‘GMO-Free’ Labels – Enhancing Transparency or Deceiving Consumers?

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Abstract
Since most consumers particularly in industrialised countries are concerned about the application of genetic engineering in food production, producers in many nations got the opportunity to label products as free of genetically modified organisms (GMOs) by the introduction of legal regulations. Standards of these regulations for labelling food products 'GMO-free' usually relate to product itself, not to the process of production. Therefore, it is quite possible that consumers' understanding of 'GMO-free' differs from what the label actually stands for, especially regarding animal products. We conducted a consumer survey in order to explore potential gaps between their ideas of 'GMO-free' food and what the label actually stands for at the example of the German regulation covering the labelling of foods as 'GMO-free'.

Keywords: Genetic Engineering, Food Labelling, Consumer Survey

JEL Codes: D12, D81, Q18

Problem Statement

Genetically modified organisms (GMOs) in food are a growing concern for consumers who are worried about the impact that GMOs may have on their health (BANSAL et al. 2007, 17). Although the harmful nature of GMOs has been questioned, especially by commercial seed providers and agriculture producers, and no scientific evidence has been provided yet to suggest that genetic modification of crops could be harmful to humans, many consumers feel a visceral reaction to the thought of eating food that has been genetically modified. Furthermore, a lot of people are afraid about the consequences genetically engineering in agriculture may have for nature and environment. Hence, they would prefer to be able to make conscious choices about whether genetic engineering has been applied during the production process of food products. A lot of consumers especially in industrialised countries (e.g., CURTIS et al. 2004; BANSAL et al. 2007) desire to avoid GMOs in food and thus need to be informed if genetically engineering has been applied at any stage of the production process. Most consumers and organisations pushing for labelling want the process labelled (EINSIEDEL 2000; BANSAL et al. 2007). This is confirmed by a representative survey about the opinion of German consumers towards genetic engineering in food production from 2005 (DÖHRING 2005), in which about sixty percent of the respondents expected that food products declared as being free from GMOs have not come into contact with genetic engineering on any stage of the production process.

In Germany, there has been a regulation concerning the voluntary labelling of 'GMO-free' products since 1998 based on the European Novel Food Regulation, which was replaced by the regulation (EC) No 1829/2003 of the European Parliament and of the Council of 22nd September 2003 on genetically modified food and feed. In May 2008, the German Government revised the regulation covering the labelling of foods as 'GMO-free'[1]. For the

[1] The labelling of genetically modified foods and feed is part of regulation EC Nr. 1829/2003 on genetically modified food and feed.

former regulation, the following rules had to be kept in order to be permitted to label a product as ‘GMO-free’:

- The product should neither be genetically modified nor be made of any genetically modified ingredient;
- No additives like e.g. enzymes, which had been made by using GMOs;
- Animals must not be given any feed which had been in contact with any kind of genetic engineering. Additionally, no drugs or vaccines made by using GMOs were allowed.

All of these restrictions have been quite hard both to control and to keep. Hence, nearly no food producer made use of the possibility to label products as ‘GMO-free’. Accordingly, the aim of the revision of the regulation in Germany in 2008 was particularly to make it easier for food producers to apply the label ‘GMO-free’. By that, more producers shall be given the possibility to actively promote their ‘GMO-free’ products.

However, most controversial in this case are modifications in the requirements a product has to fulfil in order to be permitted to carry the ‘GMO-free’ label. Compared to the previous regulation, requirements were lowered, particularly for animal products. They now can be labelled as ‘GMO-free’ as long as no genetically modified feed crops have been used in a certain time period before slaughtering, milking or laying eggs. It is not required that the animals have been fed with non-modified crops for their whole life. Moreover, the administration of drugs as well as the use of enzymes, vitamins and amino acids that have been produced with genetically modified organisms is allowed as long as the final product does not contain any GMOs. Such additives are not allowed for vegetable produce labelled as ‘GMO-free’. These facts created a heated debate if the new regulation is of use for consumers or if it is rather misleading. Nevertheless, producers apparently embrace the new regulation and start to label products as ‘GMO-free’. CAMPINA is the first multinational dairy which

uses the new ‘GMO-free’ label for one of their milk brands distributed in Germany, according to a press release from September 2008 (CAMPINA 2008).

