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A new approach to elicit consumers' willingness to purchase genetically modified apples

A willingness to purchase GM apples

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Elsa Kassardjian, Joanna Gamble and Anne Gunson
HortResearch, Auckland, New Zealand, and
Sara R. Jaeger
The University of Auckland, Auckland, New Zealand

Abstract

Purpose – The goal of this research was to try a new methodology to elicit consumers' willingness to pay for genetically modified (GM) food.

Design/methodology/approach – Even though experimental auctions have been used for several years, they do not provide qualitative information on consumers' reasoning behind their purchase behaviours. To provide further illumination in this regard, a thought-listing technique and a questionnaire were added.

Findings – A majority of the consumers involved in this study were ready to pay for the GM food offered. The benefit provided by the GM product did not seem to be the major purchase criterion and sensory assessment appeared to be important. The use of different methodologies on the same sample of participants revealed that there was a gap between purchasing intentions and behaviours, and that a key to efficiently assessing public perception and purchase behaviours is the precision of the context.

Research limitations implications – The absence of discrimination between the different benefits offered, might come from the limited size of the samples or from the nature of the benefits offered. Future research should consider larger samples and more diversified products.

Practical implications – This study has concrete methodology applications. If one would like to conduct a market study, for instance, on a specific GM product, a general survey on biotechnology will not provide relevant answers.

Originality/value – The implementation of experimental auctions with psychometric tools, created an original and suitable protocol for accessing consumers' willingness to pay as well as their justifications.

Keywords Fruits, Food products, Genetic modification, Costs, Customer satisfaction, New Zealand

Paper type Research paper

Introduction

The year 2003 has been a turning-point for New Zealand regarding genetically modified (GM) organisms. Based on the Royal Commission's report on GM, the Government announced that the five years moratorium on the commercial release of

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GM organisms, as well as on certain field trials, would be lifted at the end of October 2003. A poll conducted in New Zealand just before the moratorium's lifting (Taylor, 2003) indicated that almost 70 per cent of the New Zealanders interviewed did not want the moratorium to be lifted and did not want GM products in New Zealand. According to Noussair *et al.* (2004) if a majority of consumers are unwilling to buy GM products, as suggested by the polls, banning these products would probably be the best option. However, it has long been observed that correlations between intentions and behaviours are low (Wicker, 1969).

From the point of view of the companies developing GM products, the second generation of these products will be more acceptable due to direct benefits to consumers. The question of the influence of direct benefits to consumer is key to public acceptance of GM products. Some studies have found that consumers' acceptance for GM food is greater when the food presented a direct benefit to them, rather than a benefit to the farmers (Brown and Ping, 2001; Zhong *et al.*, 2002).

Many studies (mainly surveys, focus groups or choice experiments such as contingent valuations) have assessed whether knowledge of the nature of the benefit associated to a GM product would have an impact on people's purchasing or consumption intentions for this product. Fortin and Renton (2003), for instance, showed that attitudes toward a brand of GM bread were not more positive with a direct benefit to consumers (increased shelf life). But as the authors wrote, it is questionable whether longevity is an appropriate benefit for a GM product.

The goal of the present research is to try an innovative methodology to study purchase behaviour for specific GM products presenting different benefits, in the New Zealand context. This main goal can be achieved by answering four specific research questions:

- RQ1.* Are people ready to pay for GM products, and how much?
- RQ2.* Does the nature of the benefit influence people's willingness to pay (WTP) when different products are presented simultaneously?
- RQ3.* What is going through people's minds while they are deciding how much to pay for a GM product?
- RQ4.* Do people's opinions of GM have an impact on their WTP for GM products?

Methodology

Several studies have already tackled the willingness to buy GM products, assessing the influence of different factors (the price, the quantity of GM ingredient in the final product or the benefit provided). Most of these studies (e.g. Deliza *et al.*, 1999; Frewer *et al.*, 1997; Gamble *et al.*, 2000) used survey methodology focusing on purchase intentions only. Others (Noussair *et al.*, 2004; Lusk *et al.*, 2003; Rousu *et al.*, 2004) applied experimental auction techniques, providing real estimates of WTP for a GM product. Experimental auctions use real products, real money, and at the end of the process, winners actually have to pay for the product they purchased. These auctions are therefore an appropriate methodology to answer *RQ1* and *RQ2*.

