Organic Agriculture – Consumer Behavior and Market

THESIS by

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Effective communication about genetically modified foods towards consumer acceptance

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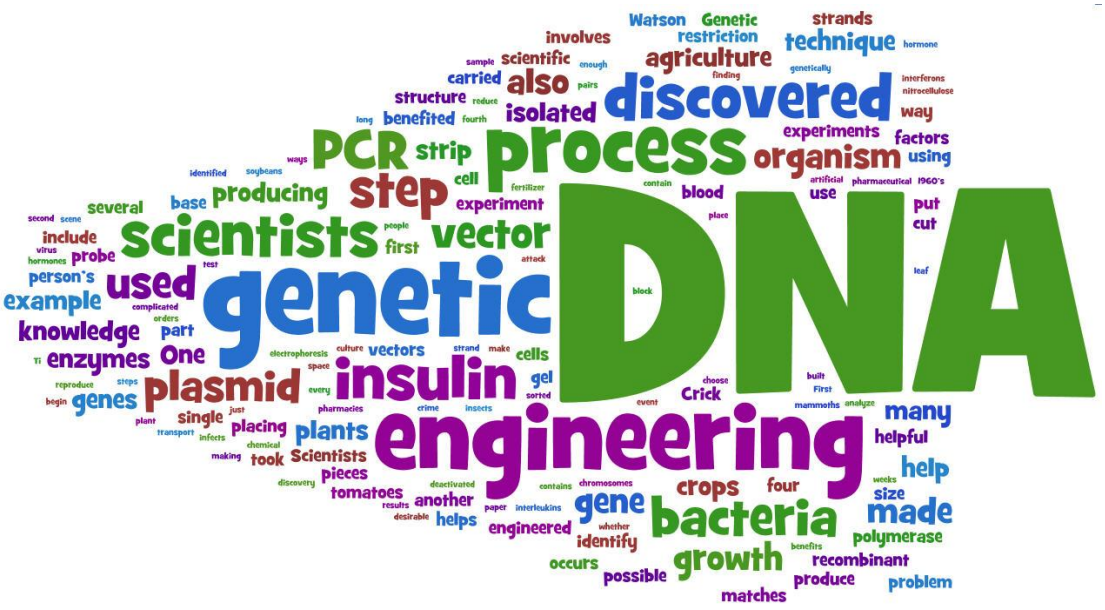

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Abstract

Genetic engineering is a promising technology concerning a more efficient, sustainable and high food production but it is accepted from the public with negativity. Communication stands very important to influence the attitude of the consumers towards the acceptance of the technology and its products, the genetically modified (GM) foods. An online survey was conducted (N=100 WUR students) to investigate if the attitude of the consumers about GM foods can be influenced by the type of information is provided. The message was formulated according to two different perspectives, the experts' and the consumers', based on the four main determinants of consumer's attitude: perceived benefit, perceived risk, subjective norm and perceived behavioral control. Additionally, it was tested if the consumers evaluate more positive the GM foods towards environmental sustainability and human health, in order to identify how communication can be more effective. The study shows that provision of information resulted only in an attitude activation effect in spite of changes of the determinants. Benefits and risks are the main factors which determine the attitude. The respondents evaluated genetic engineering as more sustainable towards the environment than the GM foods which were not considered so healthy. The results suggest that communication can be more effective if the message is formulated according to the consumer perspective and if the attribute health that consumer values more it is addressed.

Keywords: genetic engineering, GM foods, consumer, acceptance, attitude, benefit, risk, communication, sustainability, health, information

"Attitude is a little thing that makes a big difference."

-Winston Churchill

Contents

1. Introduction

The world population is growing very fast and according to scientific predictions will reach more than 9 billion by 2050. (World Population Prospects: The 2006 Revision, Lutz and Qiang, 2011) In that moment more than 7.5 billion inhabitants will be in the less developed countries while the population of the least developed countries is projected to reach 1.7 billion. (World Population Prospects: The 2006 Revision) This increase in the number of the world population especially in the less developed countries implies a problem of food security. In addition of that, the price rise, the life span increases and the natural resources available per capita decrease. Thus more millions of people in the developing world struggle to get enough to eat (Lutz and Qiang, 2011). As the gap between the amount of food produced and the global population to feed is likely to increase then feeding the world becomes a great problem. Food security is back as a major issue in world's agenda.

New technologies emerged during the beginning of the new century concerning a more efficient and high productions of food taking seriously into account the limited resources in our planet. Science and technology were a logical part of the economic growth and progress in the world. However, nowadays, the public is becoming more aware of potential negative effects of the use of new food technologies and techniques. (Hamstra and Smink, 1996) Claims by the scientists that the new technologies will bring many benefits are accepted usually with criticism from the society. This is a result of a different interpretation and perceptions from the two sides, scientists and the consumers.

Societal negativity to technological innovations on agro-food sector is not something new. A strong example is the introduction of tractors for farming activities which was "welcomed" with many protests concerning fear about the changes in traditional farming and ways of living. The result was a failure of the innovations to bring benefits to the society due to the public negativity (Frewer and Fischer, 2010). This shows how important consumer acceptance of food technologies and their products is and how they can/cannot contribute in that way to sustainability with their choice.

Due to the threat in the food security, there is a big effort nowadays from most of the governments, to a more sustainable food production with minimum use of raw materials/inputs and without disturbing the environment (Fleisher et al. 2005, Rigby and Caceres, 2001). Governments and NGOs encourage and press food companies to take into account sustainability in their production and marketing decisions but this attention to sustainable development does not accompanies with the actual demand for such products from the consumers. (Van Trijp and Fischer, 2011)

The genetic engineering of organisms, as has been reported by a number of scientists, is representative of such new technological developments in food production which promises sustainability. The genetically modified organisms (GMOs) according to the most of the scientific research are giving high yields, are resistant to pests and diseases as well as resistant to difficult weather conditions such as frost and drought. This resistance of the modified organisms leads to high productivity and to a less use of agrochemicals and thus a better protection of the environment. But there are many concerns about the genetic

variability of wild plants and also about the unknown risks of health disorders in consumers. (Carvalho et al. 2006) The opinions among the scientists (experts) differ dramatically and this has an impact to the consumers.

A person's attitude is acknowledged as fundamental factor that influences behavior and thus if consumer has positive attitude toward a product then they will have also a positive purchasing attitude toward that product. (Chen, 2008) Genetic engineering contains uncertainty and mistrust and when that happens, the attitude of the public is negative. It is well known that most of the consumers, especially those in Europe, have a negative attitude towards the use of GMOs in food production despite the fact that they can poorly understand it. (Potrykus, 2001, Grunert et al., 2004) This negative attitude has been shown to be deeply rooted and resistant towards attempts to change it and affects consumers' intention to buy food products make use of GMOs in production. (Grunert et al. 2004) Consequently for the scientists and the public it is a controversial and complicated issue. To some it is a very promising technology that can boost food production and which contributes to sustainable development but to others it is a dangerously science that threatens environment and consumers' health. (Carvalho et al. 2006)

A strong example of an initially controversial issue but at the end a successful introduction of GMOs is the so called "golden rice". This rice is a result of genetic engineering and it was developed to prevent vitamin-A deficiency in the poor and disadvantaged of developing countries whose people consume a lot of rice. For humanitarian use this had a big success. But Greenpeace and associated GMO opponents regarded this rice as a "Troyan horse" that would open the route for other GMO applications. Therefore, they tried to prevent that under any circumstances by undermining the consumer acceptance based their communication on potential risks. (Potrykus, 2001) This fight against a technology with invented and specious arguments cannot be tolerated in poor countries where the difference between life and death or health and illness can be made by the technology. According to the important scientist Potrykus Ingo (Professor Emeritus in ETH Zurich, Member of Academia Europaea and Recipient of the International Society for Plant Molecular Biology 2000 Kumho Science International Award) the "Golden rice" fulfills all the wishes of the GMO opposition in their criticism of the use of this technology and nullifies all the arguments against genetic engineering in this specific example. There are many advantages without any identified risk or negative effects. (Potrykus, 2001)

But the perception towards this technology, the genetic engineering, in general is negative and thus it is easy to influence people and to make them opponents of the technology's products. Somebody, without being an expert, can manipulate a targeted group of people if they can communicate the suitable messages to them, the messages they care and they give value. Therefore communication and information provision strategies targeted to specific consumers' interests, need and motives increases the possibility to be attended and processed by the receiving audience. (Verbeke, 2008) The "golden rice" example shows that communication can sustain a negative attitude and to make the attitude change even more difficult.