Objectives

Given this background, the present paper tries to shed light on the question whether this kind of ‘GMO-free’ labels really helps consumers to find the products they want, or if they in fact rather mislead them. Proponents of product-based regulations argue that such a kind of labelling benefits consumers by causing an increased variety of ‘GMO-free’ products on the shelves because such labelling standards are easier both to comply with and to control. Opponents, however, argue that consumers expect from a ‘GMO-free’ labelled product that it has been produced without any form of genetic engineering throughout the whole production chain. Since this is not necessarily the case for animal products, from their point of view the label misleads consumers. Hence, the following questions emerge: First, what are consumers expecting from a ‘GMO-free’ label? How big are the gaps between what consumers demand from the label ‘GMO-free’ and what it stands for? Second, does it make a difference in the view of consumers at which stage of the production chain and in which intensity genetic engineering has been applied? Third, does the importance of being free from any kind of genetic engineering vary between product categories in the perception of consumers? And finally, how important are different aspects of genetic engineering in food production for consumers’ purchase decision?

When looking at the literature, you can find a number of descriptive studies that generally explore consumers’ opinions and attitudes towards genetically modified food. The European Commission regularly conducts representative surveys on biotechnology (GASKELL et al. 2006). The most recent one of them, conducted in 2005, comes to the conclusion, that medical and industrial biotechnologies are broadly supported by the general public, whereas a strong opposition to agricultural biotechnologies exists. In the United States, the International Food

Information Council and the Food Policy Institute carried out comprehensive surveys on this issue, which indicate that American consumers have more positive attitudes towards the application of genetic engineering than Europeans (HALLMAN et al. 2002). A number of academic research papers try to explain the differences in consumer attitudes across countries and to explore the impact factors on the attitudes towards genetically modified foods (BREDAHL 2001; NELSON 2001; CURTIS et al. 2004; GASKELL et al. 2006). Consumer attitudes are directly formed by the perceived risks and benefits of genetically modified food (BREDAHL 2001, HOUSE et al. 2004), which in turn are affected by general consumer attitudes, e.g. attitudes towards the environment, consumer knowledge and trust in regulation bodies, as well as by socio-demographic characteristics (HARTL 2008). Many authors investigated the impact of subjective and objective knowledge as well as the level of information on consumer demand for genetically modified (GM) food, trust in risk regulation and its consequences for the acceptability of GM food and the impact of food labelling policy strategies on this issue (e.g., HOUSE et al. 2004; POORTINGA and PIDGEON 2005; LUSK and ROZAN 2008; WACHENHEIM and VANWECHEL 2004).

This list could be continued ad infinitum, but missing in the present literature are empirical results on consumer attitudes towards and expectations of 'GMO-free' labelled food products. Therefore, it appeared to be necessary to mine data in order to tackle the questions given above by doing a consumer survey. In this paper we first present the procedure of our research and then some interesting results that emerged from the survey. After that we discuss our findings and finally we derive conclusions about a regulation concerning the permission to put 'GMO-free' labels on animal food products.

Procedure

We conducted an online consumer survey of which the data collection lasted from the 17th until the 28th of October in 2008. The sample consisted of 1012 participants recruited from an

online-access panel. All of the participants were living in Germany, but for the reason that citizens of this country do not diverge significantly in their attitudes towards genetic engineering in food production from at least most European member states (GASKELL et al. 2006), the results can be seen as transferable for many industrialised countries. However, it has to be pointed out that the resistance in Europe against GM foods is somewhat higher than in Canada for example, and significantly higher than in the United States (NELSON 2001; CURTIS et al. 2004; GASKELL et al. 2006, 83). The recruitment process of survey participants from the online-access panel included quotas about gender, age (only within the range from 16 to 59 years, since elderly people are hardly reachable via internet) and place of residence. The average time to complete a questionnaire was about 15 minutes.

According to the literature we expected that besides socio-demographic characteristics also consumers' involvement in food products and food neophobia as well as consumption habits, attitudes towards the environment and knowledge about genetic engineering in food production would have an impact on what consumers expect from 'GMO-free' labelled food and how far they are prepared to tolerate the application of genetic modifications during the production process. Hence, our questionnaire consisted of the following parts: In the first part, people were asked about habits and attitudes related to food and nutrition. Food neophobia was measured using a subset of items from the scale developed by PLINER and HOBDEN (1992). The items measuring consumers' involvement in food products are based on the scales developed by LAURENT and KAPFERER (1985) as well as MITTAL and LEE (1989) which measure product unspecific consumer involvement. A reliability analysis of the pre-test data was applied to establish reduced scales of both food neophobia and involvement in food products that were used in the final questionnaire. In the second part we asked about subjective and objective measures of consumers' knowledge and experience with genetic engineering in agriculture, together with questions about image and expectations of a 'GMO-free' label. After that, people were asked in the third part to state preferences regarding the

application of genetic engineering in livestock production and to complete a choice experiment in the fourth part, which should help to validate stated preferences. Then, attitudes towards genetic engineering in food production were measured using items from the scale suggested by BREDAHL (2001) and HARTL (2008). Also general attitudes about ethical and environmental issues in the context of genetic engineering were taken, before in the last part participants were asked about socio-demographics and were given the opportunity to give feedback about the issue and the interview. Altogether, the survey was centred on the labelling of animal based products as 'GMO-free'. The products used in questions about purchase and consumption as well as in the choice experiment comprised milk, eggs, ground pork and ground beef. In addition to descriptive statistical methods, multivariate methods of analysis were applied to analyse the survey data.

