No. 89

Do They Always Say No? German Consumers and Second-Generation GMO Foods *

by

Jochen HARTL**
and
Roland HERRMANN***

Giessen, October 2009

* A first version of this paper was presented as a Contributed Paper at the XIIth Congress of the European Association of Agricultural Economists, "People, Food and Environment: Global Trends and European Strategies", Ghent, Belgium, 26-29 August 2008 (http://www.eaae2008.be).

Thanks are due to Oliver Herrmann and Matthias Staudigel for very helpful research assistance. Research findings in this paper are based on the unpublished PhD dissertation of the first author (Hartl 2008).

** Dr. Jochen Hartl, Produkt und Markt, Otto-Lilienthal-Straße 15, 49134 Wallenhorst. E-mail: Jochen.Hartl@gmx.de

*** Prof. Dr. Roland Herrmann, Institute of Agricultural Policy and Market Research, University of Giessen, Senckenbergstrasse 3, 35390 Giessen, Germany. Roland.Herrmann@agrar.uni-giessen.de

---

The "Discussion Papers in Agricultural Economics" are edited by: Institut für Agrarpolitik und Marktforschung, University of Giessen, Senckenbergstr. 3, D-35390 Giessen, Germany. Tel.: 0641/99-37020, Telefax: 0641/99-37029.

Do They Always Say No?
German Consumers and Second-Generation GMO Foods

1 Introduction

In the dissemination of biotechnology on food markets, consumers play a major role. Therefore, it is crucial that firms understand consumers' perceptions and assessments in order to design products which are accepted on markets. Governments have to take into account the consumer, too. A first-best regulatory framework in consumer policy, e.g. on labelling issues, will have to incorporate the information consumers have and need on biotechnology.

There is a broad literature available now on the acceptance of genetically modified (GM) foods by consumers and many of these studies have been reviewed by Lusk et al. (2005). Available studies differ by the methodology used, the period and country covered, the hypotheses on the determinants of consumers' decisions to buy GM foods or not, and various other dimensions. Despite these differences, quite a number of stylized facts emerge as a consensus from these studies. European consumers are known to be more critical towards the introduction of GM foods than North American consumers (Gaskell et al., 1999). Whereas the majority of US consumers is optimistic that food biotechnology will provide benefits to them and their families (Toner and Alexander, 2005), European consumers tend to value potential risks of GM foods much higher (Gaskell et al., 2003). Within the European Union, German consumers see much higher risks than their counterparts in the United Kingdom, the Netherlands or Scandinavian countries (INRA, 2005). The views on potential risks and benefits affect consumer perceptions on GM food as well as the willingness to pay (WTP) for GM-free alternatives. They are influenced themselves by subjective and objective knowledge and by sociodemographic variables (Gaskell et al. 2003). Various studies reveal that gender as well as age matter: Women tend to have a significantly more negative view on GM foods than men and older consumers oppose GM foods (GMF) more than young consumers do.

Assessments of agricultural biotechnology additionally suggest that the intention to purchase, which is often explored in surveys, does not coincide with actual purchase decisions on markets. Noussair, Robin and Ruffieux (2003) study the discrepancy between European public opinion and consumer purchase behaviour with regard to GM foods within an experimental study for France. They elaborate that consumers are typically unaware of the GMO content and do mostly not read the labels.

In general, most studies on consumer perceptions towards GM food and willingness to pay for GM-free foods are related to the so-called first-generation GM crops, as literature surveys by Lusk et al. (2005) and, more recently, by Hartl (2008) reveal.

However, there is evidence that consumers react differently to various types of GM food. In particular, the question arises whether the very negative response to GM foods alters with regard to GM foods of the second generation. Whereas first-generation GM crops are associated with producer-related benefits like herbicide tolerance and insect resistance, second-generation GM crops aim to deliver consumer-oriented benefits. Output traits of these crops can improve the nutritional quality, whereas input traits of first-generation GM crops do not directly provide an additional utility for consumers.

A case in point is the development of rapeseed with augmented functional properties. Currently, researchers in industry and academia aim to develop GM rapeseed that contains functional compounds such as long-chain ϖ3 fatty acids and phytosterols, which translate into increased quality of oil derived from the crop.

The objective of this paper is therefore to identify the factors influencing consumer demand for second-generation GM rapeseed oil. The analysis focuses on consumers' willingness to pay for health benefits from two functional properties offered by GM technology. To accomplish this objective a choice experiment (CE) was conducted and data were analyzed with a multinomial-logit (MNL) model. The study was conducted via an online-access panel, whereby 1556 German consumers of rapeseed oil were surveyed in September 2005.

A number of previous studies have already examined consumer acceptance and WTP for second-generation GM foods (West, Larue, Gendron and Lambert, 2002; Larue, West, Gendron and Lambert, 2004; Boccatelli and Moro, 2000). These studies indicate that a willingness to pay might exist for new functional properties in GM foods which benefit the consumer. Nevertheless, this study makes a unique contribution with regard to at least two major points:

(1) *Previous studies dealing with second-generation GM foods have vastly been conducted in countries, where consumer acceptance of GM crops is relatively high, such as the USA. The question*

arises, how consumers in countries with a rather negative sentiment towards GM foods evaluate functional properties induced by GM technology. We have conducted our survey in Germany, where consumers are rather opposed towards the introduction of GM foods.

(2) *In many previous studies, traits of second-generation GM crops have been defined very generally, such as "good for the heart" or "improved nutritional quality". Overall, not many studies have measured consumer responses towards concrete and comprehensible output traits.* We consider very concretely consumers' evaluation of two functional properties of second-generation GM rapeseed oil that are of special interest for industry and academia.

2 Functional properties of GM rapeseed

Two functional properties of GM rapeseed should be considered here, namely the constitutional effect of long-chain ϖ3 fatty acids and the cholesterol-lowering effect of phytosterols. Both characteristics can be considered as promising, since research efforts towards these traits have been pushed by industry as well as academia in the last years.

2.1 Long-chain ϖ3 fatty acids

Human physiology depends in many respects on long-chain ϖ3 fatty acids (Long Chain Polyunsaturated Fatty Acids, LCPUFA) and it is seen as scientifically proven that their consumption can make an important contribution to prevent arteriosclerosis and coronary heart diseases (Demaison and Moreau, 2002). Consumption is linked to positive effects like a lowering of the triglyceride level of the blood, a decrease in cardiac arrhythmias and phlogistic reactions as well as a lowering of the blood coagulation and viscosity (Mukherjee et al., 2002, pp. 70 et seq.). Among the most important LCPUFA are the eicosapentaenoic acid (EPA) and the docosahexaenoic acid (DHA), which are almost exclusively ingested through the consumption of fatty seafish. Normally, LCPUFA are not found in edible oils.

As a consequence, there are efforts all over the world to develop GM plants and especially rapeseed with LCPUFA. Research on LCPUFA in plants is also carried out at the EU level in the context of the integrated project *LipGene*, in which the BASF Plant Science GmbH is the leading industry partner. First achievements were made at the development of rapeseed oils with LCPUFA, although they have not reached the marketing stage yet (see e.g. Froman and Ursin, 2002). It is thought that rapeseed could offer a sustainable and pollutant-free source of EPA as well as DHA. Given this background, it is interesting which acceptance rapeseed oil with LCPUFA will find among consumers.

2.2 Cholesterol-lowering phytosterols

The cholesterol-lowering effect was regarded as a further specification. It is known that an increased blood concentration of total and LDL cholesterol and a diminished one of HDL cholesterol represent a higher risk of cardiovascular diseases. The intake of plant sterols can contribute to a lowering of the total and LDL blood cholesterol level (Yankah and Jones, 2001). A meta analysis of all placebo-controlled double-blind intervention studies has shown that a daily intake of 2 g plant sterols reduces the LDL blood concentration by 9 to 14% without influencing the HDL cholesterol concentration. That implies a risk reduction of cardiovascular diseases by approximately 25% within the age class 50-59 (Law, 2000). However, a daily intake of more than 2g does not lead to a further impact.