Experimental auctions

Jaeger *et al.* (2004) provides a description of the many different types of experimental auctions. The current study used the fifth highest price protocol. In such an auction, participants submit bids for a product and the four highest bidders win the auction. The amount they then have to pay corresponds to the fifth highest bid, called the market price. In this type of auction, Noussair *et al.* (2003) show that it is always the best strategy for bidders to bid exactly the price they consider the product is worth, independently of the bidding strategies of the other bidders. This was clearly demonstrated to the participants in this study, through the use of examples and in training.

Six auction sessions were run for this study. In three sessions, two products were provided in order to answer RQ2. Frewer *et al.* (1996) have shown that benefits to health and to the environment may represent more acceptable benefits than others (e.g. reduced costs), a finding confirmed by Mucci and Hough (2004). The two types of GM apples provided were therefore: apples presenting a benefit to the environment (hereafter referred to as E apples) and apples presenting a benefit to health (hereafter referred to as H apples). The E apples were described as GM apples with a foreign gene coming from another apple. Gamble and Gunson (2002) have indeed shown that acceptance of GM products is greater if the source of the gene is from the same type of product. These E apples were developed to be resistant to pests, eliminating the need for any chemical sprays. The H apples were also described as GM apples with a gene from another apple, containing the same amount of polyphenolics as five conventional fresh apples. Polyphenolics are antioxidants that can control undesirable allergic immune reactions like hives.

In the three other auction sessions, people bid for one product only. This has been done in order to assess if the context (two products to bid on or only one) could influence participants' WTP. As GM products with environmental benefits are of greater interest to the organisation the authors work for, E apples were provided in these three sessions.

In all the experimental auctions, participants were initially given two ordinary apples. They were then offered the opportunity to exchange their ordinary apples for two GM apples (two E and two H apples in three sessions; two E apples in three other sessions). Then, participants submitted bids, reflecting the amount of money they would pay to exchange their ordinary apples for the GM ones. Participants were asked to submit five consecutive bids.

After every bidding round, the market price was written on a white board so this information was available to everybody and could be used in the next round. Only one repetition was randomly chosen as binding. This has been done in order to eliminate the likelihood of consumers reducing their bids to buy more than one product. Their bidding strategy is therefore still demand-revealing. Roosen *et al.* (1998) have provided evidence that participants treat each repetition of the market as if it was binding despite knowing only one bidding round would be determined randomly.

Predictions about how much money people are willing to pay for a GM product are important, but a more interesting question is probably that of why people are ready (or not) to pay. This question has still not been addressed in the experimental auctions literature and this is why a thought-listing technique has been added.

Thought-listing technique

According to Cacioppo *et al.* (1999), the thought-listing technique is particularly useful when one has no clear predetermined ideas about the cognitive dimensions involved in a process. The most common methodology is to provide a paper with empty boxes so that participants can write one thought per box.

There are several success factors for the thought-listing technique:

- precision of the explanation;
- honesty; and
- immediacy of the answers.

Participants received clear explanations about what was expected from them:

We are interested in everything that is going through your mind about the auction you are going to take part in. Please list these thoughts, whether they are about yourself, the situation, and/or others; whether they are positive, neutral and/or negative.

Respondents were assured of their anonymity through the use of numerical codes. Therefore, they should have reported their thoughts honestly.

People's memory for thoughts, feelings and events is imperfect. Biases can be introduced in a delayed thought-listing technique. Because of this, participants were requested to repeat the thought-listing after every bidding round.

Content analysis (Owen, 1984) was used to identify the main themes in the data collected. Two scientists independently coded the thought-listing data, and any discrepancies in the codifications were resolved by discussion.

Questionnaire

People's WTP for GM products might be influenced by their opinions about GM and therefore by the factors influencing opinions (feelings, values, thoughts, knowledge). Among these factors, knowledge has been particularly studied and even if the link between opinion and knowledge is acknowledged, the nature of this link is not yet clarified (Kassardjian, 2002). Earlier studies have shown some inconsistent findings regarding the relationship between opinions of biotechnology and knowledge. Some have found that people with a higher knowledge of biology are more favourable to GM and biotechnology (e.g. Frewer, 1998). Other studies have found no such associations (e.g. Priest, 2000).