2. Problem background

A lot of research is performed regarding public perceptions and attitudes towards new food technologies and innovations. (Frewer and Fischer, 2010) It is recognized that there is a need to be aware of the public concerns towards new technologies in agro-food sector and thus to decide which risk should be assessed. The lack of public understanding or adequate knowledge about science that has led to the present climate of skepticism towards public science and technology is known as the "deficit model" or "knowledge deficit". (Dickson, 2005, Sturgis and Allum, 2004) In this formulation, it is the public that are assumed to be "deficient", while science is "sufficient". Doubts about the value of scientific progress or fears about new innovations and technologies are due to the gap in knowledge of the science behind them and thus people fall back on mystical beliefs and irrational fears of the unknown (Sturgis and Allum, 2004). But in the case of GM foods, scientific community cannot be assumed that is "sufficient", at least according to the public.

The relationship between sustainability and technology attracts of great deal of attention nowadays. New technologies emerged which offer benefits to the society regarding sustainable food production like genetic engineering but most of them usually are not accepted by the public. This negativity is based mainly in the lack of insight in consumer perceptions of those products (van Dam and Apeldoorn, 1996). Critical technologies that can contribute to food security are not accepted due to negative attitudes in some continents like Europe while in others, like America, there is no so strong the problem in consumer acceptance.

This paper does not intend to give an answer if any innovation should be widely accepted and without any skepticism but it aims to identify how the consumers interact with the information which is provided to them by using the example of genetic engineering technology. Understanding the mechanisms in this interaction and what effects have in consumer behavior it will be useful what arguments to use in favor of a specific product or a technology. Furthermore to examine if sustainability is the most significant relative attribute to influence individuals' product acceptance and to direct consumer behavior. The perspective also receives high importance to test if this factor gives different results. Nowadays the sustainable characteristic of a food product in the Western world is hypothesized as a relative advantage but it is not sufficiently clear if the consumer take into account this attribute to do the final choice for controversial issues like GM foods. The lack of literature covering this topic makes crucial to find out what the consumers considers most important of the messages they receive and what it has more meaning for them in order to accept a novel food.

2.1. Aim of the research

To prove that claiming sustainability for specific technologies and its products is not always successful in marketing if the:

a) Attitude of the consumer is negative towards this innovation

b) The perspective of the information is not the appropriate for the case

c) Communication is not effective due to the focus on the attribute that consumer does gives low value

2.2. Research question

The main research question is:

Can information influence a negative consumer attitude towards the acceptance of a controversial food product like genetically modified foods?

And the sub-questions that have to be answered in order to give an answer to the main research question are:

1. *What is the actual consumer perception and attitude towards genetically modified foods?*
2. *Which factors influence consumers' attitude most?*
3. *How much value does the consumer give for sustainability of a controversial food technology?*
4. *To what extent consumer's or expert's perspective of the GMOs affects consumer acceptance of this kind of foods?*

3. Theoretical framework

3.1. Sustainability, a vague concept in the food market

Many famous people in the history like Plato and Aristotle stated that in order somebody to have a reliable understanding of a subject, they must can measure and precisely define the terms of which they speak. If not, their knowledge as well as their opinions must be suspect. (Hulse, 1993) ''Good science starts with precise definitions because clearly defined terminology is a prerequisite for any fruitful scientific discourse'' it is mentioned by Wu and Hobbs. (Wu and Hobbs, 2007) This is exactly the case for the concept sustainability when it is used to describe product attributes. Nowadays this term is becoming a popular word for product attributes but in the same time it has different definitions and different measures. (Brown et al., 1987) There are at least 386 definitions of sustainable development (Rigby and Caceres, 2001) where meanings vary according to local contexts and the particular set of stakeholders involved (Frame and Brown, 2008).

Performing in a sustainable way it is process learning by doing as well as doing by learning for different capacities and capabilities on the part of those involved. (Martens, 2006; Newton, 2005) The stakeholders who are involved they produce together knowledge about sustainability in dialogic and other implemental ways. (Frame and Brown, 2008) But for many of them sustainability is a utopian ideal and agreement on what is and what is not sustainability cannot be universally decided. It is often much easier to understand what sustainability is not than to understand what sustainability is. (Frame and Brown, 2008) The result is a concept somehow vague which has little meaning. (Rigby and Caceres, 2000)

A definition of the concept requires implicit and explicit answers to questions like the following: who or what is to be sustained; at what scale of sustenance; with what resources; under what ecological and socio-economic conditions; at what assessed long-term risk and who will bear the risk, over what time period, through what social process and with what tradeoffs against other social goals. (Lili and Norgaard, 1996) Jasanoff indicates in his paper (Jasanoff, 1992) that sustainability needs to be defined by scientists because science claims strongly to value-neutrality and provides a forum where nations or communities can set aside any difference they have if favor of a universal rationalistic approach to problem solving. However, the attempts by scientists to define the concept sustainability differ essentially in the extent to which they perceive such a meeting of goals and options. (Lili and Norgaard, 1995) Sustainability as a vision is defined by the Brundtland Commission on the report *Our Common Future* in 1987 (after chair and Norwegian Prime Minister Gro Harlem Brundtland): "Sustainable Development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs". (Muller, 2011) This is the most accepted definition from the scientific community.

Questioning if sustainability is a utopian ideal, if it is something achievable and how can be known that the path is followed is sustainable will not lead to satisfied answers as it depends on how the definitions are constructed. (Brown et al., 1987) In general most of the definitions state or imply that the goal of sustainability is human survival and do not accept the desirability of a sustainable biosphere without the existence of humans. Thus it is clear a matter of setting the priorities for what has to be sustained and in what costs and can be accomplished with a clearly stated definition, appropriate measures and indicators of this popular concept. (Brown et al., 1987) The example of "golden rice" which was given before has a priority to sustain the humanity which suffers from hunger in the developing countries and in that way should be considered. Similar role have the medicines produced under genetic engineering which are sold in the European pharmaceutical market. They give to the European consumer a health benefit and that is the reason why there is no restriction in their sales as it will be described later in the report.

The concept of sustainability is assumed that it is multidimensional in the policy level and the business level. In the first one it is multidimensional, taking into account the definition where there should be a balance of the needs of current consumers and future generations. (van Dam and van Trijp, 2011) Therefore there are two dimensions, one temporal dimension as the benefits of the sustainability are a trade-off between the present and the future and a social dimension with the trade-off between consumers and others. In the business/management level, they implement sustainability around the triple bottom line of people, planet and prosperity. (van Dam and van Trijp, 2011)

There is a general lack of insight in consumer perceptions of sustainability. (van Dam and van Trijp, 2011) It was mentioned in the previous paragraph that sustainability is a complex construct consisting of different potentially interacting dimensions may create conflicts towards the sustainable development. When the consumers judge a food product to purchase, which is produced under a new unfamiliar technology promising sustainability, their motivation is complicated. This occurs because the benefits from the purchase of such sustainable product cannot be instantly seen (credence attribute) or because they refer to

others (environment or animals) or society at large and not for the individual especially. (van Trijp and Fischer, 2011) Therefore, the consumers tend to lump together the sustainability considerations such as environmental friendliness and naturalness onto a single construct. In that way they consumers tend to group together people and planet in a single sustainability dimension which they evaluate against a tangible dimension which it is consisted by price, taste and others. This shows that there are consumers who take account of the multiple dimensions of sustainable development at the same time (van Trijp and Fischer, 2011). Evaluation of one of the sustainable attributes automatically means to evaluate also the others.

