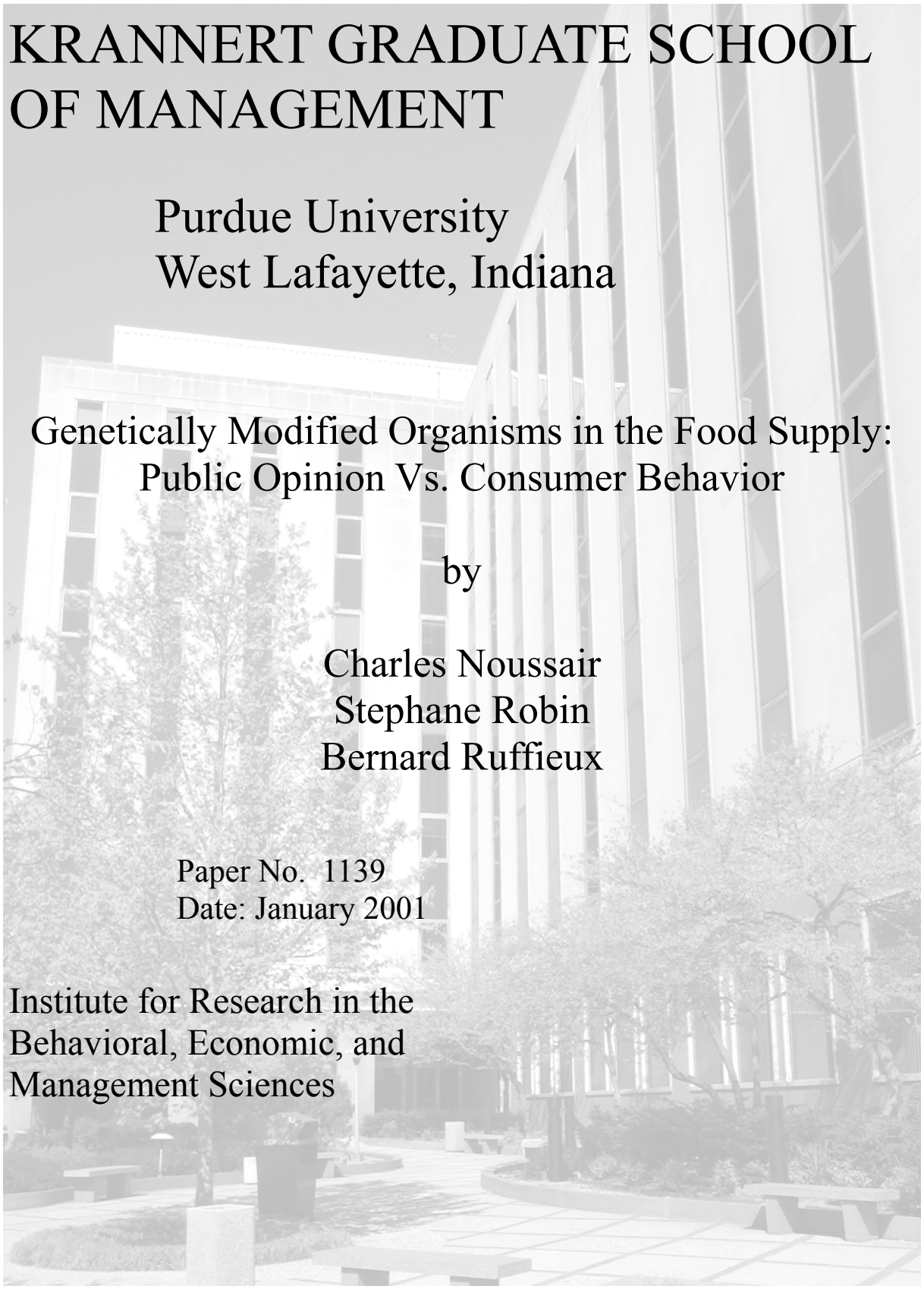

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Genetically Modified Organisms in the Food Supply: Public Opinion Vs. Consumer Behavior

by

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Genetically modified organisms in the food supply: Public Opinion vs. Consumer Behavior

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1. Introduction

The introduction of genetically modified organisms (GMO's) into food products has ignited a passionate debate, particularly in Europe. Regulatory agencies such as the FDA in the United States and the DGAL in France, on the basis of recommendations from the scientific community, have largely recognized that the GMO products currently available are safe for the consumer and the environment. Nevertheless, polling of European consumers consistently indicates a high degree of hostility toward the presence of GMO's in the food supply. This hostility has been exacerbated by the spread of the "mad cow" epidemic to the European continent, which has fueled further suspicion about the food supply. The tension between scientific and public opinion has complicated the formulation of government GMO policy[1], since in a democratic system, public opinion must be taken into account in addition to the scientific merits of the policy and the market pressures in the economy.

In response to this tension between scientific and public opinion, the policy adopted by most of the European as well as the Japanese governments has been to segregate GMO and GMO-free products at all stages of production, to require labeling of products containing GMO's

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[1] Currently in the United States there are no special rules for the authorization of the sale of GMO products. The laws that apply (the Coordinated Framework for the Regulation of Biotechnology – 51 FR 23302-23393, 6/16/86) specify the regulations on innovation, production, and sales. The regulations require evaluation of the risk to the health of humans, animals, and plants as well as the risk to the environment. The rules do not differ between genetically modified and conventional products. If the modification does not engender toxicity or allergic reactions, the new variety is typically considered as equivalent to the traditional varieties.

and to allow the market to determine which products are sold.[2] Though such a policy is free-market-oriented, some economists could view it as inefficient. Segregating the entire process of production is very costly to farmers and firms throughout the production chain[3]. Since there is no evidence that the GMO's approved by regulatory authorities are harmful, it can be argued that the expenditure represents deadweight loss. Requiring labeling of products as containing GMO's fuels the incorrect belief that they are dangerous.

On the other hand, if GMO foods do not require labeling, a possible "lemons" scenario may occur (Akerlof, 1970). The GMO's currently on the market were introduced for agronomic reasons and the foods containing them are indistinguishable from conventional foods for the consumer[4]. Since GMO's lower production costs, producers have an incentive to insert them into the food supply. Consumers, who value foods containing GMO's less than foods that do not contain GMO's, will respond by being unwilling to pay more than a price that reflects the presence of GMO's. This will cause a market collapse for non-GMO foods, which would reduce social welfare by eliminating potential gains from trade. Furthermore, it can cause a market collapse for entire products. If a firm cannot disclose that its product uses no ingredients that contain GMO's, it might replace ingredients that consumers believe may contain GMO's for products that cannot contain GMO's. This could eliminate the entire market for many products (soy lecithin, corn syrup, etc...)

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[2] The European regulatory approach to GMO's in food products is precise and preventative. It is based on legislation stemming from directives 90/219 and 90/220, which require a series of steps to evaluate the health and environmental risks of new food products containing GMO's. It does not apply to products already introduced at the time the law went into force (Bt corn from Novartis, and Round up Ready Soy from Monsanto). Neither does it apply to animal feed, additives, aromas, nor extraction solvents. Specific laws cover these industries. Regulation 528/97, the Novel Food Law, adopted on 1/27/1997 is the main law governing the labeling of products made with GMO's. Regulation 1139/98 proposes the creation of a threshold, whereby a product does not have to be labeled as genetically modified.

The French laws on the use of GMO's are versions of 90/220 and 528/97. Currently four types of corn and one type of soybean are authorized for cultivation and sale. Mandatory labeling rules exist for all products containing DNA and GM proteins. Products considered equivalent to conventional products do not require labeling. Equivalence means that there are no characteristics that are relevant to the consumer that differ between the two products. The legislation allows exemption from labeling for products that include no ingredient that consists of more than 1% GMO's. Other specific laws apply to additives, aromas and solvents. The law requires products that do not meet the GMO-free threshold to include the information "contains GMO's" in the list of ingredients of the product. The use of a designation "produced without use of biotechnologies" is under consideration.

[3] This cost is predominantly borne by the most upstream part of the production chain, the seed producers, farmers, and primary processors.

[4] GMO's have provided only innovations so far in the process whereby food products are made. However, it is widely recognized that some of the next generation of products containing GMO's will have characteristics that can be distinguished by the consumer, and that are included to make the product more appealing.

The appropriate labeling policy depends on the extent to which the impact of the hostility toward GMO's will be reflected in actual purchase decisions. This is unknown, because only very few GMO products have appeared on the market to date. The focus of this paper is to consider, using survey and experimental methods, the extent that the opinions expressed by consumers carry over to their purchase decisions, and to analyze the implications for labeling policy. The participants in our study are a demographically representative sample of residents of the Grenoble, France area. They are studied in their role as *consumers*, through their participation in laboratory markets, as well in their role as *citizens*, by means of a survey that measures their opinions on the introduction of GMO's into the food supply. We view France as an appropriate location for the study, because of the prominence of the issue from both the market and the public opinion perspectives. French citizens' groups have been at the forefront of the opposition in Europe to the inclusion of GMO's in the food supply. Since France is also the largest producer and exporter of agricultural products in Europe, its economy has a great deal at stake in GMO policy.[5]

The survey explores several dimensions of the citizens' opinions about GMO's in the food supply. The questions asked on the survey measure their knowledge about genetic engineering, the threshold at which they consider a food product to be GMO-free, their level of hostility toward the use of GMO's in foods, their views on the appropriate labeling rule for GMO products. In the data, we find a remarkably strong level of hostility toward GMO's spanning all segments of the French population.

We study purchasing behavior of consumers with a laboratory experiment designed to elicit the willingness to pay for products that contain GMO's compared to identical products without GMO's. Subjects bid for real consumer goods using the Becker-DeGroot-Marschak (BDM) mechanism (Becker et al. 1964), in which they have a dominant strategy to bid an amount equal to their true valuations for the good. We find that consumers fall into several categories. One group, constituting 14% of participants, bids an identical amount for GMO-free products and for products containing GMO's. Another group, about 35%, boycotts foods with GMO's entirely by refusing to pay any positive amount for them. Almost all of the remaining 51% demonstrates a positive willingness to pay for foods that contain GMO's but are willing to pay more for GMO-free foods. The hostility toward GMO's observed in the surveys is less intense in the market setting.

[5] In every year since 1979, France has been the largest exporter of agricultural products and foods in Europe, and second in the world behind the United States (except for in 1994). Since 1988, France has been the world's largest exporter of processed food products.

Our belief is that the differences between the survey data and the market data measure two different variables, and the apparent differences between the opinions expressed on the survey and the purchasing behavior in the market is reconcilable. The market places the subjects in their role as consumers, whereas the survey places then in the role of citizens. As consumers, they are mainly concerned with private dimensions of their preferences relevant to their own purchase decision. However, as citizens, they reveal the public dimension of their preferences, which take into account the preferences of others, concern about the environment, the process whereby production takes place and any other externalities from the widespread use of GMO's. We turn now to the general issues involved in formulating public policy toward GMO's.

2. Main Issues

Economists have noted that the proliferation of scientific advances and the integration of markets are the principal forces reshaping societies at the present time. The institutions of science and the market are the main engines of globalization (Romer, 2001). However, in some cases, the consensus of the scientific community can clash with public opinion, and both can be in conflict with the outcomes that arise on the market. As we argue below, the case of the first generation of GMO's in food products provides a prominent example.

2.1. The consumer vs. the citizen

The methodology we use allows us to contrast the opinions expressed by our subjects as citizens with their choices as consumers. Our experiment captures participants in their narrow role as consumers, that is as participants in the market. Consumers may tend to concentrate more on the product itself than on the process whereby the product was made, which they may view with disfavor, but would not alter their purchasing behavior.[6] Furthermore, if they believe that a product or the process whereby it was made causes a negative externality, as consumers they might only consider the marginal externality resulting from their individual use of a product, which is typically minimal.

On the other hand, surveys encourage participants to reply in their role as citizens. In this role, subjects may use information or beliefs in responding to the survey that they would not or

[6] Limits on sellers' communication of differences between two goods that are considered *substantial equivalents* encourage emphasis on the product rather then the process when making purchase decisions. These limits reflect the tradeoff between the benefits of providing more benefits to the consumer and the costs of misleading advertising that exaggerates the differences between one product and its competitors, which can have anti-competitive effects. The concept of *substantial equivalents* is defined by the WHO and

could not use when making purchasing decisions. They might take into account the process whereby a product was manufactured. They also might consider externalities from widespread use of a product that their choices in the market would not reflect. In the case of GMO's, positive externalities include perceived benefits to the environment from a reduction in pesticide use, and negative externalities include possible health risks to other members of society or contamination of wild plant species. Thus when production or consumption of a product causes negative (positive) externalities, one might expect a more unfavorable (favorable) evaluation of the product in the survey than is reflected in market behavior. For example, though consumers might personally be averse to eating GMO's, the fact that GMO's require fewer pesticides and fertilizer may lead them to give more favorable opinions in the survey that would be suggested by their own behavior as consumers.