The daily intake of plant sterols in industrial countries lies with 220-450 mg clearly below the optimum (Ragotzky, 2001). Apart from conventional methods of gaining plant sterols there are ambitions to develop GM plants (e.g. rapeseed) with an increased concentration of phytosterol. While the natural concentration of phytosterol in rapeseed oil lies between 480-1130 mg/100 g (Ragotzky, 2001), Vankatramesh et al. (2000) already succeeded in developing GM rapeseed that features a concentration of plant sterols between 2-5 g/100 g.

3 Methodological Approach

3.1 Design of the Choice Experiment

The analysis is based on a survey of 1.556 German consumers of rapeseed oil in September 2005. The survey was conducted via an online-access panel. It was the objective of the sample selection to represent the total population of consumers of rapeseed oil in Germany. Therefore, consumers were included who (i) consumed rapeseed oil at least sometimes and who (ii) were responsible in the household for food purchases. Like in many online panels, full representativness could not be reached. First, male and young persons were overrepresented to some extent. Secondly, only the age group 18-49 years was represented in the online panel. Although the upper age limit is restrictive, we accepted the second limitation of the online panel since 18-49 years is a most interesting age group given that agricultural biotechnology is a future technology. Of course, implications from the sample have to consider that the age group of 50 and above is excluded. The first point, i.e. the overrepresentation of male and younger respondents, was corrected by attaching lower weights to male and younger persons in the estimations. Thus, within the available age groups, the sample coincides in terms of age and gender with structural information on German buyers of rapeseed oil as taken from Sulzer (2005c).

A choice experiment, during which different rapeseed oil alternatives were shown to the respondents, represented the core of the questionnaire. The first step towards the development of the choice experiment was the selection of relevant attributes and their levels. Basically an alternative-specific design was chosen, where consumers were asked to make a choice between the cultivation methods "GM rapeseed oil", "conventional rapeseed oil" and "organic rapeseed oil". Therefore, the parameters of different attributes could be estimated separately for each of these three cultivation methods. This is plausible as particular attributes and levels should appear in combination with particular cultivation methods. Moreover, interactions between the attributes and the cultivation methods were to be expected. It is possible, e.g., that the price sensitivity for GM rapeseed oil is lower than for organic rapeseed oil. Furthermore, respondents were allowed to choose neither of the alternatives. Thus, the complete decision of the respondents could be pictured, including the possibility to choose none of the rapeseed oils.

The attributes included in the choice sets represented a functional attribute along with other relevant attributes for the buying decision. The constitutional effect of long-chain $\varpi 3$ fatty acids and the cholesterol-lowering effect of plant sterols, which have been discussed in Chapter 2, are regarded as the levels of the functional attribute. These levels are alternative-specific in the choice design, i.e. they only appear along with alternative A, thus, in combination with GM rapeseed. Additionally, other attributes that are relevant for the buying decision, such as the production process, the origin, the packaging or the price, were included in the choice design with the objective of covering all relevant characteristics of rapeseed oil. While the levels of the production process, origin and packaging are constant across the different alternatives, Figure 1 shows that the levels of the attribute price vary. The attributes and levels can be explained as follows:

Figure 1: Attributes and corresponding levels of rapeseed oil

Attributes \ Alternatives		*Alternative A* *From GM rapeseed*	*Alternative B* *From conventional rapeseed*	*Alternative C* *From organic rapeseed*	*Alternative D*
Functional attributes		• With long-chain ω3 fatty acids • With cholesterol-lowering phytosterols • n.s.			
Other attributes that are relevant for the buying decision	Production process	• Native • n.s.	• Native • n.s.	• Native • n.s.	Neither A nor B nor C
	Origin	• Produced from German rapeseed • n.s.	• Produced from German rapeseed • n.s.	• Produced from German rapeseed • n.s.	
	Packaging	• Glass bottle • Light-shielded bottle	• Glass bottle • Light-shielded bottle	• Glass bottle • Light-shielded bottle	
	Price	• 1.00 € / 0.5l • 1.75 € / 0.5l • 2.50 € / 0.5l • 3.25 € / 0.5l	• 1.00 € / 0.5l • 1.75 € / 0.5l • 2.50 € / 0.5l	• 2.50 € / 0.5l • 3.25 € / 0.5l • 4.00 € / 0.5l	

Source: Own presentation.

With long-chain ϖ3 fatty acids: It had to be differentiated between the characteristics with or without LCPUFA as part of option A in the experimental design. The former received the description "with long-chain ϖ3 fatty acids" at the front of the label. On the back side of the label the respondents got the following extra information: "produced from rapeseed that features a high concentration of long-chain ϖ3 fatty acids due to genetic modification" as well as "the regular intake of these fatty acids can demonstrably reduce the risk of cardiovascular diseases". Additionally, nutrition facts were presented to the respondents on the back side of the label that show the exact concentration of LCPUFA (3 g/100 g).

With cholesterol-lowering phytosterols: Further, it was differentiated between the specifications "with or without the enrichment of plant sterols" within alternative A in the experimental design. The former received the description "with cholesterol-lowering phytosterols" on the face of the label. The back side was provided with the information "produced from rapeseed that features an increased concentration of phytosterol due to genetic modification" and "the regular intake of phytosterols can demonstrably reduce the 'bad' LDL cholesterol by up to 15%".

Production process: Within the production process, it is generally differentiated between native, that is to say cold-pressed, and refined rapeseed oil. Different studies show that the production process plays a decisive role for the consumers (e.g. Nielsen et al., 1998). 62% of the respondents declared in a representative CMA consumer study that the production process matters when buying edible oil (Sulzer, 2005a). Therefore, this characteristic was integrated into the experimental design. The options in the choice set are either categorised as "native" or there is no information on the production process. The latter is identical to refined rapeseed oil, which must not be labelled as such.

Origin: It can be assumed that the origin plays a role in the choices of the respondents. Many studies have shown that the certificate of origin does influence the decision making of the consumers (e.g. Wirthgen et al., 1999). 40% of the respondents expressed in the CMA study mentioned above that they do pay attention to the producing country of edible oil (Sulzer, 2005a). In addition, the origin of the rapeseed oils, that are available on the market, is often stressed. In the experimental design, origin is subdivided into two specifications, namely oil from German rapeseed and oil from rapeseed without a specific certificate of origin. The former received the description "made in Germany" at the front of the label. Moreover, the information "produced from German rapeseed" was provided on the backside.

Price: It can be assumed that the price strongly influences choices of the consumers. 65% of the respondents expressed in the CMA study that they do pay attention to the price when buying edible oils (Sulzer, 2005a). Moreover, the price is necessary to compute willingness-to-pay values. The attribute levels of the price were alternative-specific in the choice design, since market prices vary considerably between organic and conventional rapeseed oil. According to the *GfK household panel*, the average consumer price for declared rapeseed oil was about 1.50 €/0.5l (Sulzer, 2005b) in 2004. The prices for conventional rapeseed oil vary from approximately 1.00 to 2.50 €/0.5l. Therefore, it was differentiated within the conventional rapeseed oil between the three levels 1.00, 1.75 and 2.50 €/0.5l. These price levels were used for the GM rapeseed oil as well. Additionally, a higher price level of 3.25 €/0.5l was added as the production of GM rapeseed oil causes extra costs and would probably be offered at a higher price than the conventional counterpart. Oil from organic rapeseed, with prices between 2.50 up to 7.00 €/0.5l, is typically more expensive than conventional rapeseed oil. Consequently, higher price categories were determined for organic rapeseed oil, namely 2.50, 3.25 and 4.00 €/0.5l.