3.2. Health, criterion for sustainability and for consumer purchase

The identification of a technological innovation which was used for food production claiming sustainability is based on hypotheses regarding the sustainable management of natural resources and maintaining their productive capacity through time for the next generations. In other words it is a perspective that considers long-term maintenance of production. (Andersson and Jacobsson, 2000) But the question if this is the prime reason why humanity seeks for sustainability. (McMichael, 2002) Sustainability is considered for the economy, for the environment, for the society-livelihoods but their major value is as the foundations upon which our longer-term health and existence depend. (McMichael, 2006) The overall sustainability project's centrality is about human health, the maintenance of the ecosystem it is about maintaining the complex systems that support human health and human life. Human health is the real bottom line of sustainability. (McMichael, 2006) Humanity seeks sustainability in relation to the population health, this is the fundamental value. If a society opts for technologies and behaviors that sustain the life supporting ecosystems then the long term health of the population will be enhanced. In other words, we achieve sustainability by transforming our ways of living to improve the environmental and social conditions to support human health and security. (McMichael, 2002)

The fate of human populations depends on the biosphere's capacity to provide a continued flow of goods and services (McMichael et al., 2003) and a technology such as genetic engineering can contribute to that. But it is not accepted by the European consumers. An explanation of that is not because of a possible risk but because of the absence of any benefit according to some studies. The majority of Europeans see little or no direct benefit from the technology or the benefits are insufficient to overcome their perceived risks. (Costa, 2008; Paarlberg, 2010) This is reflected in the different ways Europe regulates GMOs in medicine in comparison with GMOs in agriculture-food products. There is no restriction in the commercial sale of medicines despite that those medicines are not free from new risks. But the benefits from the drugs could deliver to so many Europeans in comparison with the farmers for example. (Paarlberg, 2010) Benefit in such situations stand more important than risk. Therefore the medical applications of GM are supported in Europe (Frewer et al., 1996; Costa et al., 2008)

Except the factor of benefit, health is like sustainability in nature, a credence attribute that cannot be verified by experience. In addition of that, the motivation differs for health and environment because health concern is regarded as egoistic (benefit to individual) while the environmental concern as altruistic (benefit to society). (Magnusson et al., 2003,

Mondelaers et al. 2009) As it was described in the previous section, the consumers tend to lump together the sustainability considerations onto a single construct but they separated these products from those with health-related benefits. (van Trijp and Fischer, 2011) The consumers do distinction following their instinct.

From the research until now it has been shown that consumer acceptance of specific food innovations will be predicted based on an interaction between evaluation of the perceived benefits of a product and their concern about the technology was used to produce it (Frewer et al., 2011) Therefore if the health benefit for a human is more certain and at the same time risk is less in a product than a second one, then the first product will be preferred. But if the risks and benefits are similar, the consumer has the tendency to value higher the negative effect than the positive. (Verbeke, 2008) Food safety risks weigh more heavily than nutritional and health benefits. This links with the risk aversion or else the prospect theory. This exactly happens with the genetically modified (GM) foods in Europe, there is no clear benefit while the negative information about potential health risks rules in the media. And as the negative information implies risks, this has more impact to the public than the positive information that implies benefits. (Frewer, 2008)

3.3. Risks and benefits in the communication

The credence attributes are important in judgment but they do not determine the choice because these benefits are uncertain to the individual. The hidden attributes, like sustainability and health, cannot be verified from personal experience and the consumer depends on information provided in order to do so. (Ronteltap, 2007; van Trijp and Fischer, 2011) In the recent years, the popularity of those attributes is increasing as they have become more important as components of consumer value (Verbeke, 2008). However, studies show that few consumers are aware or understand the real sustainable characteristics of products. This is a result of a poor communication of the benefits of sustainable products and thus the purchasing decisions in accordance with their conscience are more difficult for the consumers. (Vermeir and Verbeke, 2006)

Food quality labels were created, which are provided on the package, to give a feeling to the consumers about their quality (Grunert, 2002). This label when it contains information that could benefit the consumer it is considered a product advantage. (Deliza et al., 2003) This information it is a part of communication which aim to deliver adequate messages that consumers find believable and to convince them that indeed they make the right choice. (Deliza et al., 2003) Information and communication are mostly important in situations where people have to rely on judgment rather than certainty as it is exactly the case for food innovations and technologies. (Ronteltap et al., 2007) More information about the new product reduces consumers' uncertainty about its performance especially if the functionality is familiar to them. But when the functionality is unfamiliar information increases uncertainty. (Ronteltap et al., 2007) The way that the new food technologies and their products are discussed in the public is very important as complex information maybe not understandable by everybody and might communicate the wrong message. (Ronteltap et al., 2007)

To form an opinion about a product and its performance on sustainability the consumers have two basic mechanisms. The first one is called informational belief formation where the person accepts information from others and uses that information to form his/her opinion on the product's performance. Uncertainty leaded to the use of social information. The intention of the others, in other words the public pressure or subjective norm, (Chen, 2008) may also be a source of information which can influence a decision. The attitudes of people with little knowledge about a technology or a food product might be susceptible to context effects and to perception of the social pressure to perform in a specific way. (Saba and Vassallo, 2002) The effect of exposure to other's preferences or intentions on the behavioral intention may depend on the relevance of the others' reasons for their preferences. To rely on others' preferences is a way to maintain or to move to a state of cognitive consistency and especially if the preferences are similar, this increases the salience of other's preferences and in that way the behavioral intention. (Morwitz, 1997) But behavioral intention can be affected also by the consumers' perceptions of personal control over what they buy and consume. (Chen, 2008) This perceived behavioral control covers the effects of external factors, such as time, information (labeling) and availability, which consumers believe to influence their judgment of risks and benefits of GM foods for a purchase decision. Self-confidence in their ability to make a proper purchase decision is required as well. Thus their intention to purchase GM food is influenced. (Chen, 2008)

The second one is called inferential belief formation where the person uses rules of thumb to form an impression from the existing information about the product. The last one is a more unpredictable process where the consumer makes inferences on the basis of subjective knowledge and more on the subtle cues especially those are implicit in nature like in the package and its communication. Therefore these subtle cues in the product trigger the motivation for sustainable purchase and determine the choice of a product. (van Trijp and Fischer, 2011) The information which is provided from public's or private sources' experts is the variable that gives an idea and helps to identify the hidden attributes, the credence attributes of sustainability. But these attributes tend to generate perceptions of risks and uncertainty especially when information is inconsistent, unavailable or complex and the trust in the information source is low. (Ronteltap et al. 2007)

The level of trust placed on an information source determines the level of importance assigned to information from that source (Moon and Balasubramanian, 2004) making in that way trust on the source beneficial for consumer acceptance of innovations. (Ronteltap et al., 2007) The degree of consumers' trust in regulatory agencies can play an important role in shaping public attitudes towards any innovation or a product produced under a new technology. The opposite attitudes between the European and the United States consumers toward genetic engineering are an example of the difference in the level of trust placed in government. (Moon and Balasubramanian, 2004)

This risk is a very important reason that people are in opposition to a new technology. The uncertainty of scientific knowledge on the emerging complicated technology and the relation between technology and nature and how the second one is influenced by the first one, make the public even more skeptical. (Sjoberg, 2002) A hazard will be perceived riskier when the consumers perceive that the consequences of the hazard are highly unknown to

scientific experts. When the advantages or disadvantages of a technological innovation are uncertain to the scientific community or if there is no common agreement on them they influence negatively the consumer attitude and therefore the acceptance. (Ronteltap et al., 2007) Consumers update their risk assessment based on new information. (Moon and Balasubramanian, 2004) It is very important also the way these are being communicated to the public and the trust on the source that provides the information. The way that the public perceives risks can be changed with building trust by the communicators and the regulators.

Trust in the information which is provided by the different sources can influence not only the perceptions of risks but also the perceptions of benefits and in that way the acceptance of new technologies and their products. Risks are found more credible and the policies for possible negative consequences are more acceptable if trustiness, on an institution or experts, is high. If the information, provided by the experts about relevant consequences together with the extent or probability of these consequences to happen, it is received and trusted then this information can have an indirect influence on attitude and thus on public risk perceptions. Low risk perception leads to higher acceptance of new technologies. (Frewer et al. 1998; Eiser et al., 2002) Complex information, as it was mentioned earlier in another paragraph, may be not understandable by everybody and might mislead or might fail to communicate effectively. (Ronteltap et al., 2007) Therefore, tailored made messages to consumers may have a more positive effect than the communication in accordance with the expert's language (perspective) which is less likely to have an effect on consumer's acceptance. The perspective on the information then stands very important to contribute to the persuasiveness of the consumers towards a technology and its products.