2.2. Science vs. public opinion vs. the market

The case of the introduction of GMO's into the food supply is an example of a stark conflict between science and public opinion. The science-based regulatory agencies of the developed world such as the FDA have sound scientific evidence that the GMO's that have been approved for use in the food supply are safe for human consumption and for the environment. The products to be approved in the future would presumably also be safe. However, public opinion is resoundingly hostile, and there is little evidence on how the market will react. The more basic question at issue is that in deciding how much risk a society can afford to bear, what should be the relative weight accorded to the beliefs (which may be subjective) of 1) the scientific community, 2) public opinion, and 3) the market? In our study, any hostility toward GMO's revealed by the survey illustrates the conflict between science and public opinion. In our market experiment, any premium paid for non-GMO products reveals differences between the market and the scientific community. Any differences between the bidding behavior and the survey responses show that there is a difference between the outcomes produced by the market and outcomes consistent with the stated opinions of our participants.

2.3. GMO Policy alternatives

The forces of public opinion, the market and the scientific community all exert some degree of influence on public policy toward GMO's. The policy options concerning food products

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OECD as a standard for classifying products as similar. This constrains the ability to label products as GMO-free.

containing GMO fall roughly into four general classes: interdiction of GMO's, banning labeling, mandatory labeling, and voluntary labeling:[7]

Interdiction of GMO's: A policy of applying the *principle of precaution*[8] and banning GMO's offers several advantages. It sides with public opinion and placates the hostility of the population toward GMO's. It also minimizes the risk that any current or future GMO's will create any public health or environmental problems. However, this approach has the disadvantages that it resists the science and market driven economy, neglects the fact that innovation always requires the assumption of some additional risk, and could cause the country banning GMO's to lose some ground relative to other nations technologically and economically.

Banning labeling: The second possibility is to authorize GMO's but to forbid labeling to indicate their presence or absence. This approach also offers several advantages. It conforms to the recommendations of the scientific community. It eliminates misleading advertising for *substantial equivalents* (see footnote 6) that exaggerates the differentiation between products. Banning labeling also carries the lowest regulatory cost, since it only requires monitoring of whether labels contain any information about GMO content, and does not require any monitoring of actual product content. However, forbidding labeling also has some potential disadvantages. It makes science the only driver of the economy, and suppresses the possibility of the market to differentiate the products. Such a policy denies access to information about characteristics of the product or of the process that would influence consumers' decisions if it were available. In the case of GMO's, banning labeling could increase the level of hostility of citizens, who already feel that GMO's were inserted into their food supply without their consent.

Voluntary labeling: The third possibility is to allow voluntary disclosure of both the presence and the absence of GMO's. Presumably, at least for the current first generation of GMO products which do not increase the value of the product to the consumer,[9] only products that are GMO-free would be labeled. This would place products containing GMO's in the position of the conventional product, from which the GMO-free products would differentiate themselves. This is a market-oriented policy that would create a GMO-free niche market. It also has the advantage

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[7] See Caswell (1998, 2000) for a discussion of labeling policies for products containing GMO's.

[8] The principle of precaution is the current European position. The principle applies when an objective but preliminary scientific evaluation that it is reasonable to fear that the danger to the environment, or to human, animal, or plant species may exceed the guidelines of EU policy. Application of the principle requires that there are potentially dangerous effects and the scientific evaluation has not determined the level of risk with sufficient certainty.

[9] In the future, one might expect bioengineering of food products to be targeted to the consumer by, for example, enhancing the appearance or the nutritional content of products. Market pressures will require traceability and moving to Identity Preservation (IP) to trace the product along the entire production chain. This will make it less costly to segregate production into GMO-containing and GMO-free tracks.

that it requires minimal legislation. However, it also has the disadvantage that it increases inequality since it will be more difficult for lower-income consumers to afford GMO-free products than for higher-income individuals. It will also require monitoring and testing of products to ensure that the labels are accurate. There are also additional costs associated with segregating the products as well as marketing costs associated with the labeling.

Mandatory labeling: The fourth alternative is mandatory labeling of products containing GMO's. This gives the GMO-free product the role of the conventional product, and requires the GMO-containing products to differentiate themselves. Because there is an incentive to hide the fact that a product contains GMO's by making the disclosure difficult to read and find, the labeling may need to take the form of a prominent logo. Mandatory labeling is compatible with a science-oriented policy but is also responsive to public opinion. It is also compatible with a market-oriented policy. The potential disadvantages are the cost of monitoring the OGM content of foods to verify that advertising is truthful, and the cost of segregating the production processes. A second potential problem is that mandatory labeling might encourage exaggerated beliefs about the potential hazards from consuming products containing GMO's.

2.4. Labeling product vs. process

One issue in the classification of a product as GMO-free or not is whether or not the standard of being a GMO-free product imposes requirements only on the final product or also on the process of production. Placing requirements on the process of production imposes more constraints. For example, in the case of GMO's a requirement on the process would require positive labeling on animal products if GMO's were used in animal feed.[10] Meeting this type of requirement permits labels such as "produced without the use of genetic technologies". Typically, products labeled "organic" satisfy requirements on the process such as the preservation the environment and the non-use of pesticides, rather than on the final product itself.

In the case of GMO's, labeling the product as GMO-free can shift the lemons problem. Even though a product itself is labeled as containing no GMO's, if communication on the process does not exist, it could be made using GMO's without the knowledge of the consumer. If the consumer believes that production techniques involving GMO's might reduce costs for the producer, so that there is an incentive to use them, the consumer may boycott the product entirely.

[10] On the supply side, pressures on traceability, the possibility of tracking each unit of the product through the entire production process, and IP (identity preservation) are greater if there are requirements on the process.

2.5. Thresholds

At the present time it is impossible, if GMO's are authorized in the manufacture of a product, to intentionally make the product without any trace of GMO's, because contamination is very likely to occur. This technological fact requires a threshold different from zero at which a product is considered as GMO-free. The lower the threshold, the greater is the cost of production. The increase involves mostly the cost of testing the product, but also of producing very pure seeds, isolating parcels of land, and cleaning storage and transportation containers. We can expect consumers to value a product more highly the purer it is. However, the appropriate measure for purity is not obvious. Should the label GMO-free require an extremely low percentage of GMO-content, such as no ingredient being permitted to contain more than 0.1% GMO's? Or should the standard be closer to the US standard for when a product may be labeled as organic (at least 95% grown organically, measured by weight)? Public opinion and consumer behavior might diverge on this question, and it is one of the issues we investigate in our study.

3. Previous Work

3.1. Survey work

The most comprehensive source of information on consumer opinions in Europe is the Eurobarometer[11] survey, conducted on an ad hoc timetable on behalf of the European Commission. The survey conducted in late 1999, which covered the issue of biotechnology, revealed that, in general, Europeans did not expect biotechnologies, in contrast to advances such as the Internet and telecommunications technology, to have a positive impact on their lives. In general, men and young people are more optimistic about biotechnology that women and older people. On a scale from 1 (not at all in agreement) to 5 (totally in agreement), the average response of European and French participants in the Eurobarometer survey to selected questions on GMO's is given in table 1. The table shows that the average responses of French consumers are close to the averages for European consumers.

As far as the economic tradeoffs that the average European is willing to make the Eurobarometer contains other information of interest. In response to the statement "I would pay more for GMO-free foods", 53% said they were "mostly in agreement", while 36% were "mostly

[11] Eurobarometer 52.1, INRA-Europe (2000) *The Europeans and Biotechnology*, for the General Directorate for Research, European Commission, Brussels. The survey was carried out in every country of the European Union, between 1 November and 15 December 1999. This survey is the fourth in a series of Eurobarometer studies covering the same subject. The first was conducted in autumn 1991 (35.1), the second in spring 1993 (39.1), and the third in autumn 1996 (46.1). Details are available at: http://europa.eu.int/comm/research/pdf/eurobarometer-en.pdf

not in agreement" and 11% did not know. 66% indicated that they would not buy a product containing GMO's even if it had a better taste, 62% would not buy cooking oil that contained GMO's. 77% would not purchase eggs from chickens that were fed a diet containing GMO's. 88% of French consumers admitted that they were insufficiently informed about GMO's and 82% were willing to spend some time to become more informed. Overall, French citizens, as well as European citizens on the whole, find the presence of GMO's in their food to be unnatural, frightening, unnecessary, and with few benefits. The survey did not cover future expectations about GMO's in the food supply.

[Table 1: About Here]

3.2. Experimental Work

The only previous experimental economic research concerning GMO's is a study by Lusk et al. (2000). They use a technique to study consumer valuations similar to that used by Shogren et al (1994), Buzby et al. (1998), Hayes et al. (1995), Melton et al. (1996) and Roosen et al (1998). In these studies, subjects are endowed with a product that is considered to be a relatively "high-risk" or "low-quality" product. Subjects are required to consume the product at the end of the experimental session. The only way to avoid consuming the endowment is to bid in a demand-revealing auction (Vickrey, 1961) in which the winning bidders receive the right to trade the endowed product for a lower risk or a higher quality product. Sessions are typically organized as a sequence of periods, only one of which determines the final allocations and prices paid. The auction that counts is chosen at the end of the experiment using a randomizing device.

The Lusk et al. study, which uses students studying agriculture in the American Mid-West as subjects, finds that 70% of participants were unwilling to pay any money at all to exchange a product containing GMO's for an otherwise identical one that did not contain GMO's. The remaining participants were willing to pay a small premium for the GMO-free product. The study draws the conclusion that a niche market does exist in the United States for GMO-free products.

4. Methodology

4.1 The Participants

The participants in our study were a demographically representative sample of consumers in the Grenoble, France area. We used standard procedures, identical to those used by the French INRA (National Institute of Agronomic Research) to recruit our subjects. 97 subjects took part in the experiment, each one taking part in exactly one of the ten sessions of the experiment. The sessions took place between July 17th and 24th, 2000. The ages of the subjects ranged between 18 and 75 years, and averaged 33 years old. 52% were female. The socio-economic level of the sample was representative of the French urban population.

Subjects were recruited by sampling from the telephone directory of the city of Grenoble, located in the Rhone-Alpes region of France. Over 1000 telephone calls were necessary to recruit the 97 who participated in the study. Subjects were screened later in the recruiting process to make the sample more demographically representative after early recruiting attracted a disproportionate fraction of participants under age 25 and over age 60. At the time of recruitment, we did not give subjects any indication that the experiment concerned GMO's or potential risks to the food supply. Subjects were invited to come to the laboratory to sample food products for a government research project, which was not linked to private firms or marketing of any particular products. The filter we used was whether respondents were regular purchasers of biscuits. We intended the filter as a means to screen for household members who made purchase decisions, so that they would constitute a similar sample to those who took part in our survey.

4.2. The Experiment

Each session of the experiment took approximately two hours. The following table contains some summary information about the ten sessions of the experiment.

[Table 2: About Here]

4.3. The Bidding Process

In the experiment reported here, we used the Becker, DeGroot, and Marschak (BDM) mechanism to elicit willingness-to-pay information[12]. In theory, the mechanism has the ability to reveal bidders' valuations since in each auction, there is a dominant strategy to do so. That is, it is

[12] Technically, the BDM procedure is not an auction, since agents are not competing with each other for the items for sale. However, because of their parsimony, we will often use the term "bid" to refer to the submission of a limit price and the term "the auction" to refer to the process as a whole.

a best response, no matter what the other players do and regardless of the risk attitude of the bidder, to truthfully bid an amount equal to his willingness-to-pay.

The rules of the BDM mechanism are simple. Each subject simultaneously submits an offer price to the experimenter in a closed envelope. The experimenter than randomly draws a sale price from a pre-specified range of prices, that spans from zero to a price greater than the maximum willingness to pay among bidders. Any subjects who submitted a bid greater than the sale price receive an item and pay an amount equal to the sale price. The others do not receive units and make no payment. In the training periods, bids were public information but in stage 3, subjects received no information about the bidding strategies of other participants.

4.4. The Training Phase

Though previous studies of the BDM mechanism have shown it to be incentive compatible (see for example Irwin et al. 1998)[13], we nevertheless included a training phase to ensure that subjects learn to use the dominant strategy. This training proceeds in the following manner. At the beginning of a session, each subjects received 100 francs (roughly US$14) in cash. Subjects then participated in several auctions in which they bid for fictitious items. The fictitious items had induced values. Before the auction took place, each subject received a sheet of paper that indicated an amount of money for which they could redeem the item from the experimenter, should they purchase it in the auction. The induced value differed from subject to subject. The ability to redeem the items from the experimenter induced a limit price in the auction, since their payoff if they won the auction equaled the induced value minus the price they paid. The inclusion of the auctions with induced values had three objectives: to teach the subjects the rules of the auction, to eliminate the biases that tend to arise in bidding behavior, and to show subjects that the auction involve transactions where real money is at stake.