Given the alternatives with their attributes and levels, a large number of unique rapeseed oil choice sets could be constructed. Out of this pool, we sought an experimental design that maximized the statistical identification of coefficient estimates, while keeping the task for the respondents as easy as possible. Thereby, the design needed to allow the identification of all main effects as well as all alternative-specific effects. To achieve this objective, we used a computer-generated design that followed linear design principles, i.e. maximization of orthogonality and balance. A perfect orthogonal and balanced design with a D-efficiency score of 100 would have required a number of 72 choice sets. To minimize the task for the respondents, the number of choice-sets was reduced to 36, which resulted in a small reduction of the D-efficiency criterion down to 98,97 - still relatively close to the optimum. These 36 choice sets were blocked in four parts, so that every respondent had to make nine choice decisions.

Prior to the actual presentation of the choice sets the respondents received a brief introduction that made them familiar with the procedure and context of the choice experiment. According to the relevant literature, the so-called "cheap talk" proved to be effective in order to remind the respondents of their budget constraint and, thus, to avoid hypothetical distortions (Lusk, 2003). Therefore, the following "cheap talk" instruction was integrated into the introductory text: "Please make your choice as if you really went shopping in a supermarket and had to pay the price of the chosen alternative. Ask yourself: 'Would I spend my money on this product if I went shopping in a supermarket?'" Afterwards, the choice sets were presented to the respondents with pictures of different rapeseed oils.

3.2 Choice Experiment Model

Choice experiments are consistent with random utility theory. Assume that consumers derive utility from consumption of rapeseed oil as shown in the following equation (1):

$$U_{iq} = V_{iq} + \varepsilon_{iq}, \tag{1}$$

where U_{iq} is the *q*th consumers's utility of choosing option *i*. V_{iq} is the observable, deterministic component of utility. It is typically measured as a function of several explanatory variables, e.g. in the present case by the rapeseed oil attribute levels for alternative *i*. The unobservable component of utility is the residual ε_{iq}.

Given that the consumer is faced with four discrete choices in each CE question (option A, B, C or D), the probability that a consumer *q* will choose alternative *i* is:

$$P_{iq} = P(V_{iq} + \varepsilon_{iq}) > (V_{jq} + \varepsilon_{jq}),\ \forall j \neq i. \tag{2}$$

This formulation is simply based on a utility-maximizing approach, i.e. consumers will make the choice (options A, B, C or D) from which they derive the highest utility.

If the random errors in equation (2) are assumed to be independently and identically distributed across the *i* alternatives and *q* individuals with a type *I* extreme value distribution and a scale parameter equal to 1, then the probability of consumer *q* choosing alternative *i* becomes:

$$P_{iq} = \frac{e^{V_{iq}}}{\sum_j e^{V_{jq}}}. \tag{3}$$

V_{iq} is assumed to be linear in parameters. Thus, the functional form can be expressed as

$$V_{iq} = \beta_i + \beta_i{}'Z_{iq} + \beta_i{}'S_q + \beta_i{}'(Z_{iq} \times S_q). \tag{4}$$

where Z_{iq} are attributes of alternative *i*, S_q are individual characteristics *S* of the respondents, Z_{iq} x S_q interactions between *Z* and *S*, and β_i represents the coefficients to be estimated. According to equation (4), these variables directly determine the utility of each alternative and the option is selected that maximizes utility. The theory and the foundations of probability theory in MNL estimation is described in much detail elsewhere (e.g. Train, 2002).

Figure 2 describes the variables *Z* and *S* used as well as their coding. Nominally scaled variables were effect coded, i.e. the value -1 was attributed to the respective reference categories. In general, effect coding is preferred to dummy coding within discrete-choice analyses, as effect-coded variables maintain the orthogonality of the design. Thus, the effects of the coefficient are not correlated with the constant(s)[1)] (Adamowicz et al., 1994, Bech and Gyrd-Hansen, 2005). Additionally, an orthogonal-polynomial coding was used for the continuous variable *PRICE*[2)] (Louvière et al., 2001). This coding is recommended in the literature if the analyst intends to estimate non-linear relationships. An orthogonal-polynomial coding eliminates the collinearity between the elements of a polynomial, here between *PRICE* and $PRICE^2$ (Louvière et al., 2001, pp. 267 et seq.). Moreover, the continuous variable AGE was rescaled. Since algorithms, such as *BHHH*, *DFP*, or *BFDT*, are sensitive to the size of the variables, it is important for the estimation of the log-likelihood function that they possess roughly the same dimension (Louvière et al., 2001, p. 269).

Furthermore, four indices to the perceived benefits and risks of GM foods and functional foods (FF) were constructed. These indices represent the average over both positively and negatively formulated attitude items. Having used a factor and reliability analysis the one-dimensionality of each index could be confirmed. Cronbach's alpha was – as a measure for the inner consistency of an index – 0.90 in case of I_*GEN_POS*, 0.91 in case of *I_GEN_NEG*, 0.83 in case of *I_FUN_POS* and 0.70 in case of *I_FUN_NEG*.

Figure 2: Definition of the variables

	Variables	Description		
ASCs	ASC_{CON}	= 1, if conventional rapeseed oil,	= -1, if "Neither A nor B nor C ",	= 0 otherwise
	ASC_{GEN}	= 1, if GM rapeseed oil,	= -1, if "Neither A nor B nor C ",	= 0 otherwise
	ASC_{ECO}	= 1, if organic rapeseed oil,	= -1, if "Neither A nor B nor C ",	= 0 otherwise
Attributes Z	OMEGA	= 1, if rapeseed oil with ω3 fatty acids,	= -1, if rapeseed oil without extra utility,	= 0 otherwise
	PHYTO	= 1, if rapeseed oil with phytosterols,	= -1, if rapeseed oil without extra utility,	= 0 otherwise
	NATIVE	= 1, if native rapeseed oil,	= -1 otherwise	
	ORIGIN	= 1, if German origin,	= -1 otherwise	
	LIGHT SHIELD	= 1, if light-shielded bottles,	= -1 otherwise	
	PRICE	= price x in €/0.5l [rescaled: (x-2.5)/0.75]		
	$PRICE^2$	= squared price [rescaled: $(PRICE)^2$-2]		
Individual Characteristics S	SEQUENCE	= 1, if choice-task before attitudes	= -1 otherwise	
	DAILY	= 1, if daily consumption,	= -1 less frequently,	= 0 otherwise
	WEEKLY	= 1, if consumption several times a week,	= -1 less frequently,	= 0 otherwise
	MONTHLY	= 1, if consumption several times a month,	= -1 less frequently,	= 0 otherwise
	BAKING	= 1, if used for baking,	= -1 otherwise	
	FRYING	= 1, if used for frying,	= -1 otherwise	
	SALAD	= 1, if used for salad,	= -1 otherwise	
	COOKING	= 1, if used for cooking,	= -1 otherwise	
	FOOD_HEALTHY	= Answer on a seven-point Likert scale as to the relevance of a healthy diet		
	FOOD_CHOL	= Answer on a seven-point Likert scale as to the relevance of a low cholesterol diet		
	CHILD	= 1, if children < 15 in the household,	= -1 otherwise	
	MALE	= 1, if male,	= -1 otherwise	
	AGE	= Age x in years (rescaled: x/10)		
	O-LEVEL	= 1, if O-level,	= -1, if GCSE,	= 0 otherwise
	A-LEVELS	= 1, if A-levels,	= -1, if GCSE,	= 0 otherwise
	UNIVERSITY	= 1, if university degree,	= -1, if GCSE,	= 0 otherwise
	STUDENT	= 1, if student,	= -1, employee,	= 0 otherwise
	HOUSEWIFE	= 1, if housewife,	= -1, employee,	= 0 otherwise
	WORKER	= 1, if worker,	= -1, employee,	= 0 otherwise
	SELF-EMPLOYED	= 1, if self-employed,	= -1, employee,	= 0 otherwise
	CIVIL SERVANT	= 1, if civil servant,	= -1, employee,	= 0 otherwise
	RETIRED	= 1, if retired,	= -1, employee,	= 0 otherwise
	MISCELLANEOUS	= 1, if other engagement,	= -1, employee,	= 0 otherwise
	I_FUN_POS	= Index for perceived utility of FF (Mean over 3 positive attitude items)		
	I_FUN_NEG	= Index for perceived risks of FF (Mean over 3 negative attitude items)		
	I_GEN_POS	= Index for perceived utility of GMF (Mean over 6 positive attitude items)		
	I_GEN_NEG	= Index for perceived risks of GMF (Mean over 6 negative attitude items)		

Source: Own presentation.

