)	4.88 (6)	4.95 (7)
Residues of medicines in pork (small chance; zero)	4.86 (7)	4.70 (12)
Residues of herbicides in pig feed (small chance; zero)	4.78 (9)	4.67 (14)
GMO substances in pig feed (yes; no)	4.69 (11)	4.69 (13)
Guarantee for food safety (extra cooking required; no extra cooking)	4.28 (16)	4.05 (19)
Irradiation of pork to increase its safety (yes; no)	4.01 (17)	3.97 (20)
Residuals of human food industry in pig feed (yes; no)	3.47 (22)	3.36 (24)
Environment		
Requirements for pig husbandry (no; legal minimum; extra severe)	4.83 (8)	4.84 (8)
Origin of pork and choice in store		
Traceability (to farm; to region; to country; no traceability)	4.40 (14)	4.44 (17)
Choice for pork chops (one quality one price; multiple qualities and prices)	4.31 (15)	4.44 (16)
Home country of pig (Netherlands; other EU-country; outside EU)	4.00 (18)	4.08 (18)
	100	**100**
Price (reference price; minus Euro 1.36; plus Euro 1.36)	-	5.44 (2)
Taste (possibly somewhat disappointing; sufficient; excellent)	-	6.46 (1)

[1]Mean weighted importances from self-explicated and conjoint tasks.
[2]Inside plus was described as: inside, but with lots of daylight and fresh air.

Table 3: Considered attributes in trade-off analyses for various livestock products and countries[1]. Most important attribute(s) are indicated with an asterisk.

	Sensory quality	Food safety	Animal welfare	Environment	Price and other
a) Pork (Australia)	Leanness	pST*			Price
b) Beef (US, France, UK, Germany)	Marbling Tenderness	Growth horm.* GM feed*			Price
c) Beef (UK)	Leanness*				Price / Brand name Quality assur. / Packaging
d) Milk (NL)		Contamination*			Price/ Label*
e) Cheese (UK)	Flavour* Nutritional value	Gen. engineering Listeria*	Animal welfare	Environment	Production time Costs*

[1]References are a) Halbrendt et al. (1995); b) Lusk et al. (2003); c) Walley et al. (1999); d) Novoselova et al. (2002); and e) Frewer et al. (1997).

tainly-prices" with the "extra-prices" (last column), Table 1 shows that the latter are always higher. This is likely due to the different framing of the questions.

Table 2 shows the attributes included in the Customised Conjoint task. Attributes are grouped under animal welfare, food safety, environment, origin of pork and choice in store, and, for the conjoint part, price and taste. Results from the self-explicated task ("single attribute rating") show that space for pigs, application of medicines, the use of bone meal in pig feed and pigs' living surface are

Table 4: Consumer (CO) and citizen (CI) concerns per segment.

	Environmentalists (n=205)		Ecologists (n=199)		Animal-friends (n=187)		Health-concerned (n=218)		Unpronounc. (n=246)		Economists (n=140)	
	CO	CI	CO	CI	CO	CI	CO	CI	CO	CI	CO	CI
Animal welfare												
Space	5	1	3	2	5	1	6	1	8	3	9	8
Medicines	1	3	5	5	2	3	2	6	1/2	2	3	3
Living surface	2	4	1	12	1	2	1	5	1/2	1	2	5
Inside/outside housing	14	14	10	9	8	6	10	12	14	10	6	2
Breeding goal	3	10	15	14	4	10	5	14	5	9	8	7
Ind./group housing	8	12	6	13	3	4	4	11	6	13	12	15
Castration	23	19	23	22	18	19	21	17	21	19	15	12
Teeth clipping	17	16	16	18	13	16	22	19	24	20	17	19
Tail docking	16	15	14	16	12	17	17	21	19	21	19	22
Food safety												
Bone meal	7	5	2	1	7	7	3	2	4	4	5	4
Salmonella	15	11	11	3	16	9	8	4	11	8	13	6
GM breeding	6	6	8	6	9	5	12	8	12	7	24	14
Res. medicines	11	7	13	10	19	13	14	3	16	5	16	10
Res. herbicides	12	9	9	4	14	14	11	7	10	6	18	16
GMO substances	9	8	7	7	11	8	9	9	13	14	21	18
Guarantee	20	17	22	11	24	20	20	13	18	16	22	11
Irradiation	19	20	20	17	23	18	19	15	23	18	23	20
Residuals food industry	24	22	24	21	22	22	23	20	22	22	20	21
Environment												
Requirements	4	2	21	8	17	12	24	10	15	11	11	1
Origin and choice												
Traceability	10	13	12	19	6	15	13	16	7	12	7	13
Choice	18	21	17	15	15	11	18	18	17	15	14	9
Home country	13	18	4	20	10	21	7	22	9	17	4	17
Price	22	-	19	-	21	-	16	-	20	-	10	-
Taste	21	-	18	-	20	-	15	-	3	-	1	-

on average perceived as the most important attributes. Again, animal welfare comes out as an important field of concern. However, results also indicate that this is not true for *all* animal welfare aspects, as pig handling issues, such as castration, teeth clipping and tail docking score much lower.