The dominant strategy of bidding one's valuation in the auctions is not at first obvious for most subjects. We chose not to directly inform the subjects of the dominant strategy, because it might provoke negative reactions which would induce undesired bidding behavior. We chose instead to use a technique whereby the subjects themselves come to understand the strategies that constitute optimal behavior.

After subjects submitted their bids, the experimenter wrote all of the valuations on the blackboard, publicly randomly drew a price from the range of possible valuations, and asked each

[13] Bohm et al. (1997) argue that the BDM can fail if it is used to elicit willingness to sell information, if the maximum sale price is inappropriately set. Here we do not face this type of problem since we are eliciting willingness to pay information and we can specify the minimum purchase price equal to zero.

subject which valuations belonged to subjects who would be receiving units of the good. Then the experimenter wrote the bids submitted on the blackboard next to their corresponding valuations. He then asked the following questions to the group of subjects, who were free to engage in open discussion on the topic. a) Which subjects received units in the auction? B) How much did the winners pay? c) Do any subjects regret the bids they submitted, now that they know how much the others bid? After the discussion, each of the winners received an amount of money equal to his induced value minus the price he was required to pay. The cash was physically placed on the desk in front of the subject after the auction. A series of identical auctions was conducted using the same procedure. The valuations in each period were randomly drawn each period. The auctions continued until at least 80% of they bids were within 5% of valuations.

We ended the training phase of each session with an auction of an actual consumer product rather than a fictitious product with an induced value. The consumer product was a bottle of wine, whose label was visible. After bidding, all of the bids were posted, but there was no discussion as in the earlier induced value auctions. There are two reasons that we add this stage. The first reason is that in the later purchase phase of the experiment subjects would be placed in a situation that is unfamiliar in two ways: Buying products whose labels and packaging have been removed, and buying products without knowing the sale price beforehand. We believe it is better to make this leap into the unknown in two steps, with the first step being the auctioning of a product with it's packaging and labeling. This auction also serves to illustrate to subjects that they are making real purchases of products that they can keep after the experiment, and that they are not in a simulation. To render this transparent, a bottle of wine is given to each winner who is required to pay immediately the price determined by the auction from his current cash total. This auction also makes subjects aware that other's valuations for real goods can differ from their own.

4.5. The Purchasing Phase

In this phase we auctioned four products, which we referred to as S, L, C, and N during the sessions. All four products are biscuits that are typically available in grocery stores and supermarkets throughout France, and we informed subjects of that fact before bidding began. The products are different from each other, but are close substitutes. This phase of the experiment consisted of 5 periods, as outlined in table 3. Each period consisted of the revelation of some information about some or all of the products, followed by an auction for the products. At the beginning of the purchasing phase, subjects received a sample of each of the four products to taste, without packaging or labeling. Before bidding in the first period, subjects tasted each product and marked down how much they liked the product on a scale where "I like it very

much" and "I don't like it at all" were at the extremes of the possible rating. Then the auction in period 1 took place. The sequence of activity is shown in table 3.

[Table 3: About Here]

The table shows the information made available to subjects at the beginning of each period. At the beginning of period 2, we informed the subjects that product S contained GMO's and that product N was GMO-free. No information was given about products L and C in period 2. At the beginning of period 3, we informed the subjects that each of the ingredients in L contained less than 1% GMO's and that each of the ingredients in C contained less than 1/10 of one percent GMO's. We did not announce any new information about products A and D. At the beginning of period 4, subjects received a four-page handout containing background information about GMO's. The information consisted of a) the definition of a GMO, b) what classifies a product as containing GMO's c) Which GM plants are authorized in France d) which food products contain GMO's, and e) what is the current French law regarding GMO's. Before the last period we revealed the brands of the four products and the label indicating that product S is organic.

4.6. The Survey

We conducted a survey of 429 consumers in the Grenoble, France area between March 10 and May 6, 2000. Participants were asked the survey questions while shopping at grocery stores and supermarkets throughout the city. We used the questions from the 1999 Eurobarometer survey as the basis for ours, but we added questions about future hopes and expectations about GMO foods. Some of our questions are identical to those of the Eurobarometer survey to allow us to verify that the responses of our sample conform to those of Eurobarometer. We also added more precise questions about specific products, labeling policy, thresholds below which products can and should be labeled GMO-free. The survey also explores subjects' expectations and preferences for future GMO policy and its effects.

5. Results

We first review the results of our survey of the opinions of French citizens about the introduction of GMO products into the food supply. We discuss the level of knowledge they have about GMO's, the level of hostility exhibited toward GMO products, and respondents' expectations for the future. Afterwards, we present the results from our experiment on consumer choice.

5.1. Results from the opinion survey

5.1.1. Knowledge about GMO's

The complete results of our survey are given in appendix A and we review only the most relevant responses here. The first result we obtain is that French citizens are aware of the presence of GMO's in foods. 83% of our respondents were aware that genetic technologies were used in the production of certain food products meant for human, as well as products meant for animal consumption.[14] Otherwise they are not well informed about the topic. 66% of respondents believed that they had already consumed GMO's but 73% of those respondents were unable to indicate precisely the specific product containing GMO's they consumed. 11% of those who believed they had consumed GMO's stated that they knew because they saw it on the label. 33% were aware that it is mandatory in France to disclose on the label that a product contains GMO's. 23% responded that they had already seen a product labeled as containing GMO's.

Respondents typically do not know which products contain GMO's and which do not. 42% indicate that some of the corn sold on the market contains GMO's, which is correct, but 24% believed that a portion of the wheat sold on the market contains GMO's, which is incorrect. A full 40% of respondents could not name a product that contained genetically modified organisms and 59.5% could not name a product that was certain not to contain them. Those who named products they thought could not contain GMO's were often incorrect, frequently citing meat or dairy products.

Overall, French consumers are aware that GMO's are present in food but otherwise their knowledge is poor. This might be explained by the fact that the main source of information is the news media, and not the market, despite the existence of mandatory labeling. Most consumers do not pay attention to labeling when making purchases or when they consume products, and this problem is presumably aggravated by the incentive of food producers to the required labeling as difficult to read as possible.

5.1.2. Intensity and extent of the hostility of the French toward GMO's

The hostility of the French population toward GMO's leaves little room for doubt. It is almost unanimous. Nearly 90% of consumers indicate that they oppose the presence of GMO's in food products. 45% feel that the question of GMO's in food is important, and an additional 44% feel that it is very important. The extent of the hostility is vast in scope. In addition to the inclusion of

[14] This is significantly higher than the percentage we observed when conducting a similar survey in Indiana, United States, in the summer of 2000, in which 60% of the respondents indicated that they were aware that GMO's we used in human and animal food products.

GMO's in food products, 54 percent of consumers are against the presence of GMO's in packaging, and 54 percent are against their inclusion in fuels.[15]

Furthermore, we find that respondents are not impressed by possible positive characteristics of future GMO products. For example, only a minority of consumers are willing to accept products containing GMO's if they give tomatoes a better flavor (8.7%), french fries contained less fat (8.3%). Only the possibility of modifying corn so that it would pollute the environment less was received with some favor (21.2% said they were willing to accept). Overall, the opinion of GMO's is resoundingly negative.

5.1.3. Predictions and hopes for the future

Despite their hostility, the French are fatalistic about the arrival of GMO's. When asked to predict the status of GMO's in food products five years into the future, 76.1% of respondents indicated that the most probable outcome would be the establishment of two separate tracks of food production, one of which would be GMO-free. 21.3% expected that 5 years into the future, the use of GMO's in food would be widespread and no longer debated. A small minority (12%) believed that if GMO-free products were segregated from products containing GMO's, that eventually GMO's would disappear. 42.7% thought that segregation would increase the incidence of GMO's and 45% think that segregation would cause both types of products to survive over the long run. Overall, 88.3% of respondents expected that, one way or another; GMO's would be present on the market five years into the future.

When asked about their preferred policy toward GMO's five years into the future, 52.3% would be satisfied to have the choice of whether or not to consume GMO's, whereas 44.7% would prefer that they be totally eliminated. Only 3% would prefer that GMO's would spread without requiring their labeling. Overall, our survey shows that French consumers' opinions about the current generation of GMO's are characterized mainly by ignorance, hostility, and fear.

5.2. Results of the experimental study

5.2.1. The impact of GMO information

Figure 1 contains the evolution of the average bid over all subjects over the five periods of the purchase stage. The data in the figure are calculated by taking each individual's bid in period 1 as the base set equal to 100, tracking that individual's bids over time relative to his bid in period 1,

[15] Only 61% of the French viewed "mad cow" disease as more dangerous than GMO's. Listeria, which kills numerous consumers every year, was considered more dangerous than GMO's by 59%.

and averaging across all individuals in each period. Table 4 contains the variance of prices and the actual unnormalized average bids.

Recall that in period 2, we revealed that product N did not contain GMO's and product S contained GMO's. The guarantee of being GMO-free raises the limit price of the average consumer in our sample by 7.5%. In contrast, affirming that a product contains GMO's lowers the average limit price by 39%. The two changes, both of which are significant, demonstrate that the average consumer values the absence of GMO's and devalues the presence of GMO's. The relatively small increase for GMO-free suggests that consumers typically act as if there is a low probability that conventional products contain GMO's.

In period 3, we revealed that no ingredient in product L contained more than 1% GMO's and no ingredient in product C contained more that 0.1% GMO's. We observed no significant change in the average willingness to pay for product C, but the average bid for product L declined by 10%, and the decline was statistically significant. Our subjects appear to view the guarantee that no product contains more than 0.1% GMO's as consistent with the typical GMO content of conventional products, but 1% as greater.

In period 4, we provided participants with background information about GMO's. This led to a slight increase in all of the limit prices, which was significant for three of the four products. Revealing the brand names of the products in period 5, raised the average prices for products L and S significantly, and appeared to reassure some of the subjects who discounted their bids upon learning of the GMO content of the products. There was no increase in price for product N from revealing that it was organically produced.

[Figure 1 and Table 4: About Here]

5.2.2. Bidder Types

The changes between periods 1 – 3, are further characterized in table 5. Only the data from those who bid greater than 0 for the product in period 1 are included (no subject who bid zero in period one ever submitted a positive bid in later periods). The column entitled, *Percentage Boycotting* indicates the percentage of subjects that bid 0 upon being informed of the product's GMO content. The column labeled *Bid Decrease* indicates the percentage that lowers its bids for a product, without boycotting it entirely. The *Bid Unchanged* column is the percentage that does not change their bids after learning the GMO content. *Bid Increase* is the percentage that increases its bids.

34.9% of our subjects were *Boycotters* who bid zero for product S after learning that it contained GMO's. For them, the absence of GMO's is an imperative. However, 1/3 of these boycotters were weak demanders, in the sense that had bid less than 50% of the average bid in period 1, indicating that they had a low opportunity cost of boycotting the product. Furthermore, specifying a threshold also lowered the incidence of boycotting. 10.7% of the subjects boycott at the 1% percent threshold and only 4.4 boycott at 0.1%. Here also, 1/3 of these boycotters were weak demanders. That means that close to 96% are willing to accept a level of GMO content that typically results from inadvertent co-mingling. These results show a lower level of hostility toward GMO's than suggested by our survey, especially when the maximum GMO content is specified.

18.1% did not change their bid for product S upon finding out that it contained GMO's. Almost ¾ of these subjects, constituting 14% of our participants overall, did not change their bid on any the four products after learning the level of its GMO content. We classify this 14% as *Rational Consumers*. Though this is a fairly small percentage, it is greater than the 2.5% of our survey participants who responded that the question of GMO's was of no importance to them. 23% did not change or raised their bids for product S and thus were willing to accept GMO's in their food at the same price as the conventional product. Despite the current unpopularity of GMO's in food, there is still a group of consumers willing to buy them and to allow them to establish a foothold in the marketplace.

42.2% of our subjects lowered their bid for product S but did not go so far as to boycott it. The average percentage of the decrease was 28.3%. Though 42.2% of bidders did not change their bids after learning that product N was GMO-free, another 49.4% increased their bids for product N, by an average of 22.4%. This illustrates the existence of a large market for GMO-free food products.

Subjects who were not Boycotters or Indifferent were willing tradeoff GMO content and price. 4 subjects (4.9%) overall were *Enthusiastic Consumers*, demonstrated behavior consistent with having a preference for GMO foods. Two subjects who decreased their bid for N, also increased it for S. One person who decreased on N, left his bid for S unchanged and one person who increased on S left her bid for N unchanged.