4 Empirical Findings

Apart from the model results, descriptive statistics showed that GMO rapeseed oil is neglected by 74% of all respondents. This magnitude of rejection is typical for other GMO foods, too (INRA, 2001). It is also important for respondents that the characteristic "*NATIVE*" is given (71%), followed by a low price (63%), from ecological production (51%) and *LIGHT SHIELD* (51%). More differentiated results are available from the model.

Three models were estimated. One is limited to alternative-specific constants and attributes of the alternatives as explanatory variables. Individual characteristics were integrated into a second model, whereas the third one contains quadratic price parameters and interactions additionally. The estimation results of these models are presented in Table 1. Only statistically significant variables are included in the results. As measured by the likelihood ratio[3)] the accuracy of the estimation models amounts to 0.166, 0.227 or 0.229 respectively. Since values between 0.2 and 0.4 indicate a high accuracy of an estimation model (Louvière et al., 2001, p. 54), the results can be regarded as satisfactory. The influence of the attributes was estimated separately for each cultivation method, as the calculated coefficients differ strongly between the alternatives[4)]. Likelihood-ratio tests confirmed that the estimation of alternative-specific effects would improve the accuracy of the estimation. The influence of the various determinants on consumers' choices can be summarized as follows:

Alternative-specific constants: The maximum number of alternative-specific constants was integrated into the estimated MNL models. With J options, at most $(J\text{-}1)$ constants are identifiable (Train, 2002, pp. 25 et seq.), so that we excluded a constant from one alternative, namely from the option "Neither A nor B nor C". As we used an effects coding scheme, the dropped constant was coded as a -1, instead of a 0 as it is typically used in dummy coding. Each of the included constants is then interpreted relative to the mean influence of all constants.

In general, the alternative-specific constants reflect the effect on utility of all factors that are not captured by the included attributes. Thus, in our case, they measure the utility which the respondents – irrespective of included characteristics such as origin or price – associate with the particular cultivation method: "genetically modified", "conventional" or "organic". It becomes apparent from the results of the first model that the respondents link the highest utility to the organic cultivation method, followed by the conventional and genetically modified ones. Accordingly, processors of conventional and genetically modified rapeseed oil would have to allow discounts on their products, which is consistent with existing studies.

Table 1: Estimation results of the MNL models

	Variables	Alternatives	Linear . only Z Coeff. (std. error) [a)]	Linear. Z. S Coeff. (std.error) [a)]	Squared. Z. S. S*Z Coeff. (std.error) [a)]
ASCs	ASC_{GEN}	Genetical	-0.454 (0.02) ***	-0.390 (0.13) **	-0.438 (0.14) **
	ASC_{CON}	Conventional	0.346 (0.02) ***	0.216 (0.07) **	-0.193 (0.10) $
	ASC_{ECO}	Organic	1.203 (0.02) ***	0.801 (0.09) ***	1.184 (0.12) ***
Attributes Z	OMEGA	Genetical	0.229 (0.03) ***	0.260 (0.04) ***	0.270 (0.04) ***
	PHYTO	Genetical	0.028 (0.02)	0.032 (0.04)	0.017 (0.04)
	NATIVE	Genetical	0.194 (0.02) ***	0.218 (0.03) ***	0.222 (0.03) ***
	NATIVE	Conventional	0.312 (0.01) ***	0.323 (0.02) ***	0.329 (0.02) ***
	NATIVE	Organic	0.066 (0.01) ***	0.074 (0.02) ***	0.071 (0.02) ***
	ORIGIN	Genetical	0.086 (0.02) ***	0.091 (0.03) ***	0.093 (0.03) ***
	ORIGIN	Conventional	0.163 (0.01) ***	0.171 (0.02) ***	0.164 (0.02) ***
	ORIGIN	Organic	0.130 (0.01) ***	0.145 (0.02) ***	0.143 (0.02) ***
	LIGHT SHIELD	Genetical	0.136 (0.02) ***	0.163 (0.03) ***	0.156 (0.03) ***
	LIGHT SHIELD	Conventional	0.046 (0.01) ***	0.057 (0.02) **	0.060 (0.02) **
	LIGHT SHIELD	Organic	-0.004 (0.01)	-0.005 (0.02)	-0.011 (0.02)
	PRICE	Genetical	-0.273 (0.02) ***	-0.303 (0.02) ***	-0.495 (0.06) ***
	PRICE	Conventional	-0.247 (0.02) ***	-0.260 (0.02) ***	-0.725 (0.08) ***
	PRICE	Organic	-0.599 (0.02) ***	-0.655 (0.02) ***	-1.017 (0.08) ***
	$PRICE^2$	Genetical			-0.018 (0.03)
	$PRICE^2$	Conventional			-0.213 (0.04) ***
	$PRICE^2$	Organic			0.170 (0.04) ***
Individual Characteristics S	SEQUENCE	Genetical		0.213 (0.03) ***	0.215 (0.03) ***
	SALAD	Organic		0.127 (0.02) ***	0.118 (0.02) ***
	COOKING	Organic		-0.079 (0.02) ***	-0.088 (0.02) ***
	FOOD_HEALTHY	Genetical		0.129 (0.02) ***	0.126 (0.02) ***
	FOOD_HEALTHY	Organic		0.292 (0.02) ***	0.286 (0.02) ***
	O-LEVEL	Genetical		0.004 (0.04)	0.008 (0.04)
	A-LEVELS	Genetical		0.036 (0.04)	0.039 (0.04)
	UNIVERSITY	Genetical		-0.267 (0.05) ***	-0.276 (0.05) ***
	STUDENT	Genetical		-0.404 (0.07) ***	-0.586 (0.09) ***
	SELF-EMPLOYED	Genetical		0.333 (0.06) ***	0.452 (0.07) ***
	STUDENT	Organic		-0.320 (0.05) ***	-0.366 (0.05) ***
	SELF-EMPLOYED	Organic		0.467 (0.05) ***	0.501 (0.05) ***
	INDEX_FUNPOS	Genetical		0.149 (0.02) ***	0.150 (0.02) ***
	INDEX_FUNNEG	Genetical		-0.044 (0.02) *	-0.042 (0.02) $
	INDEX_GENPOS	Genetical		0.210 (0.02) ***	0.222 (0.02) ***
	INDEX_GENNEG	Genetical		-0.316 (0.02) ***	-0.311 (0.02) ***
	INDEX_GENPOS	Organic		-0.128 (0.02) ***	-0.107 (0.02) ***
	INDEX_GENNEG	Organic		0.069 (0.02) ***	0.079 (0.02) ***
Interactions S*Z	PHYTO*FOOD_CHOL	Genetical			0.072 (0.02) ***
	PRICE*STUDENT	Organic			-0.076 (0.02) ***
	PRICE*MALE	Genetical			-0.057 (0.02) **
	PRICE*MALE	Conventional			-0.157 (0.05) **
	PRICE*MALE	Organic			-0.066 (0.02) **
N:			14004	14004	14004
Mean loglikelihood:			-1.156	-1.074	-1.070
Adjusted likelihood ratio:			0.166	0.225	0.228

[a)] ***. **. *. $ significant at the 99.9%-. 99%-. 95%-. 90%-level. Source: Own presentation.