Consumer concerns

Table 2 (last column) shows that, when incorporating the results from the trade-off task, Taste becomes on average the most important attribute, followed by price. Also the other "store attributes", i.e. traceability and pork choice and origin become more important. Furthermore, most food safety attributes lose importance while some welfare attributes get increasingly important, as indicated by the standardised scores. A high importance of the attribute Price was also described by Frewer *et al.* (1997) who studied consumers' perceptions about cheese processing technologies. They however did not mention Price but Costs. Other trade-off analyses for livestock products including Price are a study by Halbrendt *et al.* (1995) about pST pork in Australia, a study by Lusk *et al.* (2003) about beef from cattle for which growth hormones and GM feed are applied, and a study by Novoselova *et al.* (2002) dealing with the safety of milk. These studies all found high importances for the food safety issues considered.

Table 3 gives a short overview of the literature on consumers' trade-offs for concerns about livestock products. The table lists the attributes considered and indicates with an asterisk which attribute(s) came out as most important. The last row shows the results of Frewer *et al.* (1997).

Consumer concerns per segment

Table 4 shows the ranking of consumers' concerns per segment (see Meuwissen *et al.* 2004), as well as the ranking of concerns for identical segments but for people in their role as citizens (derived from single attribute rating task). Comparing consumers' and citizens' concerns, it becomes clear that "citizen-consumer" differences are largest for the Economists and Unpronounced. As

consumers, Economists and the Unpronounced rank Taste 1st and 3rd respectively. Economists have clearly traded off Taste against the Environmental requirements for pig husbandry (from 1st rank to 11th), the Chance of Salmonella (from 6th rank to 13th rank) and the use of genetic modification in breeding (from 14th to 24th rank). For the Unpronounced there are no such obvious trade-offs. For Ecologists, trading off the various pork production aspects led to an increased importance of pigs' living surface (from 12th rank as citizen to 1st rank as consumer) and a pig's home country (from 20th to 4th rank). Animal-friends further stressed the importance of animal welfare aspects. The Health-concerned traded off animal and human health against environmental health: as citizens environmental requirements were ranked 10th while as consumers this concern was only ranked 24th.

Discussion and conclusions

In eliciting people's concerns it is important to decide what concerns you are interested in: citizen concerns or consumer concerns. The research design should be set up accordingly. Our study shows that with "citizen-methods" animal welfare and food safety are people's major concerns about pork production in the Netherlands. However, when asking to make specific trade-offs (i.e. in the "consumer-method"), aspects of sensory quality and price become the most important attributes. These conclusions require some nuances, since (1) even in the trade-off analysis, aspects of animal welfare remain relatively important (aspects of food safety loose more of their importance); and (2) there are clearly segments with different views: Environmentalists, Ecologists, Animal-friends and Health-concerned (in total more than 50% of the sample) specify their top 3 concerns in the field of animal welfare. Results from the conjoint study, i.e. a high importance of sensory quality and price and attention for animal welfare in specific segments, seem to associate with current market circumstances rather well. We therefore recommend this technique to supply chain participants who want to elicit the ethical concerns of their *consumers*. We also demonstrated the feasibility of obtaining insight into consumers' trade-offs between multiple attributes. In total, we considered 24 attributes, covering concerns of animal welfare, food safety, environment, sensory quality, origin, traceability and price. Customised computerised conjoint analysis shows to be an adequate technique for handling large amounts of attributes. An interesting "side-result" from our study is that "animal welfare" and "food safety" as such are not very meaningful. Consumers' concerns about welfare clearly focus on aspects of pig housing, i.e. amount of space, living surface, individual or group housing and inside or outside housing, and not so much on the handling of pigs (tail docking, teeth clipping and castration). For food safety, consumers are concerned about bone meal in pig feed (not about GMO substances), the use of genetic modification in pig breeding and the chance of Salmonella. Irradiation of pork to increase its safety is not an issue of concern. For citizens, similar conclusions can be drawn from the single attribute rating task (Table 2). In our willingness to pay questions we anticipated on the "concern differentiation" by framing the questions as "...according to government and consumer organisations".

Outlook

For further studies in the "citizen-consumer arena", we would suggest to more explicitly include the price aspect in the "citizen-methods". For instance, in our budget allocation question there was no specified option to allocate part of the budget to stimulate low-cost pork production. Also, in the single attribute rating task of CCC, Price (and Taste) were not considered. In addition, although CCC is able to cope with multiple attributes, we recommend to carefully select and describe the attributes included. Our respondents may have perceived many of the attributes in the single attribute rating task as rather unusual. They may therefore have been relatively strongly focusing on the more familiar attributes of Price and Taste when working on the conjoint task.

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