The subjects who were not Boycotters, Rational Consumers or Enthusiastic Consumers make up 46% of our participants. We call them *Nuanced Consumers*. This group places value on GMO content and will lower (raise) its bid prices when faced with products with higher (lower) GMO content. For them, GMO content is a relevant characteristic but it does not necessarily override the other characteristics of the product. Their behavior is more flexible than the survey

response, which does not permit respondents to qualify their opinions. They are willing to trade off GMO content and the price they pay.

Though product C, with a 0.1% threshold, attracted an average bid close to the conventional product, there was no consensus among the participants. 33% increased their bid (by an average of 28%) after learning the GMO content, while 27.9% reduced their bid or boycotted. The bidding behavior for product L revealed that a product meeting a 1% threshold is viewed much differently than a product labeled as containing GMO's. 17.9% increased their bid when informed of the 1% threshold, and 40.5% left their bid unchanged. Thus over half of our participants considered a product satisfying the 1% threshold as no worse than the conventional product.

[Table 5: About Here]

6. Discussion

To date in the empirical literature on consumption, and in particular on food safety, surveys and auction experiments were considered as two different techniques (each with its relative advantages and disadvantages) for observing the preferences of consumers. These preferences are typically considered to be unique for a given individual for a given product and the question was which technique would correctly reveal them. In designing the procedures and interpreting the results of our study, we take the view that the two instruments measure to different sets of variables, on one hand the opinions of *citizens* and on the other the decisions of *consumers*. For many goods consumer decisions fully correspond to their opinions. However, for certain categories of products, the decisions of a consumer may differ considerably from those that would reflect his opinion as a citizen. We believe that this is the case at the present time for products containing GMO's in Europe. If there is a difference between decisions made on markets and preferences as individuals, it has implications for policy. Whereas the consumer expresses himself on the market, the citizen expresses himself at the ballot box.

[Figure 2: About Here]

Before undertaking this project and realizing that opinions and behavior sharply diverged on the GMO issue, the only action that would be feasible in France given current public opinion would be the complete interdiction of GMO's. Our results suggest that this solution is neither necessary nor desirable. Other policies are possible that would allow for a change in opinions.

In the United States, banning labeling appeared to be the most efficient solution at first. Relying on scientific data and the concept of substantial equivalents, GMO's were introduced without the knowledge of consumers and citizens. However, in Europe, the strategy backfired as public hostility toward GMO's was aggravated by their perceived stealth imposition. This has led to a process of large-scale substitution of goods that could contain GMO's, with products that are unable to contain GMO's by food producers and distributors who are worried about their reputation.[16]

The suggestion of putting in place two segregated production tracks has been met with bad press, arguing against its expense and suggesting that the foods containing GMO's would find no market in any case. However, our results suggest that this may be the best option. However, if tracks are segregated, should there be voluntary labeling of GMO-free products or mandatory products containing GMO's?

Voluntary labeling is the more free-market oriented approach. It allows the creation of a niche market for GMO-free foods, similar to the market for organic foods. However, our study suggests that the mandatory labeling system may be more politically tenable. We have seen that voluntary labeling as GMO-free does not satisfy public opinion. Consumers want to have the choice to consume GMO's or not, not simply the possibility of avoiding them. They consider conventional products as GMO-free. Their belief is that the new products are different from the conventional ones. They need to be provided some means of learning that their beliefs are false.

Based on our survey data only, we might have concluded that mandatory labeling of foods containing GMO's would be suicidal for GMO's. However, when coupled with our data on consumer behavior it might in fact be the most efficient solution. It reassures public opinion that unlabeled conventional foods will remain GMO-free, avoids the substitution of entire products, and gives the market the role of transmitting information about the safety of GMO products, by providing an opportunity and an inventive for consumers to sample the lower cost products made with GMO's voluntarily.

The question of GMO policy is a specific case of a more general question. Who should decide on the level of risk that a society will bear, the scientific establishment, the market, or the voter? In the case of GMO's in food products, interdiction is the best alternative from the citizen' point of view, voluntary labeling from a market point of view, and banning labeling from a science point of view. The alternative of mandatory labeling, though not the favorite solution of

[16] This is a policy currently followed by the major food and distribution companies in Europe. In effect are taking the side of public opinion, they have renounced the use of GMO in any products sold in their stores or carrying their brand names. This appears to be a policy of free riding and counting on other producers to bring GMO's into acceptance.

any of the three institutions, is not the least preferred of any of them. It thus represents a plausible candidate for a compromise between the three forces we have identified that influence GMO policy.

If public authorities took only the market into account, and to leave the consumer the right to decide, then only requirements on the final product are important. If the authorities respond only to public opinion instead, recognizing that the citizen has clear preferences as to the means of production, then imposing requirements on the process in formulating regulations on labeling seems more appropriate.

Both public opinion and the consumer favor a low threshold whereby a product must be labeled as containing GMO's, though the consumer is more flexible. Our data shows the consumer does not behave much differently when faced with a 1% or a 0.1% threshold, while public opinion is much more hostile toward a 1% threshold than a 0.1% threshold. This suggests that the 1% threshold might be preferred from a market point of view, whereas 0.1% is preferred from a public opinion point of view.

Tirole (1988) classifies products into three types: search goods, experience goods and trust goods. These categories might also be applied to specific characteristics of products or processes. A search characteristic is a property, such as the color or shape, which the buyer can identify before purchase. An experience characteristic, such as taste, is only identified at the time the products consumed, and a trust characteristic, such as nutritional value or chemical content, can never be identified.

In the case of the products studied here the consumer has to trust that a product labeled GMO-free does in fact contain at most the GMO content permitted by the label. Thus GMO content can be viewed as a *non-characteristic of trust.* For a product labeled as containing GMO's we can identify at least two non-characteristics of trust. The consumer must trust that a product is a substantial equivalent of its GMO-free counterpart and also that the GMO's used did not cause a negative externality unknown to the user that would reduce his utility.

The concept of a non-characteristic of trust suggests an explanation of why our survey respondents are less hostile to future GMO's than the current generation. Currently, and in the short run, GMO content, substantial equivalence, and the safety of GMO's are characteristics of trust. However, over the long term, after experience on a large scale, substantial equivalence and the safety of GMO's become search characteristics, whereas GMO content remains a trust characteristic.

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Appendix A: Survey Questions and Responses

1. Are you aware that biotechnologies are used to produce certain foods? We say that these products contain GMO's (genetically modified organisms).

Yes	**83%**
No	**17%**

If your response is yes, please continue. If your response is no, the questionnaire is finished, please skip to the end of the survey to the identification part.

2. Have you ever consumed products containing GMO's?

Yes, I think so	**64%**
No, I do not think so	**17%**
I don't know	**19%**

3 If your answer to question 2 was yes, how do you know?

You saw it on the label	**11%**
You know of products that contain them	**16%**
Without knowing the products that contain them, you think you have eaten them	**73%**

4. In your opinion, is it mandatory for the food products made with GMO's to be labeled as such?

Yes, I think so	**33%**
No, I do not think so	**57%**
I don't know	**9%**

5. Overall, for me, the question of GMO's is

Very important	Important	Of little importance	Of no importance
44%	**45%**	**8,5%**	**2,5%**

5. I will name for you various food products. For each product please tell me if they can be made from GMO's

	Yes	*No*	*Don't know*
Cakes	**85,4 %**	**4,9 %**	**9,7 %**
Corn Flakes	**76,4 %**	**13,3 %**	**10,3 %**
Appetizer biscuits	**75,8 %**	**12,1 %**	**12,1 %**
Sauces (mayonnaise, etc.)	**67,3 %**	**17,0 %**	**15,7 %**
Frozen dinners	**66,1 %**	**16,9 %**	**16,9 %**
Deserts et ice cream	**61,2 %**	**22,4 %**	**16,4 %**
Oil	**52,1 %**	**36,4 %**	**11,5 %**
Pasta	**44,5 %**	**39,1 %**	**16,4 %**
Chocolate	**37,2 %**	**46,3 %**	**16,5 %**
Beer	**35,2 %**	**43,0 %**	**21,8 %**
Baby food	**34,5 %**	**53,3 %**	**12,1 %**
Sausage	**31,0 %**	**47,6 %**	**21,4 %**

6. Same question for these non-food products

	Yes	*No*	*Don't know*
Feed for poultry and livestock	**82,2%**	**4,3%**	**13,5%**
Medicines	**42,9%**	**30,1%**	**27,0%**
Cotton for clothing	**38,7%**	**24,5%**	**36,8%**
Cigarette tobacco	**38,0%**	**25,8%**	**36,2%**

7. To your knowledge, today in France, are genetic modifications authorized for the following products

	Yes	*No*	*Don't know*
Soybeans	**42,7%**	**34,1%**	**23,2%**
Corn	**35,4%**	**40,2%**	**24,4%**
Wheat	**24,4%**	**50,6%**	**25,0%**
Tomatoes	**23,2%**	**49,4%**	**27,4%**
Potatoes	**15,2%**	**52,4%**	**32,3%**
Strawberries	**14,6%**	**53,7%**	**31,7%**
Rice	**14,7%**	**54,6%**	**30,7%**

8. Let us move on to a somewhat technical question. To guarantee the absence of any GMO's in a product is costly. GMO-free crops can easily mix with crops containing GMO's at different stages of production. The cost of guaranteeing a product as free of GMO's is more expensive, the lower the percentage must be gauranteed. Which of the following statements is closest to your opinion ?

	Choice
For me, a product labeled "GMO-free" is a product that has no trace of any GMO's	**64,2%**
For me, a product labeled "GMO-free" is a product that contains less than 0,1% GMO's	**20,1%**
For me, a product labeled "GMO-free" is a product that contains less than 1% GMO's	**15,6%**

9. Should products that contain GMO's be labeled "contains GMO's" as well as labeling products that so not contain GMO's as GMO-free?

	Choice
Products that contain any traces of GMO's must be labeled as containing GMO's	**82,8%**
Products that contain more than 1% GMO's must be labeled as containing GMO's	**14,5%**
Products that contain more than 5% GMO's must be labeled as containing GMO's	**2,7%**

10. In making your purchases today, did you pay attention to the question of GMO's?

Yes	**77,6%**
No	**22,4%**

11. In making your purchases today, did you see any products containing GMO's

Yes	**22,6%**
No	**77,5%**

12. If you saw a product containing GMO's today did you refuse to buy it because it contained GMO's?

Yes	**50,0%**
No	**50,0%**

13. In making your purchases today, did you see any products that do not contain GMO's but are susceptible to containing them ?

Yes	**30,8%**
No	**66,4%**
Don't know	**2,7%**

14. Please compare the risks linked to GMO's with other current risks. Answer with yes, no, or equally dangerous

	Yes	No	Don't know
Water pollution is more dangerous than GMO's	67%	12%	21%
"Mad cow" disease is more dangerous than GMO's	61%	13%	25%
Listeria is more dangerous than GMO's	59%	21%	20%
Chemical residue in fruits and vegetables is more dangerous than GMO's	53%	22%	25%
Food dyes are more dangerous than GMO's	20%	61%	19%

15. I will read to you a series of statements concerning food products. For each one, please indicate whether you: agree, mostly agree, mostly disagree, or disagree.

16. GMO's simply should be banned

Agree	*Mostly agree*	*Mostly disagree*	*Disagree*
64,8%	14,5%	11,9%	8,8%

17. GMO's can be sold without labels. If they are authorized it is because they are not dangerous

Agree	*Mostly agree*	*Mostly disagree*	*Disagree*
4,0%	3,0%	8,6%	84,3%

18 GMO's are not a problem for me, but I would like a label to inform me of their presence

Agree	*Mostly agree*	*Mostly disagree*	*Disagree*
33,8%	6,7%	9,2%	50,3%

19. I do not want to buy GMO's. All products containing them should be labeled

Agree	*Mostly agree*	*Mostly disagree*	*Disagree*
83,6%	8,7%	1.5	6.2

20. I would like to be able to find products without GMO's even though I would have to pay more for them

Agree	*Mostly agree*	*Mostly disagree*	*Disagree*
66,5%	8,6%	4,6%	20,3%

21. Let's keep organic products free of GMO's. Other products can contain them without having to disclose it on the labels

Agree	*Mostly agree*	*Mostly disagree*	*Disagree*
14,6%	4,2%	8,9%	72,4%

22. Personally, would you accept that there are GMO's in the following products

	Accept	Refuse
Food products	11 %	89 %
Poultry and livestock feed	11 %	89 %
Medicine	14 %	86 %
Dyes or additives that enter processed foods in small quantities	18 %	82 %
Food for domestic animals	26,5 %	73,5 %
Packaging for food products	54 %	46 %
Fuels	54 %	46 %

I will now read to you three statement. For each statement please indicate whether you: agree, mostly agree, mostly disagree, or disagree.