Attributes of the alternatives: Table 1 shows that nearly all coefficients of the attributes are significant and possess plausible signs. Especially the variables *OMEGA* and *PHYTO* are of vital importance for the question at hand. It turns out that long-chain ω3 fatty acids increase the utility and, thus, the probability of choosing the alternative "genetically modified" significantly. To a minor degree, phytosterols have a positive impact on the utility, too[5)]. As a consequence, the original assumption that functional utility components increase the consumer acceptance can be sustained in principle. The question arises why long-chain ω3 fatty acids were rated more positively than phytosterols. It is conceivable that a smaller consumer segment which looks for a cholesterol-conscious diet is attracted by the cholesterol-lowering effect of phytosterols. By means of an interaction term between the variables *PHYTO* and *FOOD_CHOL* it was tried to depict this effect and it turned out to be significant.

As expected, the variables *NATIVE*, *ORIGIN* and *LIGHT SHIELD* have a significantly positive influence in almost all cases, too. The relative size of the coefficients implies that the characteristic "native" plays a more important role within the decision process than the attributes "origin" and "light-shielded bottle". Differences between the alternatives can be detected, too. It is remarkable that the coefficients for the variables *NATIVE* and *LIGHT SHIELD* are far lower in case of the alternative "organic", i.e. they are much less important for the choice of bio rapeseed oil[6)].

Moreover, the significantly negative price coefficients imply that a price increase results, ceteris paribus, in a lower utility and, therefore, a diminished probability of choosing the product. The influence of the variable *PRICE* was modelled both linearly and quadratically. The quadratic specification of price is more appropriate for the alternatives "conventional" and "organic". Accordingly, the price sensitivity of the consumers varies with the price level as far as these alternatives are concerned. The price sensitivity rises with an increasing price in case of the alternative "conventional", whereas it declines in view of the alternative "organic". Consumers generally seem to react to changes in prices of organic rapeseed oil if they start to cross the price range of conventional rapeseed oil. Regarding the magnitude of the price coefficients, it becomes apparent that those of the alternatives "genetically modified" and "conventional" are similar. The price coefficient of the alternative "organic" is much higher.

Individual characteristics: Unlike the oil attributes, the personal characteristics do not vary across the different options. The alternative "conventional" is used as a benchmark towards which the estimated coefficients are to be interpreted.

The results indicate that the variable *SEQUENCE* has a significantly positive influence on the choice of the alternative "genetically modified" (relative to the alternative "conventional"). This implies that the respondents are rather willing to choose GM rapeseed oil if they have not answered the attitude questions before. This suggests that the patterns follow the principle of social desirability. It is also possible that the respondents, without having become sensitive before, might not read the label thoroughly and, as a consequence, do not recognize GM food as such (Noussair et al., 2002). Additionally, the food patterns of the respondents do matter. If used for salad the choice probability of organic rapeseed oil increases. This is intuitively evident, as in case of a salad the use of subjectively high-class rapeseed oil seems to be more comprehensible than its use for baking purposes. Furthermore, consumers who pay attention to a healthy diet strongly prefer organic rapeseed oil. As expected, health-conscious consumers choose "Eco" more often. Moreover, it is more likely that higher educated respondents refuse GM food. No consistent trend concerning the influence of the educational level could be observed in previous studies. This result matches with other European studies (e.g. Springer et al., 2002). The outcome that students prefer conventional to GM rapeseed oil is consistent with the previous results, too. Interestingly, the choice probability of GM rapeseed oil is smaller than for non-students. This can be traced back to the fact that students have limited funds at their disposal and, consequently, their willingness to pay more for organic rapeseed oil is low. The significant interaction effect between the variables *PRICE* and *STUDENT* in case of the alternative "ecological" shows the same. Students are particularly responsive to changes in prices concerning organic rapeseed oil.

Finally, the attitude indices have a strong influence on the choices, too. Respondents who are more open-minded about functional foods have a significantly higher preference for GM rapeseed oil. In view of the present question, this result seems to be relevant as it suggests to combine functional and GM foods.

As expected, the indices of the perceived risks/benefits have a significantly negative/positive impact on the choice of the alternative "genetically modified". The reverse is true for the alternative "organic". Interestingly, some variables turned out to be insignificant, too. Especially the variables *MALE* and *AGE* have, as opposed to previous studies, no influence on the choice.

Interaction effects: A second possibility to integrate personal characteristics into discrete-choice models is to generate interaction effects with the attributes. The interaction terms that turned out to be significant were retained in the MNL models. As already mentioned, the interaction term between the variables *PHYTO* and *FOOD_CHOL* has a significantly positive influence. Respondents who pay attention to a cholesterol-conscious diet value the characteristic “with cholesterol-lowering phytosterols” more strongly. Apart from this, a higher price sensitivity occurs in case of students and men.

Willingness to pay: To quantify the value that consumers place on the different alternatives as well as on the attributes of the different alternatives, we also estimated WTP values. The change of the consumer surplus by adding an alternative to the choice-set, or changing attributes of alternatives can be calculated in the MNL model as (Louviere et al., 2001, p. 340, Train, 2002, p. 60):

$$WTP_q = \frac{-1}{\alpha_q}\left[\ln\left(\sum_{j=1}^{J^1} e^{V_{jq}^1}\right) - \ln\left(\sum_{j=1}^{J^0} e^{V_{jq}^0}\right)\right], \tag{5}$$

whereby the superscripts *0* and *1* refer to the initial and new conditions, respectively. α is the marginal utility of money that is identical in the MNL model to the negative price coefficient.

By use of equation (5), the mean WTP for the alternatives “GM rapeseed oil“ and „organic rapeseed oil“ relative to the alternative „conventional rapeseed oil“ has been calculated. It turned out that consumers have a negative WTP of 2.18 €/0.5l for GM rapeseed oil (without output traits), and a positive WTP of 1.56 €/0.5l for organic rapeseed oil relative to conventional rapeseed oil (Table 2). These values can be interpreted as the price decrease (increase) necessary to offset the negative (positive) utility associated with GM (organic) rapeseed oil. Assuming a average market price of about 1.75 €/0.5l for conventional rapeseed oil, the estimated WTP values would imply a price premium of - 124.3% for GM rapeseed oil and +89.3% for organic rapeseed oil. Thus, on average consumers strongly oppose GM rapeseed oil.

Table 2: Mean Willingness-To-Pay for Different Rapeseed Oil Alternatives

	Alternative		
	Genetically modified (€/0.5l)	Conventional (€/0.5l)	Organic (€/0.5l)
ORGANIC	---	---	1.56
GENETICALLY MODIFED	-2.18	---	---
OMEGA	1.37	---	---
PHYTO	0.80	---	---
NATIVE	1.08	1.86	0.17
ORIGIN	0.45	0.99	0.33
LIGHT SHIELD	0.81	0.33	0.01

Source: Own presentation.

In addition, WTP values for the attributes of the different alternatives have been calculated. Interestingly, Table 2 reveals that consumers have on average a positive WTP of 1.37 and 0.80 €/0.5l for the functional properties *OMEGA* and *PHYTO*, respectively. The basic hypothesis that functional compounds can moderate consumer concerns about GM foods can be partly confirmed. However, the positive WTP values for the functional compounds do not fully compensate consumer concerns. Suppliers of functional GM rapeseed oil would still have to discount their product relative to conventional rapeseed oil.

5 Summary

It can be concluded that the consumers of second-generation GMO foods would not generally say no. But it turns out that the supply of GMO rapeseed oil with output traits would be confronted with a strong general rejection of GMO rapeseed oil by consumers. Output traits like cholesterol-lowering phytosterols and long-chain ω3 fatty acids will raise utility according to the discrete-choice approach presented and will increase the probability of purchases of GMO rapeseed oil. Additional modelling with other approaches has shown, however, that the characteristic "genetically modified" implies for many consumers to say generally no to GMO rapeseed oil. For them, positive oil attributes will not matter within the option GMO rapeseed oil.