Results

The sample is fairly representative for the German population, at least in the age group from 16-59 years. Exactly half of the participants (506 people) are male, which is due to the quota we set. The level of both income and education in the sample is slightly higher in the sample than in the population of Germany, which can partly be reasoned by the fact that participants of online surveys usually are higher educated and therefore get higher salaries on average.

Considering knowledge and experience with genetic engineering in food production, most of the participants have worried about genetic engineering in agriculture already, at least once or twice. About 22% stated that they have worried about it oftentimes, whereas only about ten percent said that they have never thought about it before the survey. When they were shown one of the most common forms of the new 'GMO-free' label, more than seventy percent denied that they had seen such a label before. About 23% of the survey participants ticked the option that they had seen the label already on food products and less than ten percent gave television or newspapers as the source where they had noticed the label already. Hence,

apparently the new label is not yet very common in Germany. Considering knowledge about genetic engineering, we first asked about how well participants believe themselves to be informed about genetically manipulated food. People could classify themselves on a six-step scale ranging from ‘very well informed’ to ‘not at all informed’ whereas steps in between were represented by numbers only. The following figure 1 shows the results of this question:

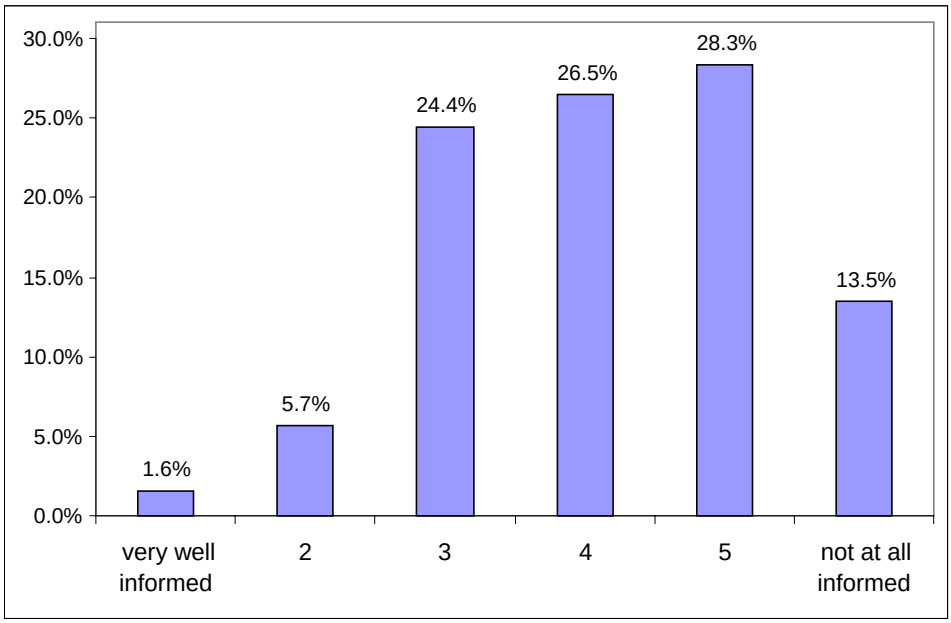

Figure 1: Response Scheme to the Question: ‘How well do you feel informed about genetically modified foods?” N=1012

Obviously, the majority feels not very well informed about the issue, what makes it difficult for people to assess individual risks that are associated with genetic engineering in agriculture. Such a remarkable degree of uncertainty is partly confirmed by the next question, which comprised items that should help to measure knowledge concerning genetic engineering in the form of a quiz. This was done in the following way: Survey participants were given a list of statements regarding genetic engineering in agriculture and its risks for mankind and nature. The statements were taken from a European survey conducted in 2005 (GASKELL et al. 2006). For each statement they were invited to say whether they thought that it was true or false. They also could choose the option ‘Don’t know’. The average rate of people which stated not to have a clue about the right answer in this case was about one third,

whereas the proportion of right answers was about 52%. In the following table 1 the results of both our survey in the middle and those for 24,683 European participants of the survey from 2005 in the right column are presented.