23. If the french fries made from GM potatoes contained less fat, I would buy them

Agree	*Mostly agree*	*Mostly disagree*	*Disagree*
6,2%	2,1	1,5%	90,2%

24. If GM corn lowered the risk of polluting the environment, I would purchase products that contained GM corn

Agree	*Mostly agree*	*Mostly disagree*	*Disagree*
12,2%	9%	6,3%	72,5%

25. If I found that GM tomatoes tasted better or lasted longer without spoiling, I would buy them

Agree	*Mostly agree*	*Mostly disagree*	*Disagree*
5,6%	3,1%	5,1%	86,2%

26. What future do you imagine for GMO's in five years ? I will read three statements to you. Please indicate whcih one you think is most likely

	Choice
Five years from now, there will be GMO's in most food products and we will no longer be debating the issue.	21,3%
Five years from now, there will be no GMO's in food products and we will no longer be debating the issue.	2,5%
Five years from now, we will have a choice. There will be products labeled as "containing GMO's" and products labeled as GMO-free.	76,1%

If your response was 3, please answer the next question if not, please go to the question after next.

27. I will now read three other statements to you. Please indicate which of the statements you most agree with

	Choice
More and more GMO's will be consumed	42,7%
Fewer and fewer GMO's will be consumed	12,0%
There will be as many products with GMO's as without GMO's.	45,3%

28. Let us turn to your personal preferences about the future of GMO's five years from now. Please indicate which of the situations you most favor

	Choice
That they would have disappeared.	**44,7%**
That they would be widely used without labeling.	**3,0%**
That we would have the choice of whether or not to consume them	**52,3%**

29. If you answered yes to part 3, would you prefer?

	Choice
That everyone would have the choice whether or not to consume GMO's everywhere, stores, restaurants, canteens, etc....	**76,9%**
That people who want GMO-free products can find them in certain stores or on special shelves	**23,1%**

30. Suppose that both products containing GMO's and GMO-free products were both on store shelves. What kind of labeling would you prefer to distinguish them?

	Choice
A complete but discrete labeling of ingredients containing GMO's, in the list of ingredients	**14,5%**
A very visible label, such as a logo.	**85,5%**

31. If a logo is used would you prefer that it indicated

	Choice
Only the absence of GMO's	**44%**
Only the presence of GMO's	**37%**
Two logos, one for products containing GMO's and one for GMO-free products.	**19%**

32. As a consumer, what would your behavior be with regard to GMO labels?

	Choice
I would look at them	**91,3%**
I would not look at them	**8,7%**

33. If you answered 1 to question 32, which of the three possibilities below would be closest to your behavior with regard to GMO labels?

	Choice
I would look at the labels but it would not change my consumption habits. I just want to be informed.	**13,4%**
I would look at the labels to try to purchase GMO-free products.	**77,1%**
I would look at the labels and take into account GMO content and price	**9,5%**

Table 1: Average Responses of European and French Participants in the Eurobarometer Survey

Question	Europeans	French
Even if GM foods offer advantages, they go against nature	4.1	4.1
GM foods threaten the natural order of things	4.0	4.2
If something went wrong with GM foods, it would be a world catastrophe	3.9	4.0
GM's are not necessary	3.7	----
I am afraid of GMO's	3.6	3.9
GMO's benefit many people	2.7	
If the majority of individuals were in favor of GM foods, they should be authorized	2.7	2.4
Making a decision on GMO's is so complicated that it is a waste of time to consult the public on the subject	2.6	2.3
The risks from GM foods are acceptable	2.3	2.1
GM foods present no danger for future generations	2.2	2.0

Table 2: Experimental Sessions

Session Number	Date and Time of Session	Number of subjects	Number of periods in training phase
#1	07/17/00 – 6-8pm	13	4
#2	07/18/00 – 2-4pm	12	3
#3	07/18/00 – 7-9pm	7	5
#4	07/19/00 – 2-4pm	11	4
#5	07/19/00 – 6-8pm	10	3
#6	07/20/00 – 2-4pm	3	5
#7	07/20/00 – 7-9pm	9	3
#8	07/21/00 – 6-8pm	11	3
#9	07/24/00 – 2-4pm	7	3
#10	07/24/00 – 6-8pm	14	??
Total		**97**	

Table 3: Sequence of events in purchase phase of an experimental session

Period 1	- Blind tasting of the four products S, L, C and N - Hedonic recording of evaluation of the four products
Period 2	- We inform subjects that "S contains GMO's" and "N is GMO free"
Period 3	- We inform subjects that "L contains only ingredients that consist of less than 1% GMO's" and that "C contains only ingredients that consist of less than 1/10 of 1% GMO's
Period 4	- We give subjects some general information about GMO products
Period 5	- We reveal the brand names of the four products, and the label "organic" for product N.
Transactions	- Random draw of the auction that counts - Implementation of transactions for the period that counts

Table 4: Average Bid and Variance of Bids, Periods 1 - 5

	Period 1 Blind	**Period 2 With GMO's or GMO-Free**	**Period 3 Thresholds**	**Period 4 Background Information**	**Period 5 Brands**
N « GMO Free »	15.29FF (0.68)	16.47FF (0.72) [+8%**]	16.95FF (0.69) [+3%**]	17.47FF (0.69) [+3%**]	17.57FF (0.64) [+1%]
C « Threshold 0,1% »	15.02FF (0.65)	14.96FF (0.63) [0%]	15.16FF (0.69) [+1%]	15.75FF (0.65) [+4%**]	15.32FF (0.66) [-3%**]
L « Threshold 1% »	15.48FF (0.75)	15.30FF (0.64) [-1%]	13.91FF (0.76) [-9%**]	13.95FF (0.75) [0%]	14.65FF (0.75) [+5%**]
S « With GMOs »	17.85FF (0.69)	10.90FF (1.03) [-39%**]	10.80FF (0.96) [-1%]	11.35FF (0.93) [+5%**]	11.81FF (0.91) [+4%**]

(...) variance, [...] increase from previous period, ** significantly different at 1% level from previous period.

Table 5: Percentage Boycotting and Decreasing, Increasing, and Holding Constant Their Bids After Learning GMO Content

Product *# of subjects with a positive initial bid*	**Average initial bid for the product**	**Percentage Boycotting**	**Bid decrease**	**Bid unchanged**	**Bid increase**
N « GMO Free » *83 subj.*	(15.29FF)	0%	8.4% (18.30FF) *(-5.4F)* [-18.9%]	42.2% (15.30FF) *(0FF)* [0%]	49.4% (14.79FF) *(+3.32)* [+22.4%]
C « Threshold 0,1% » *68 subj.*	(15.02FF)	4.4% (8.63FF) *(-8.63FF)* [-100%]	23.5% (18.71FF) *(-3.86FF)* [-20.6%]	38.2% (13.51FF) *(0FF)* [0%]	33.8% (14.99FF) *(+4.24)* [+28.3%]
L « Threshold 1% » *84 subj.*	(15.48FF)	10.7% (9.94FF) *(-9.94FF)* [-100%]	31.0% (19.02FF) *(-3.98FF)* [-26.5%]	40.5% (14.27FF) *(0FF)* [0%]	17.9% (17.90FF) *(+4.07FF)* [+20.9%]
S « With GMOs » *83 subj.*	(17.85FF)	34,9% (13.09FF) *(-13.09FF)* [-100%]	42.2% (22.37FF) *(-6.34FF)* [-28.3%]	18.1% (18.04FF) *(0FF)* [0%]	4.8% (12.13FF) *(+6.10FF)* [+50.3%]

... share of subjects in the category, (...) Average bid for the blind auction French Francs, *(...)* absolute decrease in FF, [...] average bid increase [+] or decrease [-].

Figure 1: Average Bids for the Four Biscuits in Period 1-5

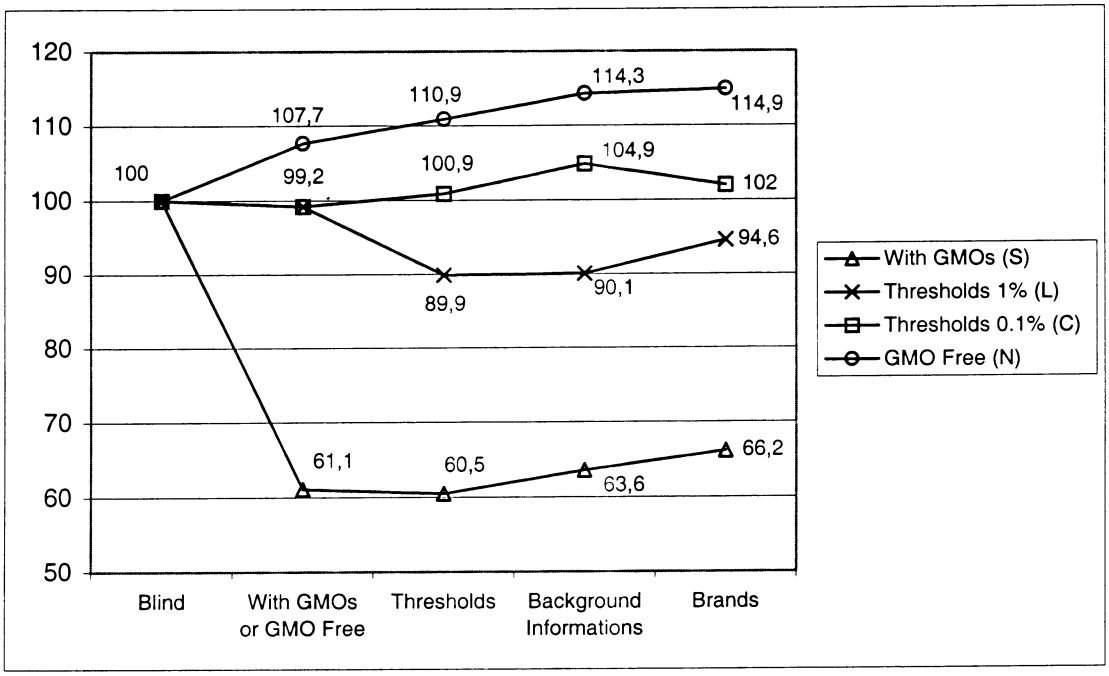
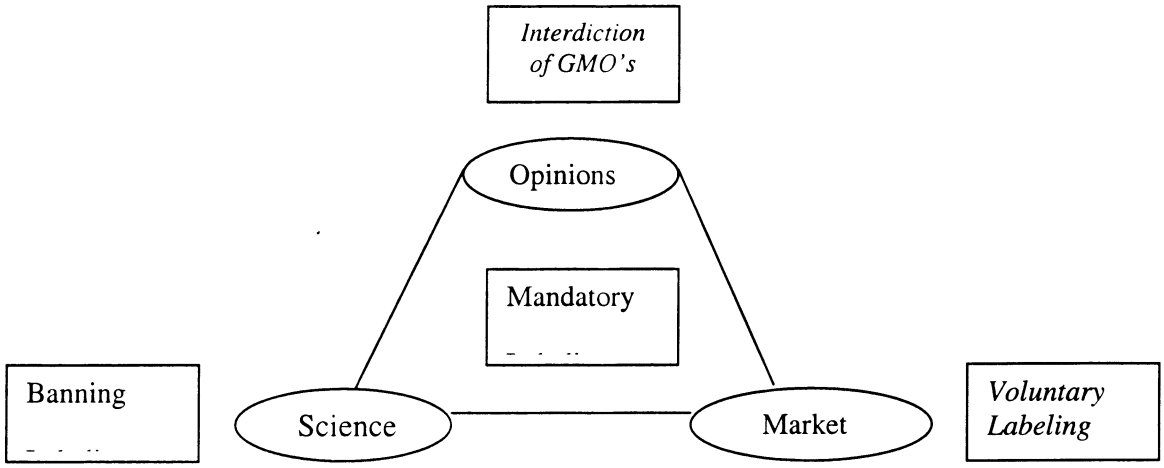


Figure 2: The Policy Triangle



Nom de l'enquêtrice : ..... Date : .....

Nom du participant : .....

Participera à l'expérience : ..... Si oui, quand : .....

GUIDE D'ENTRETIEN
· QUESTIONS AUX CONSOMMATEURS

Monsieur ou Madame, Bonjour, je me présente....., je travaille à l'Université de Grenoble et nous menons une étude sur le comportement alimentaire des consommateurs.

Cette étude déroulera entre le ***17 juillet et le 24 juillet*** à l'Institut National Polytechnique (INPG), situé 46 avenue Félix Viallet (près de la gare) à Grenoble.

Nous vous proposons d'y participer sachant qu'il s'agit de venir 2 heures. En contrepartie, vous serez indemnisé pour un montant d'environ 100 FF. Au cours de ces deux heures, nous vous demanderons de goûter et d'évaluer différents produits alimentaires actuellement en vente dans des magasins de la région. Notre étude est à finalité scientifique et n'est commanditée par aucune entreprise privée.