References

Adamowicz, W., Louviére, J., and Williams, M., 1994. Combining Revealed and Stated Preference Methods for Valuing Environmental Amenities. *Journal of Environmental Economics and Management,* **26** (3), 271-292.

Bech, M., Gyrd-Hansen, D., 2005. Effects Coding in Discrete Choice Experiments. *Health Economics,* **14** (10), 1079-1083.

Boccaletti, S. and D. Moro, 2000. Consumer Willingness-to-Pay for GM Food Products in Italy. *AgBioForum*, **3** (4), 259-267.

Demaison, L., Moreau, D., 2002. Dietary n-3 Polyunsaturated Fatty Acids and Coronary Heart Disease-Related Mortality: A Possible Mechanism of Action. *Cell Molecular Life Sciene,* **59** (3), 463-477.

Froman, B., Ursin, V., 2002. Genetic Modification of Oils for Improved Health Benefits: Production of Long Chain Omega-3 Acids in Plants. In: *Abstracts Papers of American Chemical Society,* 223, 031-AGFD Part1.

Gaskell, G., Bauer, M.W., Duvant, J., and Allum, N., 1999. Worlds Apart? The Reception of Genetically Modified Foods in Europe and the U.S. *Science*, **285** (384), 384-387.

Gaskell, G., Allum, N., and Stares, S., 2003. *Europeans and Biotechnology in 2002*. Eurobarometer 58.0, European Commission, Brussels, Belgium.

Hartl, J., 2008. *Die Nachfrage nach gentechnisch veränderten Lebensmitteln. Anwendung neuerer Entwicklungen der Discrete-Choice-Analyse zur Bewertung genetisch veränderter Lebensmittel mit Output Traits*. Giessener Schriften zur Agrar- und Ernährungswirtschaft **24**, Frankfurt a.M.: DLG-Verlag.

INRA, 2001. *Europeans, Science and Technology.* Eurobarometer 55.2, European Commission, Brussels, Belgium.

INRA, 2005. *Europeans, Science and Technology*. Special Eurobarometer 224, European Commission, Brussels, Belgium.

Larue, B., West, G.E., Gendron, C. and Lambert, R., 2004. Consumer Response to Functional Foods Produced by Conventional, Organic or Genetic Manipulation. *Agribusiness*, **20** (2), 155-166.

Law, M., 2000. Plant Sterol and Stanol Margarines and Health. *British Medical Journa,l* 320(7238), 861-864.

Louvière, J. J., Swait, J., and Hensher, D. A., 2001. *Stated Choice Methods: Analysis and Applications.* Cambridge University Press, Cambridge, UK.

Lusk, J.L., 2003. Effects of Cheap Talk on Consumer Willingness-to-Pay for Golden Rice. *American Journal of Agricultural Economics,* **85** (4), 840-856.

Lusk, J.L., Jamal, M., Kurlander, L., Roucan, M. and Taulman, L., 2005. A Meta-Analysis of Genetically Modified Food Valuation Studies. *Journal of Agricultural and Resource Economics*, **30** (1), 28-44.

Mukherjee, K. D., Warwel, S., and Weber, N., 2002. Omega-3-Fettsäuren und funktionelle Lebensmittel, in S. Warwel and N. Weber, eds., *Lipide als Funktionelle Lebensmittel.* Landwirtschaftsverlag Muenster-Hiltrup, Muenster.

Nielsen, N. A., Bech-Larsen, T., and Grunert, K. G., 1998. Consumer Purchase Motives and Product Perceptions: A Laddering Study on Vegetable Oil in Three Countries. *Food Quality and Preference,* **9** (6), 455-466.

Noussair, C., Robin, S., and Ruffieux, B., 2002. Do Consumers not care about Biotech Foods or Do They Just Not Read the Labels. *Economic Letters,* **75** (1), 47-53.

Ragotzky, K., 2001. Pflanzensterole, in H. F. Erbersdobler and A. H. Meyer, eds, *Praxishandbuch Functional Food.* Behr's Verlag, Hamburg.

Springer, A., Mattas, K., Papastefanou, G., and Tsioumanis, A., 2002. Comparing Consumer Attitudes towards Genetically Modified Food in Europe. Xth Congress of the European Association of Agricultural Economics, August 28-31, Zaragoza, Spain.

Sulzer, S., 2005a. *Einkaufskriterien für Speiseöl.* Centrale Marketinggesellschaft der deutschen Agrarwirtschaft (CM), Bonn, written responses.

Sulzer, S., 2005b. *Preise von Rapsöl.* Centrale Marketinggesellschaft der deutschen Agrarwirtschaft (CMA), Bonn, written responses.

Toner, C., and Alexander, N., 2005. *Food Biotechnology: Not a Top-of-Mind Concern for American Consumers*. International Food Information Council (IFIC), Washington, D.C.

Venkatramesh, M., Karunanandaa, M. S., Gunter, C., Thorne, G., and Crowley, J., 2000. Increased Sterol Content in Oilseeds Through Biotechnology. Annual Meeting of the American Society of Plant Physiologists, July 15-19, San Diego, CA.

West, G. E., Larue, B., Gendron, C. and Lambert, D.K., 2002, Consumers' Valuation of Functional Properties of Food: Results from a Canada-Wide Survey. *Canadian Journal of Agricultural Economics*, **50** (4), 541-588.

Wirthgen, B., Kuhnert, H., Altmann, M., Osterloh, J., and Wirthgen, A., 1999. Die regionale Herkunft von Lebensmitteln und ihre Bedeutung für die Einkaufsentscheidung der Verbraucher. *Berichte über Landwirtschaft,* **77** (2), 243-261.

Yankah, V. V., Jones, P. J. H., 2001. Phytosterols and Health Implications - Efficacy and Nutritional Aspects. Inform, 12, 899-903.

Notes

1) The interpretation of effect-coded variables differs slightly from that of dummy-coded variables: Within the effect coding, the estimated coefficients represent the deviation from the general average as opposed to the deviation from the reference category in case of the dummy coding. The coefficient of the reference category is not zero as under dummy coding, but the negative sum of the included variables, so that the *total average equates to zero*.

2) For the exact implementation of an orthogonal-polynomial coding see Louvière et al. (2001, pp. 267 et seq.).

3) The likelihood-ratio is defined as $\rho = 1-(LL(\hat{\beta})/LL(0))$, where $LL(\hat{\beta})$ denotes the *LL* value using the estimated parameters and $LL(0)$ the LL value if all parameters are equated to 0 (Louvière et al., 2001, pp. 53 et seq.). The corrected likelihood-ratio is adjusted by the number of degrees of freedom. A definition can be found in Louvière et al. (2001, p. 55).

4) The coefficient of the variable *NATIVE*, e.g., is much higher for the alternative "conventional" than for the "organic" one.

5) Interpreting the coefficients the effect coding is to be taken in account, i.e. the value of the reference categories is not 0 like with the dummy coding, but the negative sum of the included variables. In case of the first MNL model, for instance, the reference category "without extra utility" amounts to the following value: "without extra utility" = -(*OMEGA* + *PHYTO*) = -(0.229 + 0.028) = -0.257.

6) In general, it has to be borne in mind that a superior situation of decision-making between the different cultivation methods is examined in the present study. Therefore, it is quite possible that the characteristic "native" would play a more important role if the respondents had to decide between two ecological rapeseed oils. In the present analysis, however, it is rather irrelevant.

AGRARÖKONOMISCHE DISKUSSIONSBEITRÄGE

– DISCUSSION PAPERS IN AGRICULTURAL ECONOMICS –

Nr. 1 –40: siehe Agrarökonomische Diskussionsbeiträge Nr. 72.