From surveys it is clear that it is not easy for many of the respondents to engage in basic discussions about new food technologies due to the low level of information and the lack of knowledge. (Assefa and Frostell, 2007) The majority of the consumers are not experts. Therefore, they usually have limited knowledge of agriculture methods and its food production processes and also they have limited awareness of the implications of their food purchases in the food supply chain. (Vermeir and Verbeke, 2006) However finds from surveys show that more knowledge does not always lead to more positive attitudes. More knowledge means more critical questions resulting in a more skeptical attitude. And another reason which will be described later extensively is that provision of information activates existing (prior) attitudes already held by the consumers and even sometimes these prior attitudes are reinforced. (Frewer et al., 2000; Chen, 2008)

Communication stands more important than ever for food innovations and technologies in order to be accepted by the consumers. Attitudes need to be shaped and sustainable development has to be re-defined if the public wants really to have a chance get benefited. Otherwise opportunities will be lost for contribution to development and for the world's food security. The controversial issue of the genetically modified organisms is the most common example that promises sustainability but is perceived with uncertainty due to not effective communication about its risks and benefits from the experts.

3.4. Consumer attitude toward GM foods

The public awareness of biotechnology, and especially one of the sciences like genetic engineering, is low in the most of the countries of the world. Despite the lack of knowledge, in some countries like USA it is associated with low risks while in others like UK with high risks. Associated with the risks are the expectations for the benefits where for high risks the benefits are low and the opposite. As it was mentioned before, trustiness, credible information and attitudes determine public reactions. (Frewer et al., 1998) Media are very accessible to the public and with high credibility among the other sources of information therefore it is crucial to examine the messages are passed on regarding genetic engineering in the food production. A study by Frewer et al. (1998) was conducted to determine what type of risk information about genetic engineering and its products is reported in the British press. The extent and nature of the risks associated with biotechnology and genetic engineering were a point of conflict between government, experts and pressure groups. Risks most of the time they were described as unknown and that has a major impact on consumer beliefs and behaviors. (Frewer et al., 1998)

Except the media, another source of information is the introduction of the novel products of genetic engineering technology into the supermarkets. The availability of the products influences the shaping of public attitudes towards the technology and in the same time provides information about the innovation. From research, despite the use of the realistic exposure there were no effects on general attitudes towards genetic engineering. The consumers perceived those products as less natural as the conventional and they did not take into account the claims which were recommending that these food products are healthier, cheaper, stable, tastier and superior quality. (Azadi and Ho, 2009) Additionally the likelihood of purchase was low in comparison with the others and it was only increased when it was associated with health or environmental benefits. (Frewer et al., 1998; Schenk et al., 2011) The conclusion is that the consumer acceptance is likely to be determined by the recognition of real benefits of the technology to the consumers. (Frewer et al., 1998)

Increasing recognition for possible ecological and social costs imposed by GM crops leaded many governments of the most developing countries to not give to the farmers a permission to plant any GM crops. The governments also took seriously into account the activists, especially in Europe, who are organized in big groups and continue to fight the introduction of the GM foods. (Azadi and Ho, 2009) The concerns about biological safety had the result of strict EU regulation for compulsory labeling and traceability on all the food products and feed that contain, consist or produced from GMOs. Those strict regulations discourage the planting of GM crops in poor countries and make it even easier for the GM crop critics in the developing world to block this technology which is developed by mistrusted foreign multinational corporations. (Azadi and Ho, 2009)

A recent study (Frewer et al., 2000) was conducted to investigate the effects of different types of information considering GM food products on the consumer attitudes towards GM and their tendency to choose GM food products. The results showed that provision of information does not increase acceptance of GM food and the tendency of all the consumers worldwide is to avoid choose to buy them. (Frewer et al., 2000) Moreover the public acceptance is reduced by providing information about the technology itself and it is

independent of source attributions or information strategy adopted. (Eiser et al., 2002) Positive prior attitudes towards GM food were responsible for likelihood of GM food but there was no influence by information provision to change these attitudes, only to activate them (not the labeling). All these results are applicable and have impact only in cultures in which attitudes toward GM foods are already existed. The GM technology is relatively unknown and poorly understood as there is little knowledge regarding the risks and benefits of the technology. A change in the attitude maybe will occur if it appears a benefit from the use of this technology. Such new information will be taken up by the public and even more it will increase the positive attitude towards these products. (Frewer, 1998)

In a modern society where the choice is in a plethora, people will choose and will consume food products that are evaluated with positive attributes. (Frewer et al., 2004) Four groups of criteria are used by the consumers to evaluate food products and to make purchase decisions. The first one is the most dominant and it is about the sensory experience including appearance and taste. The second one, very important for GM foods, is the health considerations and it is almost to become equal in importance the last decades as all findings seem to point to the concern for healthiness as an important criterion for food purchases (Magnusson et al., 2001). At third of which importance is increasing fast is the convenience in purchasing, storing, preparing and eating food. The fourth came recently in the consumer purchase considerations and it is associated with the way the product has been produced. (Grunert et al., 2004) The way the food is produced is credence characteristic so it influences the consumer decision-making due to perceptions, inferences and attitudes. This is the second issue for the GM foods.

GM foods have caused a huge public debate and the perception gap between consumers in one side and producers and scientists in the other side has been noticeable. Scientists and food producers are enthusiastic about the changes in biotechnology and about GM applications respectively. The consumers are skeptical and thus the producers are not willing to exploit the possibilities. The same stands for the retailers who take into account the consumer concerns and the same for the EU regulators who maybe they want the food which is produced in EU not to stay back in the competitiveness in GM applications but they cannot do otherwise. (Grunert et al., 2004)

In a latest research the consumers had to evaluate food products including GM according to their benefits. The result was that the consumers perceived the benefits of GM positively however these positive attributes were overcompensated by the negative associations regarding GM food products such as unfamiliar, unhealthy, untrustworthy, non-natural and ethically wrong. The outcome is that the general attitude to GM technology has very strong influence on the perception of concrete food products. (Grunert et al., 2004) Purchasing attitudes toward GM foods are influenced by the attitude that consumer has toward this kind of foods. (Chen, 2008) The attitudes are formulated according to the knowledge that someone has about an object and next they form beliefs about characteristics of the attitude object. Then the overall attitude is a kind of an average of the evaluation of the characteristics that someone perceives. (Grunert et al., 2004)

As the consumer knowledge about GM technology and its applications is limited it is expected the attitudes to be weak and easily to be changed. (Grunert et al., 2004) But this does not happen to the European consumers when the two processes to formulate attitude, the *top –down* and the *bottom-up* processing, take place in their minds.

The *top-down processing* regards an attitude embedded in a system of general values and attitudes like food neophobia, attitude to technology and others. "These general attitudes function as guidance in deriving attitudes towards more specific objects in a way which preserves the evaluative tendency of the higher-order attitudes." (Grunert et al., 2004) The result is general, strong and stable attitudes. Even if someone perceives benefits in the application of GM, that is determined by how risks are perceived which they prevent the perception of benefits. This is the case for the GM foods according to the research up to now. The attitude towards this technology and its products is explained by the higher order attributes and also provision of information resulted in an attitude activation effect, an attitude which is already negative. The top-down processing in the formation of attitudes towards foods implies that these attitudes cannot be easily influenced or changed. The reason is that there will be a tendency to maintain the agreement between the attitude towards GM and the more general attitudes and values in which it is embedded. (Grunert et al., 2004)

The *bottom-up processing* on the other hand, exists, but it is much weaker that the top-down one to influence the attitudes. This change can be done by knowledge through two different kinds, information or by experience. The information which was is provided in the studies, no matter what type, it cannot change the attitude; it just activates the one that already exists which it is negative in general. Also if the functionality of the technology is unfamiliar the attitude becomes even more negative by the information was provided. However the attitude finally changed to less negative when the people could have a direct product experience. But this kind of knowledge is not available to the Europeans as the GM foods are limited in the market all in small quantities. Freedom of judgment and choice does not exist in the most of the European markets concerning genetically modified food products as they are isolated from all the other kind of foods. In an experiment to identify the attitude of the consumers towards GMOs, the consumers experienced a GM cheese and they really like it. Although in this case it was provided also information labeling "superior taste", a clear consumer benefit, which was mainly the responsible of changing the attitude. (Grunert et al., 2004)