Est-ce que cela vous intéresserait vous ou une personne de votre foyer?

Vérifier que la personne intéressée est majeur.

SI CELA INTERESSE UNE AUTRE PERSONNE DEMANDER A QUEL MOMENT IL EST POSSIBLE DE RAPPELER

*SI REPONSE **NEGATIVE**, DIRE : BIEN, JE VOUS REMERCIE, AU REVOIR.*

Si LA REPONSE EST POSITIVE : Auriez-vous quelques minutes à m'accorder car j'aurais quelques questions à vous poser concernant vos habitudes alimentaires.

SI OUI, PASSER A LA QUESTION 1

SI LA PERSONNE EST OCCUPEE, DIRE : préférez-vous que je vous rappelle à un autre moment ? *(ET LAISSER LE CONSOMMATEUR DECIDER D'UNE HEURE A SA CONVENANCE) TOUTEFOIS, Pas AU DELA DE 21 HEURE DIRE* :

DIRE : Bien, je vous rappellerais donc le.....à.....heure, merci et au revoir.

Question 1- Consommez-vous régulièrement des biscuits ?

***SI la réponse est non**, DIRE :*
"JE SUIS DESOLEE MAIS VOUS NE CORRESPONDEZ PAS AU PROFIL DE CONSOMMATEUR QUE NOUS RECHERCHONS . JE VOUS REMERCIE ET VOUS PRIE DE M'EXCUSER POUR LE DERANGEMENT. AU REVOIR "

SINON PASSEZ A LA QUESTION 2

Question 2- De quel type d'achats alimentaires êtes-vous responsable dans votre foyer :

A Produits achetés en boulangerie : €OUI €NON
€Régulièrement €Occasionnellement

B Produits achetés en marché, supérette €OUI €NON
€Régulièrement
€Occasionnellement

C Produits achetés en hypermarché €OUI €NON
€Régulièrement
€Occasionnellement

SI LA PARTICIPATION EST OCCASIONNELLE pour C et D, DIRE :
"JE SUIS DESOLEE MAIS VOUS NE CORRESPONDEZ PAS AU PROFIL DE CONSOMMATEUR QUE NOUS RECHERCHONS . JE VOUS REMERCIE ET VOUS PRIE DE M'EXCUSER POUR LE DERANGEMENT. AU REVOIR "

SINON PASSEZ A LA QUESTION 3

Question 3- Avez-vous déjà participé à des tests consommateurs?
OUI € NON€
Si oui, précisez sur quels types de produits ; quel type d'étude, et la durée de l'étude :
Type de produit :

SI PARTICIPATION DANS LES 2 DERNIERS MOIS A DES ETUDES DE PREFERENCES OU DANS LES 2 DERNIERES ANNEES A DES ETUDES DESCRIPTIVES QUEL QUE SOIT LE TYPE DE PRODUIT, DIRE :
"JE SUIS DESOLEE MAIS VOUS NE CORRESPONDEZ PAS AU PROFIL DE CONSOMMATEUR QUE NOUS RECHERCHONS . JE VOUS REMERCIE ET VOUS PRIE DE M'EXCUSER POUR LE DERANGEMENT. AU REVOIR "

SINON PASSEZ A LA QUESTION 4

4 – IL Y A-T-IL DES ALIMENTS QUE VOUS NE POUVEZ OU QUE VOUS NE VOULEZ PAS MANGER.

SI PARMI LES ALIMENTS REFUSES IL Y A ALIMENT AVEC OGM, DIRE :
"JE SUIS DESOLEE MAIS VOUS NE CORRESPONDEZ PAS AU PROFIL DE CONSOMMATEUR QUE NOUS RECHERCHONS . JE VOUS REMERCIE ET VOUS PRIE DE M'EXCUSER POUR LE DERANGEMENT. AU REVOIR "

SINON PASSEZ A LA QUESTION 8

5- JE VAIS MAINTENANT VOUS DEMANDER :

- Votre nom : - Prénom :
- Votre âge :
- Votre adresse : .....

REPORTER ICI LE NUMERO DE TELEPHONE APPELE :.....

Pourriez-vous m'indiquer votre profession
Profession :
.....
DEMANDER D'ETRE LE PLUS PRECIS POSSIBLE
(EX : SI LA PERSONNE REPOND ENSEIGNANT : LUI DEMANDER DE PRECISER SI ELLE EST INSTITUTRICE OU PROFESSEUR D'UNIVERSITE)

La profession de votre conjoint(e) ou compagnon (compagne) :

5- Quelles sont, en général, vos disponibilités horaires ?
(INDIQUER LE MAXIMUM DE DISPONIBILITES)

NOUS ALLONS MAINTENANT CONVENIR AVEC VOUS D'UN RENDEZ-VOUS FIXE:.

Session	Date	Horaire	RV
Session 1	lundi 17 juillet 2000	18h-20h	
Session 2	mardi 18 juillet 2000	14h-16h	
Session 3	mardi 18 juillet 2000	19h-21h	
Session 4	mercredi 19 juillet 2000	14h-16h	
Session 5	mercredi 19 juillet 2000	18h-20h	
Session 6	jeudi 20 juillet 2000	14h-16h	
Session 7	jeudi 20 juillet 2000	19h-21h	
Session 8	vendredi 21 juillet 2000	14h-16h	
Session 9	vendredi 21 juillet 2000	18h-20h	
Session 10	lundi 17 juillet 2000	18h-20h	
Session 11	mardi 18 juillet 2000	14h-16h	

A ne demander que s'il n'y a pas eu trop de difficultés à obtenir le premier RV

DEMANDEZ ENSUITE SI LES PERSONNES SERONT JOIGNABLE ENTRE LE 17 ET LE 24 JUILLET 1999.

L'EXPERIENCE SE DEROULE PAR GROUPES DE 16 PERSONNES. C'EST POURQUOI NOUS VOUS DEMANDONS D'ETRE PONCTUELS CAR L'EXPERIENCE NE POURRA COMMENCER TANT QUE TOUS LES PARTICIPANTS NE SERONT PAS PRESENTS.

VOUS POUVEZ VOUS RENDRE SUR LE SITE A PIED OU EN VOITURE. NOUS VOUS SIGNALONS QU'IL N'EST PAS FACILE DE TROUVER UN PARKING, PREVOYEZ UNE PETITE MARGE. NOUS VOUS REMBOURSERONS LES FRAIS DE PARKING ET DE PARCMETRES.

NOUS VOUS ENVERRONS UN COURRIER DE CONFIRMATION POUR VOUS RAPPELER VOS HORAIRES PRECIS POUR LA SEANCE, AINSI QU'UN PLAN POUR VOUS RENDRE SUR LE SITE DE L'INSTITUT NATIONAL POLYTECHNIQUE.

SI VOUS LE DESIREZ, VOUS POUVEZ NOUS RAPPELER AU 04 76 57 48 88. LAISSER UN MESSAGE SUR LE REPONDEUR SI IL N'Y A PERSONNE

6- AVEZ-VOUS DES QUESTIONS ?

REPONSES AUX EVENTUELLES QUESTIONS :

- POURQUOI CETTE ETUDE ?

CETTE ETUDE VA NOUS PERMETTRE D'AVANCER DANS LA CONNAISSANCE DES MOTIVATIONS DES CONSOMMATEURS DANS LEURS CHOIX ALIMENTAIRES.

- EST-ELLE COMMANDITEE PAR UN INDUSTRIEL ?

NON, ABSOLUMENT PAS.

- EST-CE QUE NOUS ALLONS TRAVAILLER AVEC DES PRODUITS DE DEVELOPPEMENT OU DES PRODUITS DU MARCHE ?

CE SERONT DES PRODUITS EN VENTE ACTUELLEMENT DANS LES SUPERMARCHES

EN QUOI CELA CONSISTE ?

VOUS VIENDREZ EN SALLE D'EVALUATION SENSORIELLE A L'INSTITU NATIONAL POLYTECHNIQUE OU VOUS DEGUSTEREZ ET DONNEREZ VOTRE APPRECIATION DES PRODUITS.

SERONS-NOUS REMUNERES?

VOUS SEREZ REMUNERE SUR LA BASE FOFAITAIRE DE 100 FRANCS. VOUS RECEVREZ EGALEMENT DEs PRODUITS PARMI CEUX AVEC LESQUELS NOUS ALLONS TRAVAILLER.

Madame, Monsieur,

Suite à l'entretien téléphonique que vous avez eu avec l'une de nos assistantes, vous avez accepté de participer à une étude sur les aliments. Nous vous en remercions.
Cette étude est réalisée par des économistes grenoblois dans le cadre d'un projet de recherche publique sur le comportement alimentaire des consommateurs.

Vous êtes invité à vous présenter le .....juillet 2000 à ..... dans la salle F 001 de l'**E**cole **N**ationale **S**upérieure de **G**énie **I**ndustriel (**ENSGI**) pour une séance de dégustation qui durera 2 heures et demi. En contrepartie, vous serez indemnisé pour un montant de 100FF. Cette indemnisation vous sera remise en espèces.

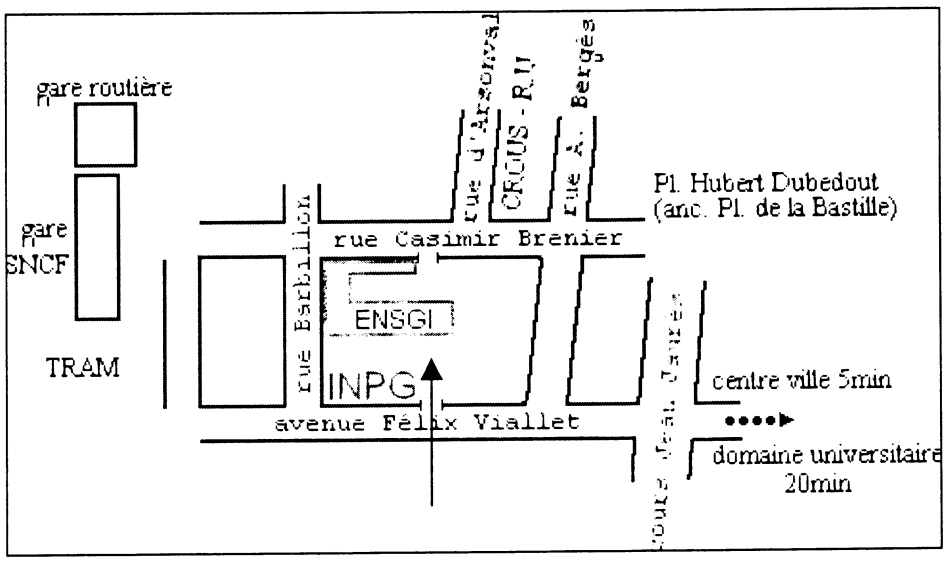
Une quinzaine de personnes participeront à cette séance. Nous ne pouvons commencer que lorsque tous les participants sont présents. Il est donc important que chacun des participants respecte l'heure de la convocation. N'hésitez pas à venir un peu en avance, vous serez accueilli par les organisateurs de la séance.

Vous trouverez ci-dessous un plan pour vous rendre à l'**ENSGI.** L'école est située **46, avenue Félix Viallet à Grenoble** (juste à côté de la gare SNCF). Il n'est pas facile de se garer dans le quartier de la gare. Nous vous conseillons de venir à pied ou en transport en commun (Tramway A ou B arrêt Gare, Bus ligne 1 arrêt Alsace Lorraine). Si vous devez néanmoins venir en voiture, n'hésitez pas à vous garer sur une place payante, le laboratoire vous remboursera les frais de stationnement à votre demande.
Le parcours pour vous rendre à la salle 001 sera fléché dès votre entrée sur le site de l'ENSGI.

Si pour quelque raison que ce soit vous ne pouviez venir à la séance, merci de bien vouloir nous prévenir au 04 76 57 48 88.

Merci encore pour votre collaboration.

Bernard Ruffieux
Directeur du laboratoire d'Economie de l'ENSGI.



PREMIERE PARTIE DE LA SEANCE
INSTRUCTIONS

L'objet de la première partie de la séance est de vous familiariser avec une forme de mise en vente particulière. Cette forme de mise en vente sera celle utilisée pour vendre les produits durant toute la séance de ce soir.

Pour simplifier l'apprentissage des règles de cette mise en vente particulière, nous ne commencerons pas par vendre des produits réels. Nous allons organiser un petit jeu au cours duquel nous allons mettre en vente des jetons. La suite de ces instructions vous présente les règles de mise en vente ainsi que le principe du jeu d'apprentissage que nous allons effectuer.

REGLES DE MISE EN VENTE

Supposons que tous les participants à cette séance désirent acheter une unité d'un même produit disponible en grande quantité. Les règles de mise en vente que nous allons utiliser sont les suivantes :

- Chaque participant propose par écrit un **prix d'achat**. Tous les participants font cette proposition au même moment et sans discuter entre eux des prix d'achat qu'ils souhaitent proposer.