A potential reason for these contradictory results, given by House *et al.* (2004), lies in the manner in which knowledge is measured. They recommended that researchers measure the type of knowledge appropriate to the study, including a mix between objective knowledge (what people know) and subjective knowledge (what they think they know). This is precisely what Gaskell *et al.* (2003) did with the "engagement model". Here, they assessed people's engagement with biotechnology based on objective knowledge, subjective knowledge, as well as what they called "reported and intended behaviour". This model has been developed for a comprehensive study in 15 countries (the Eurobarometer), and is used in the present study, to assess the impact of engagement on WTP. The fourth research question can therefore be stated:

RQ4. Do people's opinions of GM and their engagement with biotechnology, have an impact on their WTP for GM products?

Questionnaires were designed to provide information on participants' opinions of GM and their level of engagement with biotechnology.

Opinions were assessed through one question presented in the Appendix, Figure A1. Participants were asked to indicate their agreement/disagreement with presence of GM food in New Zealand supermarkets, by circling the number that best corresponded to how they felt on a seven-point scale. Answers 1, 2, 3 were considered as unfavourable and answers 5, 6, 7 as favourable, 4 being the "neutral - don't care" position.

The questions developed by Gaskell *et al.* (2003) for the Eurobarometer (see the Appendix, Figure A2) were used in order to assess engagement with biotechnology. Following Gaskell *et al.* (2003), a score was given to each participant, for each of the three groups of questions (reported and intended behaviours; awareness of biotechnology; knowledge of biology and genetics). The sum of participants' scores varied between 7 and 16 (on a total range from zero to 16). Participants were then split in two groups. The 11 participants with scores of 7, 8 and 9 were considered as the least engaged, and the 12 participants with scores of 15 and 16, as the most engaged (only the most and least engaged participants were taken into account as the greatest differences were expected to be between these two extremes). These thresholds were arbitrary but allowed comparisons.

The following protocol details how the experimental auctions, thought-listings and questionnaires were combined.

Protocol

The experimental protocol had seven main steps:

- (1) Participants were recruited by an agency. They had to both purchase and eat "Braeburn" apples at least once a week, to ensure they were interested in the product. After a brief explanation on the whole process, participants signed a consent form.
- (2) Participants were then given NZ\$40 (equivalent to approximately €20) for the experiment and an ID number to remain anonymous. They were told that they could use the money to purchase some apples during the auctions, or keep the \$40.
- (3) "Genetic modification" was defined and the experimental auctions as well as the thought-listing technique were explained.
- (4) Training was carried out using chocolate bars instead of apples, to ensure the process was well understood. As described earlier, participants had to submit five consecutive bids. After each bidding round, participants received feedback on the market price and wrote down their thoughts on the corresponding form. At the end of the five bidding rounds, one was randomly chosen as binding and the four winners (four highest bidders) had to pay the market price (fifth highest price) for the product (the chocolate bar).
- (5) The procedure was repeated with apples. The process was the same as the one described in step 4. In those sessions with two products (E and H apples), only one product was for sale (randomly determined at the end of each bidding round), despite the fact that bidding was for both products.
- (6) Participants filled in their questionnaires.

(7) A debriefing session and informal discussion were organised to answer questions, as participants were not allowed to talk during the auctions. Participants were also told that the apples proposed were not actually GM and therefore that no one would have to pay for the exchange.

A total of 82 participants took part in the study. The demographic information is given in Table I.

Hypotheses

RQ1

Based on Taylor’s poll Taylor (2003), which revealed that 70 per cent of New Zealanders did not want GM products, a strong rejection of these products could be expected, and therefore many \$0 bids (revealing that participants do not want to pay to exchange conventional apples for GM ones):

H1. \$0 bids \approx 70 per cent of all bids.

RQ2

A KRC survey KRC Research (2003) revealed that 58 per cent of Europeans would be more likely to accept GM crops if they reduced allergic reactions (comparable to the H apples of this study) against 51 per cent for GM crops requiring fewer pesticides (comparable to the E apples of this study). Similarly, according to Lusk *et al.* (2003), a health benefit would be more acceptable than an environmental benefit. A greater WTP for the H apples than for the E apples can therefore be expected:

H2. $WTP_{H \text{ apples}} > WTP_{E \text{ apples}}$

RQ3

This was a general question. The thought-listing data provide qualitative information to assist with the other research questions.