4. Conceptual framework

The consumer attitude toward GM food products is determined by the perceptions of benefits and risks according to the Attitude Model by Bredahl (2001) who based his model on Fishbein's Multi-attribute Attitude Model (1963). The consumers also will purchase a product influenced by the attitude they have toward the product, the social pressure they feel which is called subjective norm and of course if they feel that they can do this purchase, the perceived behavioral control. This purchase intention is explained by the Theory of Planned Behavior created by Aijen (1985) which it is applicable explaining consumer's food choice. Therefore the consumer's intention is influenced by the perceived risks, the

perceived benefits, the subjective norm and the perceived behavioral control. Roger's theory diffusion of innovations (2003) identifies five characteristics of innovations that explain the differences in the intention rates. These are the relative advantage (a certain advantage), the compatibility, the complexity (ease of use), the trialability (availability for trials) and the observability (social visibility). The first three relate to the perceived cost-benefit while trialability to behavioral control and observability to subjective norm.

The core of this paper's framework is constituted by the Ronteltap et al. (2007) framework that explains how the consumers' intention that leads to acceptance of an innovation is influenced by the above mentioned determinants. In the framework by Ronteltap et al. (2007) the consumer acceptance or rejection of food technologies and innovations is determined by their intention to use them. There are four proximal determinants of the consumer's intention: the perceived costs and benefits, the perceived risk and uncertainty, the subjective norm and the behavioral control. In their turn these determinants are affected by some distal determinants which are the consumer characteristics, the innovation characteristics and the social system characteristics. Communication is the linkage of the characteristics of the innovation depending on the consumer characteristics of which the innovation aim to. It links the two kinds of determinants.

In the consumer characteristics are included the knowledge, the age, the familiarity, general attitudes and values while the innovation characteristics are objectively measurable characteristics like appearance or the way in how the food is being produced. In the perceived cost-benefit the sensory and the credence attributes are included. Perceived risks are any kind of risks like for example about health, environment or trustworthiness of the information source. Perceived behavioral control refers to the belief that an individual has about his or her ability to perform a particular behavior with ease or with difficulty. Subjective norm is the social influence or else the perceived social pressure for an individual to engage or not to a behavior. The persons who comply with a norm, they suppose they will create good impression for their actions while those who do not they can expect disappointment from their environment (Fishbein, 1963; Aijen, 1985; Fisher and Ackerman, 1998; Bredahl, 2001).

The centre of this paper is on the communication of Ronteltap et al. (2007) framework and how the messages, which are communicated by the experts and formulated according to different perspective, affect the consumers' acceptance. The innovation features are excluded in the model as the only communication about them and the only information the consumer has about the food product is through the messages from the experts-scientists. The consumer characteristics are also excluded and are replaced by only one, the attitudes and values towards food technology and its products as this paper examines how strong attitudes can be shaped and changed. These attitudes and values are based partly on previous experiences that consumer had.

A behavioral intention is the subjective probability of a person that he or she will perform a specific behavior. Also, the more favorable a person's attitude toward some objects the more the person intents to perform positive behaviors with respect to that object and the same it is for the negative attitude which lead to a negative behavior. (Aijen, 1985)

Therefore intention and attitude have meaningful differences as a positive attitude leads to a positive intention, a favorable behavior with respect to the object somebody likes and has positive belief.

According to all these that described above the conceptual framework is at it follows (Fig.1):

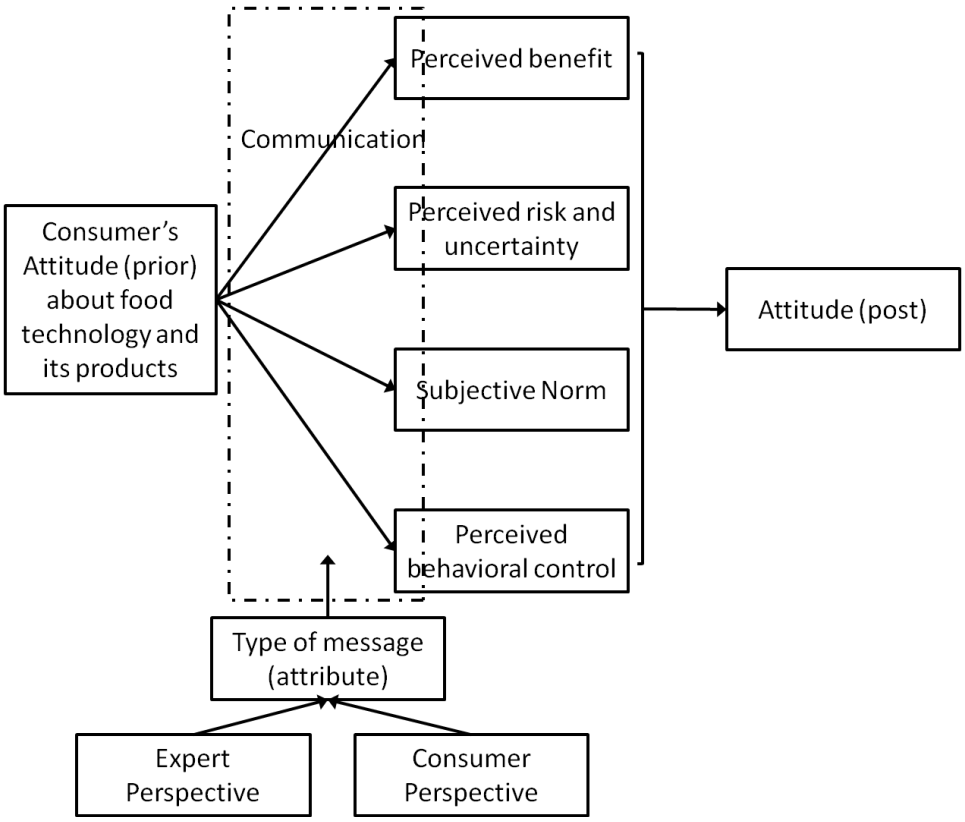

Fig.1. Conceptual framework for research on changing the attitudes through effective communication

The focus of the report is not to find out if GMOs are truly sustainable food products but to prove that claiming sustainability it does not work always for the success in the market of a product. The experts who promote a product focus in the wrong message, a message (sustainability) that does not influence the consumer acceptance and thus there is a mismatch between the two sides. That is the reason that the messages should be focused in something else, a value or an attribute that consumer cares most like health is. Moreover it is hypothesized a failure in the communication between experts-scientists and consumers on the other side based on the wrong formulation of the message (perspective). The different perspective on the message may have different effects on the consumer's attitude.

Taking the above mentioned literature as standpoint the conceptual model was designed and the following five hypotheses will be tested:

H1: *The perspective in the message has different effects on the factors which determine the attitude.*

H2: *The sustainability attribute on GM foods has the larger effect on the factors which determine the attitude than the health attribute.*

H3: *The information which is provided, no matter what type, does not change the attitude in spite of changes of determinants.*

H4: C*onsumer perspective is perceived as more positive than the expert perspective.*

H5: *The effects of the determinants on attitude are stronger for the health attribute than the environmental sustainable one.*

5. Methodology

5.1. Design

In order to investigate the importance of sustainability for the consumer and if the attitude about GM foods can be changed promising environmental sustainability, a survey was conducted. Different messages were formulated from trustful sources like scientific journals and organizations in order to give trust to information. The messages were the independent variables in the conceptual framework while the perceived cost/benefits, the perceived risk, the subjective norm and the behavioral control were the dependent variables.