41. Manfred WIEBELT, Allgemeine Wirtschaftspolitik und Agrarsektorentwicklung in Entwicklungsländern - Eine allgemeine Gleichgewichtsanalyse. Februar 1997, 31 Seiten.
(als erweiterte Fassung erschienen unter dem Titel "Wie beeinflußt die allgemeine Wirtschaftspolitik die Landwirtschaft? Transmissionsmechanismen und ihre quantitative Bedeutung" in "Berichte über Landwirtschaft", Band 75 (1997), Heft 4, S. 515-538)

42. Kerstin PFAFF und Eva BEIMDICK, Der internationale Teemarkt: Marktüberblick, Protektionsanalyse und Entwicklung ökologisch erzeugten Tees. Februar 1997, 38 Seiten.

43. Anke GIERE, Roland HERRMANN und Katja BÖCHER, Wie beeinflussen Ernährungsinformationen den Nahrungsmittelkonsum im Zeitablauf? Konstruktion eines Ernährungsinformationsindexes und ökonometrische Analyse des deutschen Butterverbrauchs. Mai 1997, 44 Seiten.
(gekürzte und geänderte Fassung erschienen unter dem Titel "Ernährungsinformationen und Nahrungsmittelkonsum: Theoretische Überlegungen und empirische Analyse am Beispiel des deutschen Buttermarktes" in "Agrarwirtschaft", Jg.46 (1997), Heft 8/9, S.283-293)

44. Joachim KÖHNE, Die Bedeutung von Preisverzerrungen für das Wirtschaftswachstum der Reformländer in Mittel- und Osteuropa. September 1997, 16 Seiten.

45. Christoph R. WEISS, Firm Heterogeneity and Demand Fluctuations: A Theoretical Model and Empirical Results. September 1997, 16 Seiten.

46. Roland HERRMANN und Claudia RÖDER, Some Neglected Issues in Food Demand Analysis: Retail-Level Demand, Health Information and Product Quality. Oktober 1997, 27 Seiten.
(überarbeitete Fassung erschienen in „Australian Journal of Agricultural and Resource Economics“, Vol.42, No.4, 1998, S. 341-367)

47. Timothy JOSLING, The WTO, Agenda 2000 and the Next Steps in Agricultural Policy Reform. Mai 1998, 46 Seiten.

48. Kerstin PFAFF, Marktstruktur- und Preisasymmetrieanalyse der Fleischbranche in Mittelhessen. September 1998, 60 Seiten.

49. Kerstin PFAFF und Marc C. KRAMB, Veterinärhygiene- und Tierseuchenrecht: Bedeutender Standortnachteil für Erzeuger und Schlachthöfe in Hessen? Oktober 1998, 22 Seiten.

50. Axel REINHARDT, Determinanten der Investitionsaktivitäten der Ernährungsindustrie. Empirische Ergebnisse für die deutsche Fruchtsaftindustrie. Dezember 1998, 34 Seiten.

51. Roland HERRMANN, Claudia RÖDER und John M. CONNOR, How Market Structure Affects Food Product Proliferation: Theoretical Hypotheses and New Empirical Evidence for the U.S. and the German Food Industries. Februar 1999, 58 Seiten.

52. Roland HERRMANN und Richard SEXTON, Redistributive Implications of a Tariff-rate Quota Policy: How Market Structure and Conduct Matter. März 1999, 60 Seiten.
(ein Teil wurde in stark veränderter Form unter dem Titel "Market Conduct and Its Importance for Trade Policy Analysis: The European Banana Case" veröffentlicht in: MOSS, C., G. RAUSSER, A. SCHMITZ, T. TAYLOR und D. ZILBERMAN (eds.) (2001), Agricultural Globalization, Trade and the Environment. Dordrecht: Kluwer Academic Press, S. 153-177)

53. Stanley R. THOMPSON und Martin T. BOHL, International Wheat Price Transmission and CAP Reform. Juni 1999, 11 Seiten.

54. Michaela KUHL und P. Michael SCHMITZ, Macroeconomic Shocks and Trade Responsiveness in Argentina – A VAR Analysis. Juni 1999, 19 Seiten und Anhang.
(erschienen in "Konjunkturpolitik", Jg. 46, 2000, Heft 1/2, S. 62-92)

55. Roland HERRMANN, Johannes HARSCHE und Kerstin PFAFF, Wettbewerbsnachteile der Landwirtschaft durch unvollkommene Märkte und mangelnde Erwerbsalternativen? Juni 1999, 17 Seiten.
(etwas gekürzte Fassung erschienen in "Zeitschrift für Kulturtechnik und Landentwicklung", Heft 5/6, 1999, S.282-288)

56. Stanley R. THOMPSON und Wolfgang GOHOUT, CAP Reform, Wheat Instability and Producer Welfare. August 1999, 15 Seiten.

57. Silke SCHUMACHER, Nachwachsende Rohstoffe in Hessen: Analyse und Bewertung anhand des Fallbeispiels Raps. August 1999, 24 Seiten.

58. Ernst-August NUPPENAU, Nature Preservation as Public Good in a Community of Farmers and Non-Farm Residents: Applying a Political Economy Model to Decisions on Financial Contributions and Land Allocation. August 1999, 40 Seiten.
(wurde in veränderter Form unter dem Titel "Public Preferences, Statutory Regulations and Bargaining in Field Margin Provision for Ecological Main Structures" veröffentlicht in "Agricultural Economics Review", Vol. 1 (2000), No. 1, S. 19-32)

59. Stanley R. THOMPSON, Roland HERRMANN und Wolfgang GOHOUT, Agricultural Market Liberalization and Instability of Domestic Agricultural Markets: The Case of the CAP. März 2000, 18 Seiten.
(erschienen in "American Journal of Agricultural Economics", Vol. 82 (2000), No. 3, S. 718-726)

60. Roland HERRMANN, Marc KRAMB und Christina MÖNNICH, The Banana Dispute: Survey and Lessons. September 2000, 29 Seiten.
(gekürzte und stark veränderte Fassung erschienen in „Quarterly Journal of International Agriculture“, Vol. 42 (2003), No. 1, S. 21-47)

61. Roland HERRMANN, Stephanie KRISCHIK-BAUTZ und Stanley R. THOMPSON, BSE and Generic Promotion of Beef: An Analysis for 'Quality from Bavaria'. Oktober 2000, 18 Seiten.
(geänderte Fassung erschienen in „Agribusiness – An International Journal“, Vol. 18 (2002), No. 3, S. 369-385)

62. Andreas BÖCKER, Globalisierung, Kartelle in der Ernährungswirtschaft und die Möglichkeit der Neuen Industrieökonomie zur Feststellung von Kollusion. November 2000, 37 Seiten.

63. Kerstin PFAFF, Linkages Between Marketing Levels in the German Meat Sector: A Regional Price Transmission Approach with Marketing-Cost Information. Mai 2001, 17 Seiten.
(stark überarbeitete Fassung erschienen unter dem Titel „Processing Costs and Price Transmission in the Meat Marketing Chain: Analysis for a German Region“, in “Journal of International Food and Agribusiness Marketing”, Vol. 15 (2003), Nos. 1/2, S. 7-22 von Kerstin PFAFF, Sven ANDERS und Roland HERRMANN)

64. Roland HERRMANN, Anke MÖSER und Elke WERNER, Neue empirische Befunde zur Preissetzung und zum Verbraucherverhalten im Lebensmitteleinzelhandel. Mai 2001, 28 Seiten.
(stark veränderte Fassung erschienen in „Agrarwirtschaft“, Jg. 51 (2002), Heft 2, S. 99-111)

65. Stanley R. THOMPSON, Wolfgang GOHOUT und Roland HERRMANN, CAP Reforms in the 1990s and Their Price and Welfare Implications: The Case of Wheat. Dezember 2001, 14 Seiten.
(erschienen in “Journal of Agricultural Economics”, Vol. 53 (2002), No. 1, S. 1-13)