RQ4

The first expectation regarding the influence of opinion on WTP was that participants favourable to GM would be less likely to bid \$0:

	E apples only (n = 44)		E and H apples (n = 38)		Total (n = 82)
	N	%	N	%	
<i>Gender</i>					
Females	28	63.6	25	65.8	53
Males	16	36.4	13	34.2	29
<i>Age</i>					
18-25	7	15.9	3	7.9	10
26-35	8	18.2	9	23.7	17
36-45	14	31.8	9	23.7	23
46-55	8	18.2	8	21.0	16
56-65	7	15.9	9	23.7	16

Table I.
Participants’
demographic information

$$H3a. \$0bids_{favourable} < \$0bids_{other}$$

The second expectation was that these participants would have greater WTP than the others:

$$H3b. WTP_{favourable} > WTP_{other}$$

The converse hypotheses were made for participants unfavourable to GM:

$$H3c. \$0bids_{favourable} > \$0bids_{other}$$

$$H3d. WTP_{favourable} < WTP_{other}$$

Gaskell *et al.* (2003) found that the most engaged people were more favourably inclined than the others. Given *H3b* and *H3d*, expectations are:

$$H4a. WTP_{most\ engaged} > WTP_{other}$$

$$H4b. WTP_{least\ engaged} < WTP_{other}$$

Results and discussion

A majority of participants ready to pay for the GM apples

Although only 24 per cent of the participants agreed in their questionnaires with the presence of GM food in New Zealand supermarkets, only 25 (30 per cent) bid \$0 in all five rounds (they did not want to pay to exchange their ordinary apples for GM ones). For the H apples, this was the case for 12 of the 38 participants (32 per cent). This is far fewer than the 70 per cent rejection indicated in the poll results (Taylor, 2003). *H1* is therefore rejected.

Moreover, explicit concern about GM was the justification given by only half (52 per cent) of those participants bidding \$0 in all five rounds. Many (28 per cent) did not justify their \$0 bids. Others explained their \$0 bids by the fact that they wanted to keep their money (10 per cent) (e.g. "Need the money so that's that") or that they were happy with the conventional apples they were initially given (10 per cent) (e.g. "I might want to swap if what I've got didn't look so good").

A majority of participants in this study were ready to pay for the GM apples. This finding demonstrates that there is likely to be a difference between poll or survey results and experimental auction results. As Noussair *et al.* (2004) wrote, surveys place respondents in the role of citizens, who make judgments from society's point of view, whereas experimental auctions specifically reveal consumers' reactions. It is therefore crucial to choose the most appropriate methodological tool for the research question.

No clear influence of the benefit provided

Figure 1 presents the WTP for the five bidding rounds in the auctions where both E and H apples were presented. No bidding round was excluded from the analysis as is traditionally done in the experimental auctions literature. In fact, thoughts revealed that participants' attention varied during the process: some were interested in the first rounds and expressed boredom at the end (e.g. "I am bored with having to do another two bids", thought written after the 3rd bidding round), whereas others started to get involved in the last rounds (e.g. "A bit lost here", thought written after the 2nd bidding round; the same participant wrote "Well, I made it in this round" after the 4th bidding round).

According to Figure 1, the bids for the E apples tended to be greater than for the H apples. Nevertheless, no significant difference between WTPE and WTPH was found (Wilcoxon Rank-Sum: $U = 1663.0$, $p = 0.195$). H_2 is therefore rejected. This relationship between WTPE and WTPH is illustrated in Figure 2 ($r = 0.911$). One point can correspond to more than one participant since several participants can have the same WTP for the E and the H apples.

The only significant difference found between the E and H apples lies in the nature of the thoughts associated with these products. Participants wrote significantly more positive thoughts about E apples than H apples ($X^2 = 7.5$, $df = 1$, $p = 0.05$) probably