The communication about the two attributes, health and sustainability, had to be done according to different perspectives in order to find out the influence of the perspective on the attitude toward the technology and its product. Thus the messages which were communicated were formulated based on the consumer perspective and the expert perspective. The dependent variables, the factors that influence the attitude, would change according to the message. Therefore within each message those variables were reflected. The factorial design was a 2 (attribute: sustainable versus healthy) within x 2 (perspective: consumer versus expert) between. In the two stories were reflected also the four proximal determinants of the consumer's attitude (perceived benefits, perceived risks, perceived behavioral control and subjective norm). Thus to cover every factor the messages from which the two stories were constructed were 16; there were 8 for each story. (**Appendix questionnaire**)

Each story of a different perspective reflected both the two credence attributes. Both of them were included in the same story in order to do the comparison and to find out which attribute consumer values more towards the GM food products. Every attribute was described in accordance of the four factors which influence the attitude. In that way it would prevent the respondent to understand easily about what attribute is communicated in the story. The construction of the messages is shown in the appendix (**Appendix questionnaire**). Prior to each story a notification suggested to the respondent to read the story before answering the questions which were following.

The two stories of the two different perspectives about health and environmental sustainability were:

1. Consumer perspective (non-expert): Applying gene technology in food production can be beneficial as the genetically modified food products contain more nutrients than other food products. Also for the environment is favorable as the use of pesticides can be reduced by the use of GM crops. Many people they think that we should buy GM food products because they are safe and because genetic engineering is a means for sustainable development. On the other hand there is a possibility of creation of long term toxicity due to the contained toxins. Also genetically modified organisms are likely to interfere with wild species in nature. If GM food products are available you can easily find them and choose one.

2. Scientist perspective (expert): Genetic modification allows crops to be bred by selectively inserting one or more genes into a plant in order to confer specific advantages like bio-fortification of the micronutrient content. Also, genetically modified Bt transgenic varieties can reduce the use of chemical pesticides because of their pest resistance due to the Bt toxin they contain. The United States Department of Agriculture (USDA) (for general food quality and worker safety), the Food and Drug Administration (FDA) (for toxicity) and the Environmental Protection Agency (EPA) (for environmental impact) approve genetically modified products and do not find any harmful consequence to human and to the environment by their use. On the other hand there is a possibility that some genes may flow towards related wild species and to create "super-weeds", invasive plants, and thus an accelerated decrease in biodiversity. Additionally the gene coding for Bt toxin which is used in some GM crops may result in consuming continuously secreted insecticide toxins. You can easily choose a GM food product by checking for the unique identifier which is established by Commission Regulation (EC) No 65/2004.

5.2. Participants

The effect of the two stories on the attitude towards the acceptance of GM foods was tested in a self-administrated online experiment with the use of Qualtrics, a computer program. The target group of this survey was 100 students from Wageningen University as it is a convenient sample and also fulfills the criterion of investigating multi-national attitudes. They could participate at their ease while data collection was active during two weeks in May 2012. An advantage of being students in Wageningen University, a university of life sciences, is that they are aware of the principles of sustainability and they have higher knowledge than others. Hypothetically most of them are sustainable consumers due to their knowledge and education and they are willing to contribute to sustainable development by consuming in a sustainable way. It wasinteresting to examine if they were willing to do the same with the GM foods by taking into account the sustainable advantage of the product and less the health attribute.

5.3. Questionnaire constructs

In the beginning of the questionnaire three items were presented to measure the prior attitude that consumer has towards genetically modified food and in that way to identify after giving the information if that attitude changed. Each attitude item was scored on a 7-

point likert scale (1=I totally agree to 7=I totally disagree). Then a story followed, for the half of the respondents the story was according to consumers' perspective and for the other half according to the experts' perspective. To ensure that the respondent read the story and how the story was perceived; a basic question followed immediately after each story asking how the respondent perceived genetic engineering according to the text. This question was scored on a semantic deferential 5-point scale (1=very bad to 5=very good).

After that, items related with the determinants of the attitude followed. For each factor were three items. The first two items were for each one of the two attributes, human health and sustainable development, which were scored on a 7-point likert scale (1=I totally agree to 7=I totally disagree). The third one was to measure about what attribute the respondent gives more value and was scored on a 5-point anchored scale (1=health, 5=environmental sustainability) . Afterward it was examined again the attitude that consumer had with the same three items that measured the prior attitude in order to test if this was changed after the messages that were communicated through the story. The total amount of the items was 19 excluding the questions about the profile of the interviewees. The items, except those they measure what the respondent prefers more, were adapted from Bredahl (2001) and they were adjusted. The items are presented in the following table (Tab.1):

ITEMIZED ATTITUDE, PERCEIVED BENEFITS/RISKS/BEHAVIORAL CONTROL/SUBJECTIVE NORM STATEMENTS
Attitude about GM foods (Prior and Post) statements
1. Applying gene technology to food production is extremely good
2. I am strongly for buying GM food
3. Overall I think GM food products are good
Question which follows story and measures how the story was read
1. According to the text, genetic engineering is:
Perceived benefits statements
1. The GM food products are beneficial for human health
2. The genetic engineering is beneficial for sustainable development
3. The genetic engineering and its products can give benefits for:
Perceived risks statements
1. The GM food products involve risk for human health
2. The GM food products involve risk for sustainability
3. The highest risk from the use of genetic engineering is in:
Subjective norm statements
1. My social environment would be more supportive if I buy GM food for my health
2. My social environment would be more supportive if I buy GM food for sustainable development
3. My social environment would be more supportive if I buy GM food for:
Perceived behavioral control statements
1. If GM food products are available I can easily choose one for my health
2. If GM food products are available I can easily choose one based on sustainability
3. If GM food products are available I can easily choose one for:

Tab.1. The items which were used in the questionnaire

Before each story, in the beginning, it was required from the respondents to fill in basic information about them like age, gender, study program and country of origin. Thus a

consumer profile was constructed for each of the respondents. The study program was very important as from that could be identified the knowledge a respondent had from a similar field of the technology and if this knowledge guided them to choose respectively. The country of origin was also important as the respondents from other continents like America are more used with the idea of GM foods.

6. Statistical analyses

6.1. Sample description

They were collected 115 questionnaires from students in Wageningen University but 15 of them were excluded from the analysis as they were uncompleted. The complete 100 questionnaires were processed with IBM SPSS Statistics 19. In two weeks time, 41 men and 59 women participated and completed successfully the survey. The participants were distributed automatically by the program; 19 male and 30 female participants received the consumer perspective story while 22 male and 29 female participants the expert perspective story. In total they were 41 male and 50 female participants. It is noticeable that more women and fewer men received the story which was formulated according to consumer's perspective.

The age range among the students was from 18 to 30+ divided in five categories: 18-20, 21-23, 24-26, 27-29 and 30+. The biggest proportion (48%) aged from 24 to 26. **(Appendix, Descriptive statistics I)** The respondents were from 23 different countries, an impressive number from only 100 participants. The majority was from Netherlands (33) and Greece (31). The origin of the respondents can be seen in the graph below (Fig.2):

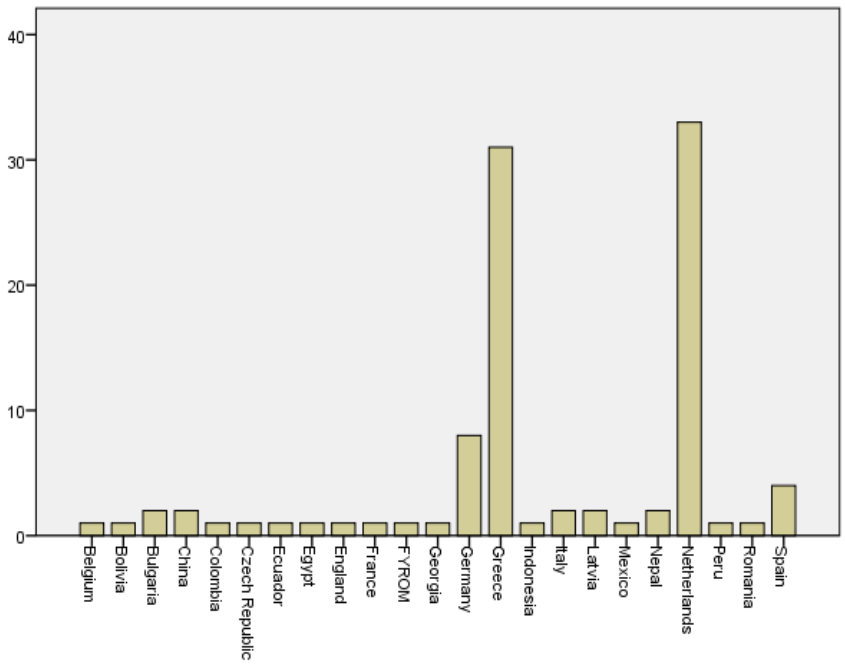

Fig.2. The country of origin of the respondents

The field of studies of the respondents was used as another criterion to divide the participants. The purpose was to check whether their educational background has influence

on their attitude towards genetic engineering and GM foods and if they are more sensitive to the information which was provided. According to this criterion, the students-respondents were divided into four major disciplines. The majority of the participants were from the field Technology and Nutrition (33%) followed by Society and Economics (27%) and with only one participant less followed by Biology, Plants and Animals (26%) and finally from the Environment and Landscape department (14%). (**Appendix, Descriptive statistics II**)