66. Andreas BÖCKER, Extending the Application of Experimental Methods in Economic Analysis of Food-Safety Issues: A Pilot Study on the Impact of Supply Side Characteristics on Consumer Response to a Food Scare. Juni 2002, 30 Seiten.
(veränderte Fassung erschienen unter dem Titel “Consumer response to a food safety incident: Exploring the role of supplier differentiation in an experimental study” in “European Review of Agricultural Economics”, Vol. 29 (2002), No. 1, S. 29-50)

67. Andreas BÖCKER, Perception of Food Hazards – Exploring the Interaction of Gender and Experience in an Experimental Study. Juni 2002, 24 Seiten.
(stark veränderte Fassung erschienen unter dem Titel “Geschlechterdifferenzen in der Risikowahrnehmung bei Lebensmitteln genauer betrachtet: Erfahrung macht den Unterschied” in “Hauswirtschaft und Wissenschaft“, Jg. 29 (2002), Heft 2, S. 65-75)

68. Roland HERRMANN und Anke MÖSER, Preisrigidität oder Preisvariabilität im Lebensmitteleinzelhandel? Theorie und Evidenz aus Scannerdaten. Juni 2002, 29 Seiten.
(erschienen in „Konjunkturpolitik“, Jg. 48 (2002), Heft 2, S. 199-227)

69. Sven ANDERS, Johannes HARSCHE und Roland HERRMANN, The Regional Incidence of European Agricultural Policy: Measurement Concept and Empirical Evidence. Oktober 2002, 18 Seiten.
(wesentlich überarbeitete Fassung erschienen unter dem Titel „Regional Income Effects of Producer Support under the CAP“ in „Cahiers d’Economie et Sociologie Rurales“, No. 73, 2004, S. 104-121 von Sven ANDERS, Johannes HARSCHE, Roland HERRMANN und Klaus SALHOFER)

70. Roland HERRMANN, Nahrungsmittelqualität aus der Sicht der Verbraucher und Implikationen für Pflanzenproduktion und Politik. Juni 2003, 16 Seiten.

71. Sven ANDERS, Agrarökonomische Analyse regionaler Versorgung. November 2003, 20 Seiten.
(erschienen in: T. MARAUHN und S. HESELHAUS (Hrsg.) (2004), „Staatliche Förderung für regionale Produkte“, Mohr Siebeck, Tübingen, S. 73-92)

72. Sabine KUBITZKI, Sven ANDERS und Heiko HANSEN, Branchenspezifische Besonderheiten im Innovationsverhalten des Ernährungsgewerbes: Eine empirische Analyse des Mannheimer Innovationspanels. Dezember 2003, 23 Seiten.
(erweiterte Fassung von S. KUBITZKI und S. ANDERS, erschienen in „Agrarwirtschaft (German Journal of Agricultural Economics)“, Jg. 54 (2005), Heft 2, S. 101-111)

73. Roland HERRMANN und Anke MÖSER, Psychological Prices of Branded Foods and Price Rigidity: Evidence from German Scanner Data. März 2004, 27 Seiten.
(stark veränderte Fassung erschienen in “Agribusiness – An International Journal”, Vol. 22 (2006), No. 1, S. 51-67)

74. Roland HERRMANN, Sven ANDERS und Stanley THOMPSON, Übermäßige Werbung und Marktsegmentierung durch staatliche Förderung der Regionalvermarktung: Eine theoretische Analyse. März 2004, 18 Seiten.
(erweiterte Fassung erschienen in „Agrarwirtschaft (German Journal of Agricultural Economics)“, Jg. 54, Heft 3 (2005), S. 171-181)

75. Andreas BÖCKER, Jochen HARTL, Christoph KLIEBISCH und Julia ENGELKEN, Extern segmentierte Laddering-Daten: Wann sind Segmentvergleiche zulässig und wann Unterschiede zwischen Segmenten signifikant? - Ein Vorschlag für einen Homogenitätstest. März 2005, 62 Seiten.

76. Sven ANDERS, Measuring Market Power in German Food Retailing: Regional Evidence. März 2005, 16 Seiten.

77. Heiko HANSEN und Johannes HARSCHE, Die Förderung landwirtschaftlicher Erzeugnisse durch die Europäische Agrarpolitik: Regionale Auswirkungen in Deutschland und Bestimmungsgründe. April 2005, 13 Seiten.
(erschienen in: Unternehmen im Agrarbereich vor neuen Herausforderungen, Schriften der Gesellschaft für Wirtschafts- und Sozialwissenschaften des Landbaues e. V., Band 41, 2006, S. 471-481)

78. Johannes HARSCHE, Die Bestimmungsgründe der Agrarförderung in Industrieländern und Schwellenländern. Mai 2005, 14 Seiten.

79. Jochen HARTL und Roland HERRMANN, The Role of Business Expectations for New Product Introductions: A Panel Analysis for the German Food Industry. Oktober 2005, 18 Seiten.
(etwas veränderte Fassung erschienen in “Journal of Food Distribution Research”, Vol. 37 (2006), No. 2, S. 12-22)

80. Sven ANDERS, Johannes HARSCHE, Roland HERRMANN, Klaus SALHOFER und Ramona TEUBER, The Regional Allocation of EU Producer Support: How Natural Conditions and Farm Structure Matter. Januar 2006, 32 Seiten.
(überarbeitete Fassung erschienen unter dem Titel „The Interregional and Intertemporal Allocation of EU Producer Support: Magnitude and Determinants“ in “Jahrbuch für Regionalwissenschaft” – Review of Regional Research”, Vol. 27 (2007), No. 2, S. 171-193)

81. Sven ANDERS, Stanley THOMPSON und Roland HERRMANN, Markets Segmented by Regional-Origin Labelling with Quality Control. Mai 2007, 27 Seiten.
(zur Veröffentlichung angenommen in „Applied Economics“, 2007)

82. Heiko HANSEN und Yves SURRY, Die Schätzung verfahrensspezifischer Faktoreinsatzmengen für die Landwirtschaft in Deutschland. Juni 2007, 14 Seiten.
(erschienen in: Good Governance in der Agrar- und Ernährungswirtschaft, Schriften der Gesellschaft für Wirtschafts- und Sozialwissenschaften des Landbaues e. V., Band 42, 2007, S. 439-449)

83. Meike HENSELEIT, Sabine KUBITZKI, Daniel SCHÜTZ und Ramona TEUBER, Verbraucherpräferenzen für regionale Lebensmittel - Eine repräsentative Untersuchung der Einflussfaktoren -. Juni 2007, 26 Seiten.
(in veränderter Form erschienen in “Berichte über Landwirtschaft”, Band 85 (2007), Heft 2, S. 214-237)

84. Sabine KUBITZKI und Wiebke SCHULZ, Das Nachfrageverhalten bei regionalen Spezialitäten: Das Beispiel Apfelwein in Hessen. Juli 2007, 21 Seiten.
(überarbeitete Fassung erschienen in “Jahrbuch der Absatz- und Verbrauchsforschung”, Jg. 53 (2007), Heft 2, S. 208-224)

85. Jochen HARTL, Anwendung der Meta-Analyse zur Identifizierung von Determinanten der Zahlungsbereitschaft für genetisch veränderte Lebensmittel. September 2007, 32 Seiten.

86. Heiko HANSEN, Temporal Instability and Redistributive Dynamics of Gross Transfers Arising from EU’s Common Agricultural Policy. November 2007, 12 Seiten.

87. Michael GAST und Roland HERRMANN, Determinants of Foreign Direct Investment of OECD Countries 1991-2001. Juli 2008, 23 Seiten.

88. Gergely SZOLNOKI, Dieter HOFFMANN und Roland HERRMANN, Quantifizierung des Einflusses der äußeren Produktgestaltung auf die Geschmacksbewertung und auf die Kaufbereitschaft bei Wein mittels eines Charakteristika-Modells. Juli 2008, 20 Seiten.

89. Jochen HARTL und Roland HERRMANN, Do They Always Say No? German Consumers and Second-Generation GMO Foods. Oktober 2009, 18 Seiten.