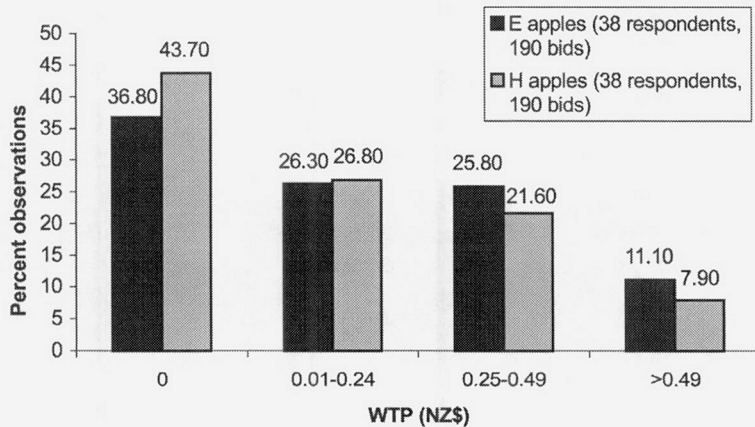


Figure 1.
Histograms of WTP over five bidding rounds

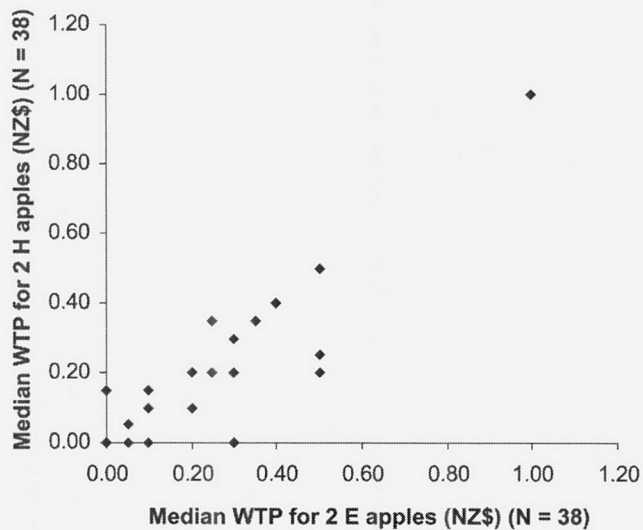


Figure 2.
Scatter plot of E against H WTP

because some people were more dubious towards the stated health benefits (e.g. “I don’t really believe ‘health benefits’”). Using a survey methodology, Koivisto Hursti *et al.* (2002) had previously failed to demonstrate any effects of tangible benefits on Swedish consumers acceptance of GM tomatoes.

Interestingly, there was a significant difference between the WTP for the E apples in the sessions where this product was the only one, and the WTP for the same apples, when they were proposed together with H apples (Wilcoxon Rank-Sum: $U = 16234.5$, $p < 0.001$):

$$WTP_{E (E; H)} > WTP_{E (E \text{ only})}$$

Participants might have wanted to express a slight preference for the E apples.

Opinion, engagement and WTP are linked

Link between opinion and WTP. In order to assess any potential influence of participants’ opinions of GM on their WTP, the first step was to determine which participants were favourably inclined to GM and which ones were unfavourably inclined to GM. This could be done in two different ways, using either the questionnaires (see the Appendix, Figure A1 for the question dedicated to participants’ opinion of GM food) ($n = 80$), or the thought-listing (56 participants wrote thoughts about GM). For example “GM sounds like a good idea. GM better than pesticides” was considered as a favourable thought whereas “Freaky GM apples” was classified as unfavourable. Two researchers independently classed participants into the favourable or unfavourable categories, based on the thoughts they had written. Table II summarises these classifications.

Consistent with expectations (*H3a*), there was a significant difference in the distribution of the \$0 bids between favourably inclined participants and the remaining sample:

$$\$0bids_{favourable} < \$0bids_{other}$$

This difference was found using both methods of classification (questionnaires and thoughts). The difference was nevertheless greater with the thoughts classification. Participants considered as favourably inclined according to their thoughts had significantly less \$0 bids than the ones considered as favourable based on their questionnaires ($X^2 = 6.75$, $df = 1$, $p = 0.05$). Moreover, the bids of the first ones (thoughts classification), were significantly higher than the bids of the second ones (questionnaire classification) (Wilcoxon Rank Sum: $U = 269$, $p = 0.009$).

Thus, thoughts appeared to be better indicators of people’s opinions of GM products than the answers to a single question. This finding reinforces previous

	Favourable		Unfavourable		Neither – nor/don’t care	
	N	%	N	%	N	%
Questionnaire classification ($n = 80$)	20	25.0	38	47.5	22	27.5
Thoughts classification ($n = 56$)	15	26.8	29	51.8	12	21.4

Table II.
Summary of the two classifications

ones (e.g. Hunt *et al.*, 2003), suggesting that a key to understanding public perception (and therefore to determining a particular GM product's market opportunity and potential sale price) is the precision of the context. Thoughts were linked to the specific products, whereas the question was very general. Moreover, in this study where participants could really buy a GM product, they probably had to focus more carefully on what they thought of the GM product, whereas the questionnaire in this study (and surveys in general) did not have any binding consequences. In the following, favourably or unfavourably inclined participants, will refer to the thoughts classification.