- L'animateur de la séance collecte l'ensemble des propositions des participants. Puis il tire au sort un prix parmi différents prix. Ce prix sera le **prix de vente** du produit.

- Deux situations sont alors possibles :
  - Les participants qui ont proposé un prix d'achat supérieur ou égal au prix de vente achètent le produit et payent le prix de vente.
  - Les participants qui ont proposé un prix d'achat inférieur au prix de vente n'achètent pas le produit.

Exemple 1

Vente de bouteilles de vin.
Chaque participant peut acheter une seule bouteille de vin.

Quatre participants :	**Proposition de prix d'achat**
– Participant A	– Participant A propose 12 F20
– Participant B	– Participant B propose 0 F
– Participant C	– Participant C propose 5 F40
– Participant D	– Participant D propose 7 F10

Prix de vente tiré au sort : 7 F10

Exemple 1 - Suite

Prix de vente tiré au sort : 7 F10

- Participant A
  - Prix d'achat proposé : 12 F20
  - Participant A **achète** une bouteille et paye **7 F10**
- Participant B
  - Prix d'achat proposé : 0 F
  - Participant B **n'achète pas** une bouteille
- Participant C
  - Prix d'achat proposé : 5 F40
  - Participant C **n'achète pas** une bouteille
- Participant D
  - Prix d'achat proposé : 7 F10
  - Participant D **achète** une bouteille et paye **7 F10**

Remarques :

- Les règles de mise en vente sont telles qu'il est impossible qu'un participant achète à un prix supérieur au prix d'achat qu'il a proposé.
- Pour chaque vente, il peut y avoir plusieurs acheteurs.

Dans un premier temps, pour vous familiariser avec ces règles, nous allons mettre en vente non pas des produits réels mais des jetons. Ces jetons ont une certaine valeur pour chaque participant. Cette valeur correspond à la somme que l'animateur s'engage à verser au participant s'il achète ce jeton au cours de la vente. En d'autre terme, quand un participant achète un jeton, il sait que l'animateur lui reprendra le jeton en échange d'une somme dont il connaît le montant par avance. Nous appellerons cette somme : **valeur de reprise**.

Si un participant achète un jeton à un prix de vente inférieur à sa valeur de reprise, il réalise un gain égal à la différence entre la valeur de reprise et le prix de vente du jeton.

Exemple 2

- L'animateur s'engage à reprendre un jeton au participant A contre la somme de 30F
- La valeur de reprise pour le participant A est de 30F
- Si le participant A achète le jeton à 20F, il sait qu'il va gagner 10F

– Prix de vente = Gain

– 20F = **10F**

Au cours de cette première partie, nous allons organiser plusieurs périodes de vente. Chaque participant ne peut acheter qu'un jeton par période. Chaque période se déroule de la manière suivante :

1. Chaque participant tire au sort une **Fiche Proposition d'achat** identique à celle présentée ci-dessous parmi plusieurs fiches proposées par l'animateur

Exemple 3

Fiche Proposition d'achat

Période : 0 Lettre d'identification : .....

Votre valeur de reprise pour le jeton 7 F

Votre proposition de prix d'achat pour le jeton .....

Les valeurs de reprise sont tirées au hasard. Pour le même jeton, les participants ont des valeurs de reprise différentes. Chaque participant ne connaît que sa valeur de reprise et ne sait rien sur celle des autres participants.

2. Chaque participant note sa lettre d'identification sur sa Fiche Proposition d'achat. Puis il inscrit le prix d'achat qu'il propose pour le jeton (à 10 centimes près).

3. L'animateur de la séance ramasse les Fiches des participants. Il inscrit au tableau les valeurs de reprise et les prix d'achat proposés par chacun des participants. Un participant tire alors au sort le prix de vente du jeton pour la période.

4. En fonction du prix de vente et des propositions d'achat, l'animateur détermine quels sont les participants qui achètent un jeton.

5. En fonction du prix de vente et des valeurs de reprise, l'animateur détermine quels sont les gains des participants qui ont acheté un jeton.

Exemple 4 — **Prix tiré au sort : 16**

Participant	Valeur de reprise	Proposition d'achat	Achat/ Pas achat	Gain/Perte
A	12	11	Pas achat	**0 F**
B	20	14	Achat	20 – 16 = **4 F**
C	15	17	Achat	15 – 16 = **-1 F**
D	18	18	Achat	18 – 16 = **2 F**

Avant de lire la suite de ces instructions, pour faciliter la bonne compréhension des différents points que nous venons d'exposer, nous allons effectuer une période d'essai (période 0).

Après cette période d'essai, nous allons conduire une série de périodes de vente (période 1, période 2, etc.). Cette succession de périodes permettra une meilleure compréhension de la logique des règles de mise en vente que nous utiliserons pour la vente des produits dans la suite de cette séance.

Chaque participant peut acheter un jeton par période. Au début de chaque période, chaque participant tire une nouvelle Fiche Proposition d'achat. Les valeurs de reprise sont différentes à chaque période. A chaque période, le prix de vente est tiré au sort parmi des prix compris entre la plus petite et la plus grande des valeurs de reprise de la période.

L'objet de l'étude à laquelle vous participez est de mesurer des comportements réels. C'est pourquoi, à partir de maintenant, nous allons rémunérer les périodes de vente. A partir de la période 1 et pour chaque période, un participant qui achète un jeton et qui réalise un gain reçoit véritablement la somme correspondant à ce gain. Cette somme vient s'ajouter aux 50 F donnés précédemment pour participer à le seconde partie de la séance.

De même, un participant qui achète un jeton et qui réalise une perte doit verser la somme correspondant à cette perte. Cette somme est prélevée sur les 50 F donnés précédemment pour participer à le seconde partie de la séance.

DEUXIEME PARTIE DE LA SEANCE
INSTRUCTIONS

Au cours de la seconde partie de la séance, vous allez goûter quatre biscuits. Puis, vous les noterez. Enfin, nous organiserons des ventes au cours desquelles vous pourrez acheter ces produits. Les règles de mise en vente que nous utiliserons sont celles qui ont été présentées au cours de la première partie de la séance. Ces produits sont actuellement en vente dans des grandes surfaces de la région grenobloise.

Dégustation et notation

Au cours de cette phase, nous vous demandons de goûter **quatre biscuits.** Afin que vous ne soyez pas influencé par le nom ou la marque de ces produits, nous les désignerons par les lettres suivantes :

Produit L Produit S Produit N Produit C

Après les avoir goûté, vous donnerez **une note** à chaque produit sur la **Fiche de notation** qui vous a été distribuée. Cette fiche comporte les échelles de notation suivante :

Je n'aime pas du tout — **J'aime beaucoup**

Sur cette échelle, vous inscrirez **une croix sur la barre grisée**. Plus vous aurez aimé le biscuit, plus cette croix sera inscrite à droite de la barre. Moins vous aurez aimé le biscuit, plus cette croix sera inscrite à gauche de la barre.

Proposition de vente

Après la dégustation et la notation, nous organiserons plusieurs périodes de ventes : période 1, période 2, période 3, etc.

Au cours de chacune de ces ventes, nous mettrons en vente environ 600 grammes de chacun des 4 biscuits. Pour certains biscuits cela correspond à un lot de 2 paquets, pour d'autres à un lot de 3 paquets et pour d'autre encore à un lot de 5 paquets selon le type d'emballage utilisé pour les produits.

Pour chaque période, les participants disposent d'une fiche de vente similaire à celle présentée sur la page suivante. Sur cette fiche, les participants inscrivent le prix maximum qu'ils sont prêts à payer pour en acheter un lot de chacun des produits (à 10 centimes près).

Fiche d'enchère du participant ....

Période 1

Biscuit L

Prix d'achat proposé pour un lot de 600gr environ

Biscuit N

Prix d'achat proposé pour un lot de 600gr environ

Biscuit C

Prix d'achat proposé pour un lot de 600gr environ

Biscuit S

Prix d'achat proposé pour un lot de 600gr environ

Fin des périodes de vente et fixation des prix de vente

Lorsque nous aurons terminé toutes les périodes de vente, pour chaque lot de produit, nous tirerons au sort son prix de vente. Ce prix de vente sera tiré, *par un participant*, parmi un ensemble de prix compris entre 0 F et une fois et demi le prix de vente des lots de biscuits dans les grandes surfaces de la région grenobloise.

Vente des produits

L'objet de cette séance n'est pas pour nous de vous vendre le plus de biscuits possible. En conséquence, parmi toutes les ventes que nous allons effectuer, une seule sera véritablement prise en compte et une seule vente réelle de produits aura lieu.

Lorsque nous aurons terminé toutes les périodes de vente, nous tirerons une période au sort parmi toutes celles réalisées. Seules les propositions que les participants auront effectués durant cette période seront prise en compte pour déterminer s'ils achètent ou s'ils n'achètent pas les produits.

Il est possible que pour cette période, un participant soit en situation d'acheter plusieurs lots des différents biscuits. Si cette situation se présente, l'animateur de la séance procédera à un nouveau tirage au sort pour ne choisir qu'un seul lot. La vente sera effectuée uniquement sur le lot tiré au sort.

Exemple 5

Prix de vente tiré au sort pour chaque lot de biscuits:

Biscuit L : 190 FF Biscuit N : 70 FF Biscuit C : 380 FF Biscuit S : 260 FF

Fiche d'enchère du participant A Période 1	Fiche d'enchère du participant A Période 2	Fiche d'enchère du participant A Période 3
Biscuit L Prix d'achat proposé pour un lot de 600gr environ 200 FF	**Biscuit L** Prix d'achat proposé pour un lot de 600gr environ 320 FF	**Biscuit L** Prix d'achat proposé pour un lot de 600gr environ 320 FF
Biscuit N Prix d'achat proposé pour un lot de 600gr environ 0 FF	**Biscuit N** Prix d'achat proposé pour un lot de 600gr environ 0 FF	**Biscuit N** Prix d'achat proposé pour un lot de 600gr environ 0 FF
Biscuit C Prix d'achat proposé pour un lot de 600gr environ 490 FF	**Biscuit C** Prix d'achat proposé pour un lot de 600gr environ 490 FF	**Biscuit C** Prix d'achat proposé pour un lot de 600gr environ 490 FF
Biscuit S Prix d'achat proposé pour un lot de 600gr environ 100 FF	**Biscuit S** Prix d'achat proposé pour un lot de 600gr environ 270 FF	**Biscuit S** Prix d'achat proposé pour un lot de 600gr environ 270 FF

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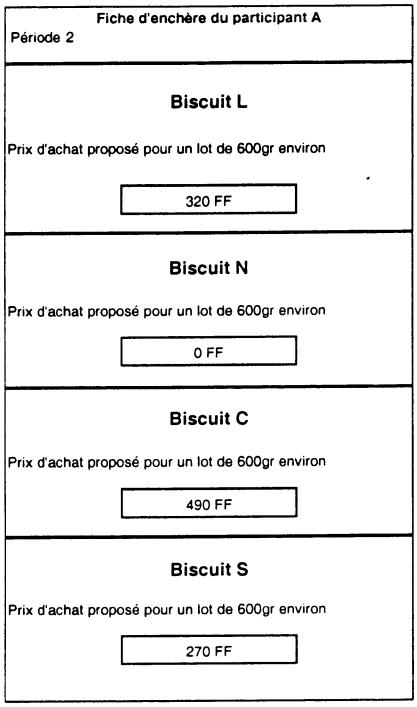
Exemple 5 - Suite

Tirage au sort de la période prise en compte : période 2



- Le participant A achète 2 lots de biscuits :
  - il **achète** le lot de biscuits L à **190 F** car il avait proposé un prix (320 F) supérieur au prix tiré au sort.
  - il **achète** le lot de biscuits C à **380 F** car il avait proposé un prix (490 F) supérieur au prix tiré au sort.

Tirage au sort du lot de biscuits acheté
Le lot de biscuits C

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En d'autres termes, il n'est pas possible qu'un participant puisse acheter plus d'un lot de biscuits au cours de la séance. Cependant, toute décision que vous allez prendre au cours de la seconde partie de la séance est importante. En fonction de la période tirée au sort, chaque proposition que vous aurez effectuée peut vous conduire à acheter ou à une pas acheter un produit.

Remarques :

1. Durant toute la seconde partie de la séance, à votre demande, vous pourrez de nouveau goûter les biscuits mis en vente.

2. Contrairement à ce que nous avons fait pour la première partie de la séance, les prix proposés par les participants ne seront pas affiché au tableau.