Table 1: Quiz about genetic engineering - numbers represent percentage of respondents

		Own Survey			Eurobarometer 2005
		Right	**Wrong**	**Don't know**	**Right answer**
1	Cloning of creatures produces genetically identical copies of them.	79,2%	6,8%	14%	68,1%
2	Normal tomatoes do not have genes, while genetically modified ones do.	13,6%	56,4%	29,9%	59,1%
3	Genetically modified animals are always smaller than normal ones*.	5,5%	61,9%	32,6%	55,2%[a]
4	Human genes can mutate by eating genetically modified fruits.	21,5%	38,6%	39,8%	48,1%
5	It is possible to transfer genes from animals into plants.	26,2%	22%	51,8%	**

* This item was inversely formulated in the Eurobarometer.
** Numbers are not comparable.

Grey colour indicates correct answers.

Source: GASKELL et al. 2006; own.

Obviously, participants of our survey do not differ significantly concerning knowledge from other Europeans, but as you can see, the level of uncertainty is quite high and the quota of 'Don't know'-answers is striking. Only about 8% of respondents of our survey classified all the five of the statements correctly, while the average amount of correct classifications was about 2,6. The correlation coefficient between the perceived level of information according to figure 1 and the number of correct answers as indicator for the objective level of knowledge is highly significant with about 0,28.

As mentioned above, one of the main aims of the survey was to face consumers' expectations about the new 'GMO-free' label with what it stands for. There seems to be indeed a gap between consumers' expectations and the revised label standards.

Table 2: Expectations and fulfilment of production standards

	Should be allowed to carry the label	Should **not** be allowed to carry the label	Don't know	Permission to carry the label based on the regulation
Food product contains genetically modified organisms, e.g. yoghurt cultures, yeasts.	25,1%	**59,6%**	15,3%	No
Food contains enzymes or has been produced with the aid of enzymes, which were being obtained from genetically modified organisms.	26,9%	**56,1%**	17%	Yes
Animal feed contains genetically modified organisms.	8,4%	**78,3%**	13,3%	Yes and no*
Animal feedstuff contains additives which have been produced with the aid of genetically modified organisms.	11,9%	**73,5%**	14,6%	Yes
Drugs and vaccines for the animals have been produced with the aid of genetically modified organisms.	23,4%	**61,2%**	15,4%	Yes

* Until a certain time period before slaughtering / milking / laying eggs.

Source: own

As you can see from table 2, there seems to be a clear difference between consumers' understanding of 'GMO-free' and the requirements to carry the label. The application of drugs and additives that have been generated with the aid of GMOs is objected by most of the participants. Furthermore, about 78% refused that food products still should be allowed to carry the 'GMO-free' label if the fodder has been free from GMOs only for the required time period before product generation. We also surveyed if people make a difference between meat products on the one hand and milk and eggs on the other hand considering green light for genetically modified organisms in animal feedstuff. Obviously, people don't make a difference: More than ninety percent of the respondents gave the same answers for both groups of products, whereas 74% denied the 'GMO-free' label for products in which animals

have been fed without genetically modified crops only for a certain period before the raw material was taken from them. This observation could be validated by the choice experiment, which is explained later in this article. Hence, most consumers expect from ‘GMO-free’ labelled products that animals have never been fed with genetically modified fodder crops. As you can see, most consumers are clearly against genetically modified feed crops, whereas the tolerance for genetic engineering in the fields of medicine and food additives is somewhat higher. Also remarkable is the quota of people choosing the ‘Don’t know’-option, which is about 15% in the average. This again supports the observation that consumers are quite uncertain about the impact of genetically modifications in food production on health, well-being and nature.

In order to gather not only attitudes and opinions towards genetic engineering and conditions of the ‘GMO-free’ label, we also asked each of the respondents to complete a choice experiment about either eggs, or milk, or ground beef or ground pork. A screening question made sure that in the choice experiment participants only got products they regularly buy. Furthermore, a special setting in the online questionnaire provided for equal numbers of completed choice experiments, which means that for each product about 250 experiments were done. The experiment was done in the form of a choice based conjoint analysis (CBC). All considered products varied regarding the following aspects:

- Application of genetic engineering in the animal feed production (Contains GMOs; Free from GMOs at least for a certain time period; Free from GMOs);
- Application of feed additives that have been produced with the aid of GMOs (Yes; No);
- Administration of drugs and vaccines that have been produced by GMOs (Yes; No);
- Product origin (Germany, Hesse);
- Price (Low level; Medium level; High level).