Consistent with *H3b*, there was a significant difference between the WTP of favourably inclined participants and the others, but for the E apples only (Wilcoxon Rank-Sum: $U = 7555.5, p < 0.001$) (probably due to the small number in the H apples condition):

$$WTP_{\text{favourable E}} > WTP_{\text{other E}}$$

Conversely, unfavourably inclined participants were found to be more likely to bid \$0 ($X^2 = 37.96, df = 1, p = 0.05$) and to bid lower amounts of money for both E (Wilcoxon Rank Sum: $U = 13223, p < 0.001$) and H apples (Wilcoxon Rank Sum: $U = 2375, p < 0.001$). *H3c* and *H3d* are therefore proven correct:

$$\$0\text{bids}_{\text{unfavourable}} > \$0\text{bids}_{\text{other}}$$

$$WTP_{\text{unfavourable}} < WTP_{\text{other}}$$

Link between engagement and WTP. Consistent with the findings of Gaskell *et al.* (2003), there was significantly more people expressing favourable thoughts towards GM food among the participants most engaged with biotechnology than in the remaining participants (see Table III) ($X^2 = 5.14, df = 1, p = 0.05$).

There is as well a significant difference between the amount of money the most engaged participants are willing to pay and the amount others are willing to pay for the E apples only (Wilcoxon Rank-Sum: $U = 6936.0, p < 0.001$) (*H4a* is confirmed for the E apples):

$$WTP_{\text{most engaged E}} > WTP_{\text{other E}}$$

Conversely, among the least engaged participants, no one was favourable to GM food (see Table IV) and they expressed significantly more unfavourable thoughts than the other participants ($X^2 = 7.76, df = 1, p = 0.05$).

Table III.
Opinions expressed by the most engaged participants against the others

	Favourable (%)	Unfavourable (%)	Other (neither-not/not thoughts on GM) (%)
Most engaged	41.7 (5 participants out of 12)	16.6 (2 participants out of 12)	41.7 (5 participants out of 12)
Other	14.3 (10 participants out of 70)	38.6 (27 participants out of 70)	47.1 (33 participants out of 70)

These least engaged participants gave lower bids for H apples only (Wilcoxon Rank-Sum: $U = 1193.0, p < 0.001$). H4b is correct for these H apples:

$$WTP_{\text{least engaged H}} < WTP_{\text{other H}}$$

A need to “interact” with the products

Of the participants, 43 per cent spontaneously wrote in their thoughts that they wanted to try the GM apples.

Of the participants, 21 per cent were simply curious as to whether the genetic modification had altered or improved the sensory qualities of the apples (smell, appearance, texture, taste). These participants' WTP was significantly greater than the WTP of the remaining participants (E apples: Wilcoxon Rank-Sum: $U = 10687.5, p = 0.001$ /H apples: Wilcoxon Rank-Sum: $U = 2460.0, p = 0.012$).

Some 16 per cent of the participants were so curious that they explicitly justified their WTP by a wish to try the GM apples. Interestingly, four of these 13 participants expressed unfavourable thoughts towards GM products, but curiosity was more important. Once again, these participants' WTP was significantly greater than the others' WTP (E apples: Wilcoxon Rank-Sum: $U = 7011.5, p < 0.001$ /H apples: Wilcoxon Rank-Sum: $U = 1797.5, p = 0.002$).

Finally, 6 per cent of the sample expressed frustration at being unable to taste the apples and therefore bid \$0 (e.g. “Will it affect taste? Why would I pay for something I haven't tried? They should offer test samples”).

Since even unfavourably inclined people bid positive amounts of money because they wanted to try the GM products, curiosity could be used to attract consumers in the first place, just as for any other new product. Nevertheless, long-term success will depend on the specific attributes of the product itself (benefit associated and sensory qualities). Indeed, while participants were expected to mainly focus on the GM aspect of the apples proposed, many thoughts were related to questions regarding the sensory qualities of the products (smell, taste, appearance, texture). This finding suggests that GM apples may be assessed on the same criteria as conventional apples. Grunert *et al.* (2004) have found that a positive sensory experience with a GM food decreased negative attitudes towards genetic modification in food production.