In order to see how the students according to their field of studies they were distributed for the two stories (Tab.2), a cross tabulation of those categorical variables was performed (**Appendix, Descriptive statistics III**). The results can be shown below:

		Field of studies				Total
		Biology, Plants and Animals	Environment and Landscape	Society and Economics	Technology and Nutrition	
	Story 1 - Consumer	15	6	12	16	49
	Story 2 - Expert	11	8	15	17	51
Total		26	14	27	33	100

Tab.2. Field of studies for the respondents in correlation with the story they read

6.2. Testing hypotheses

Hypothesis 1: The perspective in the message has different effects on the factors which determine the attitude.

A Factorial Mixed ANOVA was performed to examine if indeed the differences among the between subjects factors, the expert and the consumer perspective, and the within subjects factors, health and environmental sustainability, are significant. (**Appendix, Analysis I**) There are significant differences between the two perspectives ($F=3.813$, $p<0.05$). However, there are no significant differences among the factors when the interaction of the perspective with the attributes is taken into account. In the test of the between subjects effects, the two perspectives are significant different except for the factor Risk ($F=0.245$, $p>0.05$). This indicates that risk has no difference between the two perspectives; it is perceived the same from the respondents. However, the perspective that gives the most positive results in all the determinants is the consumer's perspective (see table 4 of Hypothesis 2).

Conclusion about H1: The hypothesis 1 can be partially confirmed as the main effect of the perspective is significant for all the factors-determinants except for Risk. Specifically, the different perspective affects different the Benefit, the Subjective Norm and the Subjective Behavioral Control, factors that influence the consumer's attitude but do not affect the risk which is perceived similar from the respondents. The consumer perspective is perceived as the most positive one according to the scores of the respondents on the factors.

Hypothesis 2: The sustainability attribute on GM foods has the larger effect on the factors which determine the attitude than the health attribute.

From the results of the Factorial Mixed ANOVA which was performed to test Hypothesis 1 (**Appendix, Analysis I**), there are significant differences between the within subjects factors health and sustainability ($F=6.235$, $p<0.05$). The effect of the interaction of the within attributes with the kind of perspective is also significant ($F=3.128$, $p<0.05$). The tests of the within subjects health and environmental sustainability shows also a significant difference for the dependent variables/factors Benefit ($F=21.245$, $p<0.05$), Risk ($F=5.157$, $p<0.005$), Social Norm ($F=6.498$, $p<0.05$) and Subjective Norm ($F=6.843$, $p<0.05$). From the comparison of the means in the interaction of perspective with the within attributes (**Appendix, Analysis II**), clearly the consumers perceive that GM foods are more sustainable than healthy. This includes the factor Risk (risk is negative by definition so low values it means less risk and thus positive result) where there is less risk in sustainability than health. As it was mentioned in Hypothesis 1, the perspective that gives the most positive results in all cases is the consumer's one (Tab.4); the results are depicted in the following table (Tab.3):

Factors	Perspective	Attribute	Mean (s.e.)
Perceived Benefit	Consumer	Sustainability	4.612 (0.212)
		Health	4.082 (0.212)
	Expert	Sustainability	3.941 (0.240)
		Health	2.961 (0.208)
Perceived Risk	Consumer	Sustainability	4.061 (0.250)
		Health	4.735 (0.213)
	Expert	Sustainability	4.686 (0.245)
		Health	4.765 (0.209)
Subjective Norm	Consumer	Sustainability	3.735 (0.205)
		Health	3.408 (0.190)
	Expert	Sustainability	3.059 (0.201)
		Health	2.725 (0.187)
Subjective Behavioral Control	Consumer	Sustainability	4.102 (0.226)
		Health	3.980 (0.227)
	Expert	Sustainability	3.412 (0.221)
		Health	2.980 (0.223)

Tab.3. The mean values of the attributes for all the factors according to different perspectives

To confirm the above results, One-Way ANOVA was performed for every third item for each factor. The third item, as it was mentioned before in the methodology, measures the preference for health or for sustainability attribute and it is scored on a 5-point anchored

scale (1=health, 5=environmental sustainability). The results confirm that (**Appendix, Analysis II**), as the means of all factors except the perceived behavioral control give the most positive values for sustainability. The perceived behavioral control between the two perspectives is significant different ($F=4.434$, $p<0.05$). The mean value for the expert perspective scores toward sustainability while the mean value for the consumer perspective scores toward health attribute.

Conclusion about H2: The Hypothesis 2 is confirmed as the main effect of the attribute is significant for all the factors with the environmental sustainability more positive than health. The respondents perceive genetic engineering technology more positive for the environment in comparison with their products, the GM foods, which are not considered so healthy. The consumers evaluated more positive the GM foods according to consumer perspective and always toward environmental sustainability.

Hypothesis 3: The information which is provided, no matter what type, does not change the attitude in spite of changes of determinants.

A reliability analysis was performed for the statements that define the attitude. The Cronbach's Alpha isvery high for the prior and for the post attitude ($\alpha=0.929$, $\alpha=0.940$ respectively) showing high reliability, the degree to which all the items measure the same uni-dimensional latent construct as the inter-correlations are maximized. (**Appendix, Analysis III**)

According to H1 the predictor is a change in the average attitude towards genetic engineering and its products depending on the information (story) is provided. Two new variables are created representing the mean of the three statements of the attitude, one for the prior-attitude and one for the post-attitude respectively. Factorial Mixed ANOVA was used where dependent variable are the attitude after and the attitude before and the factor between is the type of the story (perspective). (**Appendix, Analysis IV**) The differences in the within subjects effects with the story interaction are not found significant ($F=0.268$, $p>0.05$) despite the fact that the two stories are significant different ($F=4.492$, $p<0.05$).