The prices in the experiment were set according to consumer prices, whereas the lowest based on discounter prices, the medium one on the average price and the highest on prices for

organic food. The mean relative importance of product characteristics for participants of the experiment is shown in figure 2 below.

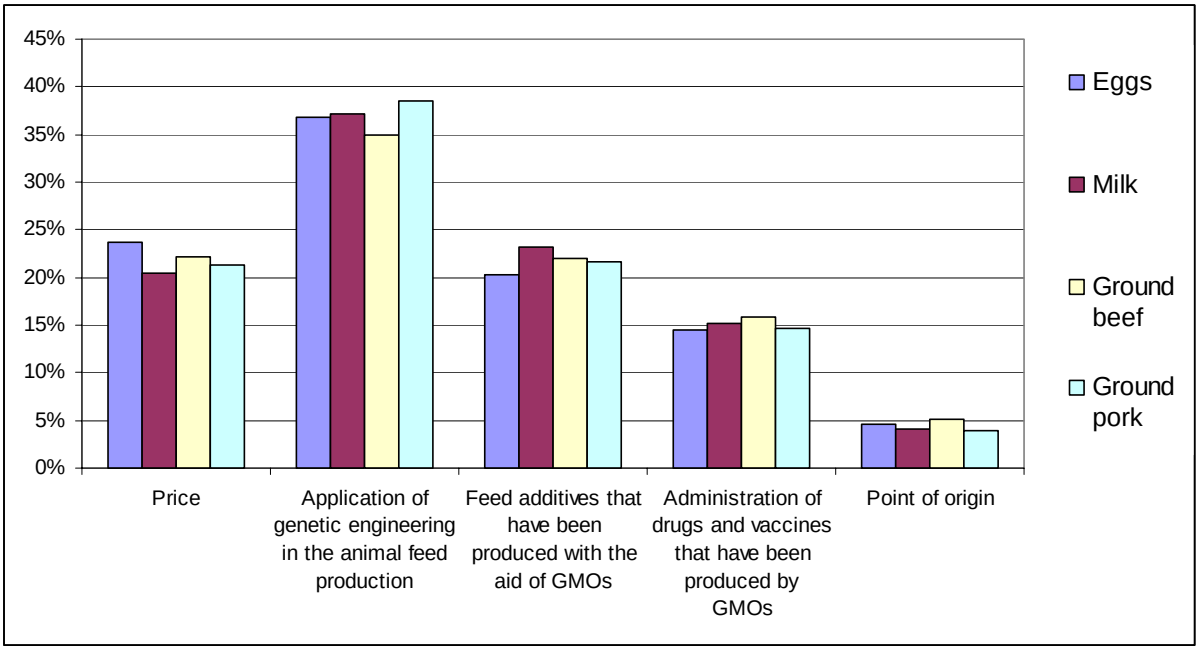

Figure 2: Relative importance of product characteristics as a result of the choice experiment for different products. N=1001

Source: own

As you can see from figure 2, highest importance was given to the characteristic of whether genetically engineering had been applied in the feed production. Furthermore, the question whether animal feed contains additives that have been produced with the aid of GMOs appears to be as important as the price attribute. The relative importance seems to be independent from the type of product, as already mentioned above, so the ranking of attribute importance is almost identical for all the four of the considered products. However, even though we tried to make the choice scenario as realistic as possible, you have to be careful with the interpretation of the results of the experiment. On the one hand, people are sensitised to the genetic engineering issue by previous questions, on the other hand, there might have occurred protest choices by people who are highly against genetic engineering in agriculture. Nevertheless, our results show that German consumers have a very high preference for food that has been produced completely without genetically engineering.

Discussion and Conclusions

Since at the time of writing this paper we are still busy with data analysis, our results are not complete yet and further results, especially concerning interdependencies, are highly anticipated. So far, the survey results demonstrate that consumers expectations of 'GMO-free' labelled food products do not comply with the requirements of the new 'GMO-free' label introduced by the German government this year. Due to eased requirements producers such as CAMPINA start using the 'GMO-free' label, but our empirical results show that only adequate information about the real claims of the 'GMO-free' label will avoid consumer deception and thus enable them to make conscious buying decisions. If label requirements for animal products remain as they are today, consumers who want to avoid any food that has come into contact with genetic engineering, not only for health reasons but also for ethical attitudes, can not rely on the 'GMO-free' label only, but have to buy organic products in order to be sure to buy completely 'GMO-free' products. Further conclusions will be given as soon as the data analysis is finished.

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