Recommendations and conclusions

Although the thoughts revealed that some people were more dubious regarding the health benefit, no significant difference was found between the bids made for the E apples against the H ones. The benefit scenarios could probably have been pre-tested by providing a list of benefits and asking participants to classify them according to

	Favourable (%)	Unfavourable (%)	Other (neither-not/not thoughts on GM) (%)
Least engaged	0 (0 participants out of 11)	72.7 (8 participants out of 11)	27.3 (3 participants out of 11)
Other	21.1 (15 participants out of 71)	29.6 (21 participants out of 71)	49.3 (35 participants out of 71)

Table IV.
Opinions expressed by the least engaged participants against the others

their preferences. More than two products and more than one scenario per type of benefit could have been provided as well. In the present study, there was only had one type of apple presenting a benefit to the environment and one presenting a benefit to health.

When presented with another product, the WTP for E apples was greater than when these E apples were the only ones presented. This finding reinforces the need in future work on the influence of benefits on WTP, to present different products simultaneously and carefully select these products.

A total of 28 per cent of the participants bidding \$0 in all five rounds, did not explain their \$0 bids. It would be interesting in future work to set up, in parallel, another experimental auction with thought-listing. Participants could receive GM apples at the beginning, and be offered the opportunity to pay to exchange their GM apples for conventional ones. Crossing the results of these two types of experimental protocols would allow clarification of the motivations (curiosity, rejection of GM, willingness to keep the money).

A major interest of this work lies in the combination of the methodological tools used. As Marks *et al.* (2003) write:

In the absence of direct market evidence, experimental auction market methods are arguably the more promising approach for predicting actual consumer behaviour. [...] That said, such studies (survey and choice experimental evidence) can yield important information about individual consumer attitudes and usefully combine such information with demographic, socio-economic and psychometric information.

The implementing of experimental auctions with a thought-listing technique created an original and suitable protocol for accessing participants' WTP as well as their justifications.

Another innovative contribution was to provide two GM products with different benefits simultaneously. The experimental situation created for this study was close to a purchase environment where consumers have to choose.

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Appendix

Figure A1.
Question focused on
participants' opinion

Question 28: If genetically modified food was available in the stores, it is highly likely that I would ...	Definitely avoid	1	2	3	4	5	6	7	Definitely buy

Question 32: Before today, had you ever talked about modern biotechnology with anyone?			
<input type="checkbox"/>	Frequently		
<input type="checkbox"/>	Occasionally		
<input type="checkbox"/>	Once or twice		
<input type="checkbox"/>	Never		
Question 33: I would take the time to read articles or watch TV programmes on the advantages and disadvantages of developments in biotechnology			
<input type="checkbox"/>	Tend to agree		
<input type="checkbox"/>	Tend to disagree		
<input type="checkbox"/>	Don't know		
Question 34: I would be prepared to take part in public discussions or hearing about biotechnology			
<input type="checkbox"/>	Tend to agree		
<input type="checkbox"/>	Tend to disagree		
<input type="checkbox"/>	Don't know		
Question 35: Have you heard of this application of biotechnology before, or not?			
	Yes	No	Don't know
Genetic testing: using genetic tests to detect inheritable diseases such as cystic fibrosis mucoviscidosis, thalassaemia			
GM food: using modern biotechnology in the production of foods, for example to make them higher in protein, keep longer or change the taste			
GM enzymes: using genetically modified organisms to produce enzymes as additives to soaps and detergents that are less damaging to the environment			
Question 36: Below are some items that should be rated as true or false. Please circle 1 if you think the statement is true, or circle 2 if you think the statement is false.			
	True	False	
There are bacteria which live in waste water			
Ordinary tomatoes do not contain genes, while genetically modified tomatoes do			
The cloning of living things produces exactly identical offspring			
By eating a genetically modified fruit, a person's genes could also become modified			
It is the mother's genes that determine whether a child is a girl			
Yeast for brewing beer consists of living organisms			
It is possible to find out in the first few months of pregnancy whether a child will have Down's syndrome			
Genetically modified animals are always bigger than ordinary ones			
More than half of the human genes are identical to those of chimpanzees			
It is impossible to transfer animal genes into plants			

Figure A2. Questions focused on reported and intended behaviours (questions 32, 33, 34); on awareness of biotechnology (question 35); on knowledge of biology and genetics (question 36)