3. Vous avez reçu 50 F pour participer au vente. Vous pouvez, si vous le désirez, faire des proposition de prix d'achat supérieur à cette somme. Vous risquez cependant dans ce cas d'acheter un lot de biscuit à un prix supérieur à 50 F et d'avoir à nous verser cette somme.

Les OGM en questions

1. QU'EST CE QU'UN OGM ?

Un OGM est défini comme "un organisme dont le matériel génétique a été modifié d'une manière qui ne s'effectue pas naturellement par multiplication et/ou par recombinaison naturelle".

Il s'agit des techniques de génie génétique. Elles peuvent être appliquées aussi bien sur des organismes animaux ou végétaux que sur des micro-organismes. Ainsi, le génie génétique permet de modifier, supprimer ou introduire certains caractères. Lorsque des gènes sont introduits, ils peuvent provenir de n'importe quel organisme : virus, bactérie, levure, champignon, plante ou animal.
La transformation consiste à :
apporter une fonction nouvelle. Par exemple conférer à des plantes une tolérance à un herbicide ou à un insecte ravageur ;
inactiver une fonction déjà existante. Par exemple retarder la maturité des fruits ou diminuer le caractère allergène d'un aliment.

Les OGM correspondent à des organismes vivants. Ils sont biologiquement actifs et peuvent se disséminer dans l'environnement. En revanche, les produits qui en dérivent tels que la farine, l'huile, etc. ne peuvent pas se reproduire.

2. QU'APPORTENT LES TECHNIQUES DE GENIE GENETIQUE POUR L'AMELIORATION DES PLANTES CULTIVEES ?

Le recours au génie génétique permet de contourner certaines difficultés liées aux autres méthodes d'amélioration des plantes cultivées.

Avant l'apparition du génie génétique, on utilisait deux grands types de méthodes :
la méthode traditionnelle de **croisements** entre plantes d'une même espèce et de **sélection** des individus intéressants. Cette méthode est longue, limitée et aléatoire.
la biotechnologie de **mutation artificielle** par irradiation ou par traitement chimique. Ces techniques restent aléatoires comme dans le cas des croisements traditionnels.

Le principal intérêt des OGM est que le génome est modifié de façon **ciblée** : on détermine *à l'avance* les caractères précis que l'on souhaite incorporer ou retirer et on *connaît* la modification génétique nécessaire à l'obtention du caractère recherché. Ces techniques sont très puissantes puisqu'elles offrent la possibilité d'introduire n'importe quel caractère nouveau. Ceci justifie la vigilance publique qui les entoure.

3. COMMENT EST EVALUE UN OGM AVANT D'ETRE MIS SUR LE MARCHE ?

L'analyse des risques pour la santé et des risques pour l'environnement sont les éléments fondamentaux et préalables à toute autorisation de mise sur le marché d'OGM. Elle est fondée sur des éléments scientifiques. Elle est confiée à des comités d'experts indépendants.

En France, l'analyse des risques de dissémination d'un OGM dans l'environnement est réalisée par la Commission du Génie Biomoléculaire (CGB). Les risques alimentaires (alimentation humaine et animale) sont analysés par l'Agence Française de Sécurité Sanitaire des Aliments (AFSSA).
Les évaluations sont effectuées au cas par cas. Elles tiennent compte de la nature du gène, de l'espèce et de la variété, des conditions et zone d'utilisation et de l'usage qui sera fait de l'OGM (alimentaire ou industriel).

En fonction de ces éléments, on évalue quatre **types de risques : le risque toxique ; le risque alimentaire pour l'homme et l'animal ; le risque allergique ; le risque écologique** (prolifération dans l'écosystème, effet sur les populations d'insectes, transfert d'ADN entre espèces végétales voisines, etc.).

L'autorisation d'un OGM vaut pour l'utilisation qui est prévue : un OGM autorisé comme semence doit faire l'objet d'une évaluation complémentaire et d'une nouvelle autorisation si l'utilisation envisagée est la production, la transformation industrielle, l'utilisation alimentaire, etc.

4. QUELS SONT LES PLANTES GENETIQUEMENT MODIFIEES AUTORISEES EN FRANCE ET SOUS QUELLES CONDITIONS ?

SONT AUTORISES POUR TOUTE UTILISATION (IMPORTATION, CULTURE ET TRANSFORMATION) :

Le **maïs Bt-176** de la société Novartis tolérant à un insecte ; tout usage
Le **maïs MON 810** de la société Monsanto tolérant à la pyrale ;
Le **maïs TR 25** de la société AgrEvo tolérant à un herbicide.

L'autorisation est limitée à une durée de 3 ans et elle est assortie de mesures de suivi ("*biovigilance*") de l'utilisation des semences afin d'évaluer les effets éventuels des cultures sur l'environnement (effets sur les populations d'insectes et sur les bactéries du sol) et de suivi de la consommation par les animaux du maïs ainsi produit (évolution de la flore digestive). Le comité de biovigilance réunit experts scientifiques et représentants de la société civile.

2) SONT AUTORISES SEULEMENT A L'IMPORTATION EN VUE DE LEUR TRANSFORMATION INDUSTRIELLE :

Le **soja** tolérant à un herbicide obtenu par la société Monsanto pour la transformation en aliment humain et animal
Le **maïs BT-11** de la société Novartis, tolérant à la pyrale et à un herbicide pour la transformation en aliment animal.
La *culture* de ce soja ou de ce maïs n'est pas autorisée en Europe.

Enfin, sont autorisés pour la production et la commercialisation de fleurs coupées, des **oeillets** à coloration modifiée ou présentant une tenue en vase prolongée mis au point par la société Florigène.

5. PEUT-ON, SI NECESSAIRE, REVENIR SUR UNE AUTORISATION ?

Oui, si un pays considère que le produit présente un risque pour la santé ou l'environnement. Il peut alors en interdire provisoirement l'utilisation ou la vente.

La France a décidé un moratoire jusqu'en novembre 2000 qui interdit la commercialisation des colza génétiquement modifiés afin de poursuivre l'évaluation du risque environnemental que peut entraîner le croisement de ces colza OGM avec des plantes sauvages C'est le "*moratoire colza*".

Toutefois, les huiles obtenues à partir de ces colzas sont autorisées : on peut les importer, mais leur fabrication ne peut avoir lieu en France.

6. DANS QUEL BUT CREER DES PLANTES TRANSGENIQUES ?

Actuellement, les buts poursuivis sont multiples :

Améliorer les caractéristiques agronomiques : tolérance aux herbicide, résistances aux insectes, au bactéries, virus, etc. On diminue ainsi les quantités de produits chimiques nécessaires ;

Faciliter la production de semences de "*variétés hybrides*" ;

Stériliser les graines récoltées ("*terminator*") pour contrôler le risque de dissémination dans l'environnement ou empêcher leur utilisation comme semences ;

Améliorer la conservation des fruits en retardant leur maturation ;

Améliorer la qualité des arbres utilisés comme pâtes à papier en modifiant le taux de lignine. Le rendement est accru, l'utilisation de produits chimiques d'extraction et de blanchiment est diminué ;

Améliorer la qualité nutritionnelle des aliments en modifiant les acides gras ou les amidons, ou en diminuant le caractère allergène d'un aliment;

Produire des composés à usages médicaux tels que du collagène, des lipases gastriques, de l'albumine voire des vaccins...

7. DANS QUELS PRODUITS ALIMENTAIRES PEUT-ON TROUVER DES OGM OU LEURS DERIVES ?

Aujourd'hui les OGM autorisés (maïs, colza , soja) ne sont pas directement consommables en tant que tels (les pousses dites 'de soja' sont en réalités des pousses de haricot mungo qui n'ont rien à voir avec le soja utilisé dans l'industrie agro-alimentaire) ; les maïs génétiquement modifiés autorisés ne servent pas à la production de maïs doux ou de maïs pop-corn.

En revanche, on peut consommer les produits dérivés de ces OGM sous plusieurs formes :

Aliments :
à base de maïs : farine, semoule, huile, chips, pétales pour petit déjeuner ;
à base de soja : huile, tonyu, tofu, crèmes desserts, sauce, lait de soja;
à base de colza : huile.

Ingrédients :
farine de maïs : pain, céréales pour petit-déjeuner, biscuits apéritifs, etc.
flocons de maïs : barres de céréales, etc.
semoule de maïs : biscuits apéritifs, chapelure, bière, céréales pour petit déjeuner, etc.
amidon de maïs et fécule : plats cuisinés, sauces, charcuterie, desserts, pâtisseries, etc.
dérivés de l'amidon de maïs (sirop de glucose, dextrose, etc.) : sauces, biscottes, barres céréales, bières, potages, biscuits apéritifs, yaourts, glaces, etc.
farines de soja : pain, pain de mie, pâtisseries, etc.
protéines de soja : plats cuisinés, charcuterie, préparations pour nourrissons, etc.

Additifs :
issus du maïs : E 1404, E 1410, E 1412 à E 1414, E 1420, E 1422), E 1440, E1442, E 1450, E151, E 150a à E 150d, E 420, E 421, E 953, E 965, E 966, E 967, E 575, E 315, E 316.
issus du soja : lécithine (E 322) et E 479b.

Supports d'arômes :
produits dérivés du maïs tels que amidons, maltodextrines, β cyclodextrine.

Enzymes :
enzymes pour la fabrication de bière, d'alcool, de pain, de sirops de maltose et de glucose ;
enzymes utilisées pour la fabrication de fromages.

8. PEUT-IL Y AVOIR DES OGM COMMERCIALISES SANS AUTORISATION ?

Non, sauf accident ou fraude. En fait, 90 % des cultures transgéniques dans le monde se situe en Amérique du Nord. En 1999, les Etats-Unis, avec 28,7 millions d'hectares représentaient à eux seuls 72 % de la superficie totale de plantes transgéniques. Au sein de l'Europe, il s'agit d'OGM qui ont été autorisés dans l'Union européenne et dont la commercialisation est suspendue en France. C'est le cas pour le colza Topas 19/2 de la société Agr'Evo. Les risques d'importation d'OGM hors zone Europe non autorisés concernent essentiellement les produits dérivés du maïs et du soja et de colza. L'Europe est très déficitaire en soja.

9. ETIQUETAGE DES OGM

QUELLES SONT LES MODALITES D'ETIQUETAGE DES PRODUITS DESTINES A L'ALIMENTATION HUMAINE ?

Le règlement prévoit que des produits dérivés d'OGM (ingrédients, additifs, arômes, etc.) sont étiquetés dans la mesure où ils ne sont plus équivalents aux produits existants comparables, c'est-à-dire quand ils contiennent de l'ADN ou des protéines liées à la modification génétique.

La démonstration de l'absence d'ADN et de protéines dispense de l'étiquetage. Une liste de produits considérés comme équivalents sera établie, regroupant l'ensemble des produits dispensés d'étiquetage.

La mention *"génétiquement modifié"* doit suivre le nom de chaque ingrédient concerné. Cette mention doit également apparaître sur les produits pour lesquels il n'existe pas de liste d'ingrédients (huile, bière, etc.).

Il est prévu une tolérance afin de répondre au problème de "*contaminations*" fortuites en OGM (disséminations de pollen de maïs par le vent par exemple). Ainsi, pour un ingrédient donné, la présence fortuite de moins de 1 % d'ingrédients issus d'OGM n'oblige pas son étiquetage et la preuve qu'il n'y a pas eu utilisations de matières premières OGM.

Un produit peux contenir une mention du type "*sans OGM*" si cette absence peut être prouvée. Cette mention signifie donc que des précautions ont été prises à tous les stades de la filière pour s'assurer qu'aucun OGM n'est entré dans la chaîne de production du produit, même fortuitement.

DE QUELS MOYENS DISPOSE-T-ON POUR CONTROLER L'ETIQUETAGE ?

La bonne application de la réglementation suppose l'utilisation de deux outils complémentaires :

la **traçabilité** depuis les matières premières, c'est-à-dire le suivi documentaire qui permet d'identifier l'origine et la nature ainsi que la destination des produits à chaque transaction commerciale ;

les **analyses de laboratoire** pour vérifier la présence d'ADN d'OGM.

Les pouvoirs publics disposent à la fois de laboratoires pour analyser les produits et de moyens classiques de contrôle (documents, factures, et évaluation de la fiabilité de la traçabilité des professionnels).

Rappelons enfin que :

la France est autosuffisante en maïs conventionnel : les importations de maïs en grain représentent moins de 1 % des ressources et les importations de produits dérivés du maïs destinés à l'alimentation animale représentent 6 % de l'approvisionnement de ce secteur.

Moins de 200 ha de maïs OGM ont été mis en culture en France en 1999, soit environ 0,01 % de la surface totale des cultures de maïs ; beaucoup d'entreprises ont hésité à mettre des OGM dans leurs produits ; certaines ont même changé la composition des produits afin d'exclure, pour l'instant, tout dérivé de maïs ou de soja.

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