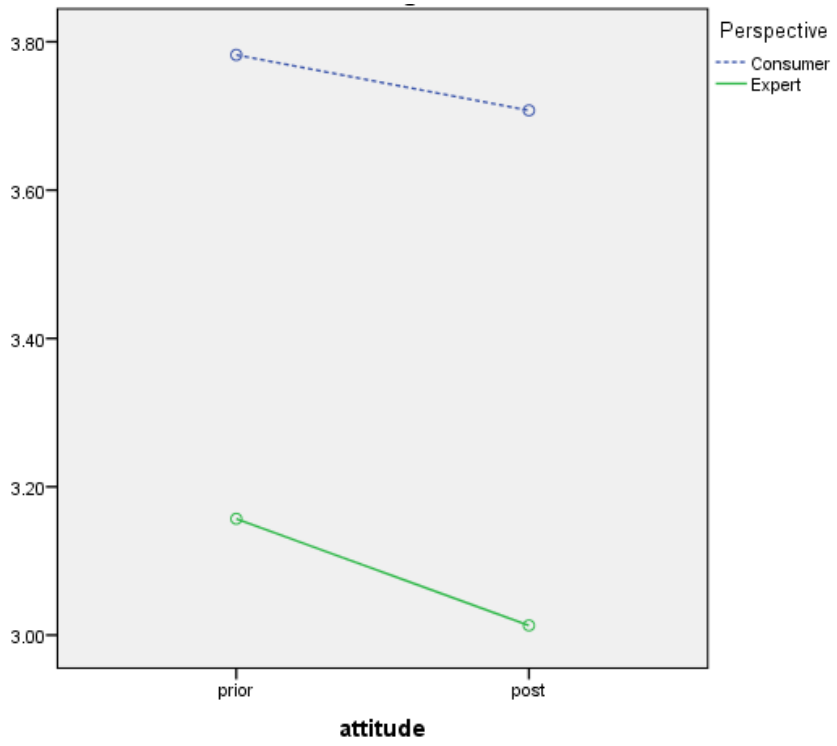

Fig.3. The attitude before and after of the given stories

Although there is no significant effect of story-perspective on attitude change for the interaction by the story ($p>0.05$), a comparison in the means of the two attitudes is an indication that information affects negatively the already negative attitude (Story 1 M=3.782 became M=3.707 and Story 2 M=3.157 became M=3.013). To understand if these differences can be justified with a larger sample size, partial eta squared (np^2) is calculated to help interpreting the results by indicating the percentage of variance in each of the effects or interaction that is accounted for by that that effect or interaction. Starting with the within subjects attitude before and attitude after the value 0.027 indicates that 2.70% of the within variances is accounted for by the within subjects while the interaction of them with the story has even lower effect (0.003). However, the value of 0.44 indicates that 44% of the between subject variance is accounted for by the perspective. This explains the differences between the starting points of the two prior attitudes (of the people who received story of different perspective) in the graph (Fig.3).

Conclusion about H3: The Hypothesis 3 can be confirmed as the information which is provided cannot change an already established attitude in the minds of the consumers. The familiarity with the technology can be a possible reason for making the attitude even more negative. This is consistent with the discussion in the literature review section where more information about the new product increases consumer's uncertainty when the functionality of the product or the technology is unfamiliar.

Hypothesis 4: Consumer perspective is perceived as more positive than the expert perspective.

Although no effect in the Factorial Mixed ANOVA for Hypothesis 3 was found, there is an indication that consumer perspective has a less effect on the consumer's attitude. The importance of the perspective can be verified better from the answers on the question below the text which had the role to make the respondent to read the text. The answer to this question reflects the opinion of the respondent about the text given concerning GM foods. (**Appendix, Analysis V**) This question asks the respondent to evaluate the genetic engineering and its products according to the text in the range "very bad" to "very good". From the 49 people who received the Story 1 the "good" and "very good" was chosen by 20 of them while the "very bad" and "bad" only by 5. In contrast from the 51 people who received the Story 2 only 6 evaluated the text just "good" but 16 of them they evaluated it "bad" and "very bad".

A t-test procedure (**Appendix, Analysis V**) was used to test the equality of variances (Levene's test). The variances are equal in both groups of the stories ($p>0.05$) and the group means are significantly different ($p<0.05$). Looking at the group statistics table it is noticeable that the respondents who received the consumer perspective story they evaluated much more positive the story than the respondents who received the expert perspective story. The t-test succeed to reveal a statistically reliable difference between the mean answers of respondents' opinion about the consumer story which was given ($M=3.39$, $s=0.786$) and the Expert story ($M=2.73$, $s=0.777$) $t(98)=4.239$. $p<0.05$, $a=0.05$.

Conclusion about H4: The Hypothesis 4 can be also confirmed as consumer's perspective in a message seems more beneficial to inform consumers about a new product than the message according to expert's perspective. Perhaps, complicated information influences negatively the attitude by making the respondents more skeptical towards the examined product.

Hypothesis 5: The effects of the determinants on attitude are stronger for the health attribute than the environmental sustainable one.

The predictors are the statements (items) that apart the four factors which influence an attitude, the benefit, risk, norm and control. In those factors each first item is about health attribute while the second one is about sustainability. The third one has a different role and gives the preference on the attribute. A Regression Analysis was performed by taking into account every two first statements for each factor. (**Appendix, Analysis VI**)

The goodness of the model in other words if the model explains the variations in the dependent variable, can be seen at the model fit (ANOVA). The significance of the model shows that the model could fit the data ($p<0.05$). The proportion of the variation in the dependent variable (Post attitude) which can be explained by the independent variables (Factors) is close to 78% (R Square= 0.776) showing the strength of the association, Therefore there is high correlation between the studied variables.

The predictor benefit is significant for health and sustainability (health $t=6.312$, $p<0.05$ and sustainability $t=2.529$, $p<0.05$). It can be noticed the differences between the coefficients,

the slopes (b) where for health the slope is much higher (b=0.455) than sustainability's one (b=0.174). So for every unit increase in health benefit, a 0.455 increase in attitude after is predicted holding all the other variables constant.

The t-tests were performed for the differences between the slopes of health and sustainability for each factor. The t-test for the factor benefit gives a value of t (98) =2.8 bigger than critical value 1.98 and thus $p<0.05$ showing the significant differences between the two slopes which confirm the importance of health attribute for the respondents. On the other hand the predictor risk is also significant but only for health ($t=-3.440$, $p<0.05$) and not for sustainability ($t=0.225$, $p>0.05$). Especially the differences between the coefficients describe more the prediction in the post attitude. For risk in health is b=-0.246 while for sustainability is b=0.15. So for every unit increase in health risk, about 0.246 decreases in attitude after it is predicted holding all the other variables constant. A t- test shows that the two slopes are significant different between them t (98) =3.96 bigger than critical value 1.98 and thus $p<0.05$. This shows that the health risk is of higher importance for the consumer than the sustainability one. About subjective norm the t-test confirm that the two slopes (b1=0.128, b2=0.052) are not significant different and the same occurred for the slopes of perceived behavioral control (b1=0.121, b2=0.015).

Conclusion about H5: Risk and benefit were the only factors which were significant and these are the main factors that influence consumer's attitude positively or negatively, a find that is consistent with the discussion in the literature review section. Perhaps, the top-down processing takes place in the minds of the consumers in the judgment of GM foods which states that even if someone perceives benefits in the application of GM, that is determined by how risks are perceived which they prevent the perception of benefits. Health is more important in the context of the before mentioned factors and thus the Hypothesis 5 is confirmed. It has been already mentioned in Hypothesis 2 that consumers evaluate the genetic engineering and its products as more sustainable than healthy. Therefore a desire for a healthy GM food is higher; an aspect that this kind of foods still do not fulfill according to the consumers.

6.3. Further statistical analyses

a. Respondents' educational background

The field of studies (educational background) of the respondents was used to check whether their educational background has influence on their attitude towards genetic engineering and GM foods and if are more sensitive to the information is provided. By performing a comparison of the mean-attitudes (**Appendix, Analysis VII**) the students are distributed according to their studies (Tab.4):

Field	Number of respondents	Mean of prior attitude	Mean of post attitude	Difference of the means
Biology, Plants and Animals	26	3.6923	3.6795	0.0128
Environment and Landscape	14	3.2619	2.9762	0.2857
Society and Economics	27	2.7531	2.7160	0.0371
Technology and Nutrition	33	3.9495	3.7778	0.1715
Total	100	3.4633	3.3533	0. 1100

Tab.4. The mean values of the student's attitudes in relation with their educational background

From the results above some conclusions can be made. The most positive prior attitude about GM foods have the students of Technology and Nutrition while the most negative have the students of the Society and Economics field of studies. The information has a more negative effect on the students of Environment and Landscape field while the least negative effect on the students of Biology, Plants and Animals.

Factorial Mixed ANOVA was performed for each field of study. (**Appendix, Analysis IX**) The attitude, as it was already noticed in the differences of means, it is decreased in both perspectives. The effect for the story interaction is not significant for the Environment and Landscape ($F=0.43$, $p>0.05$) and for the Technology and Nutrition ($F=0.428$, $p>0.05$). For the Society and Economics the story interaction effect on attitude is not also significant ($F=2.906$, $p>0.05$). But in the estimated marginal means graph there is an indication of a positive effect of the expert perspective story on the attitude in contrast with the indication for slight decline of the attitude influenced by the consumer perspective story. In the Biology, Plants and Animals field the differences among the attitudes with the story interaction are almost significant ($F=4.130$, $p=0.053$). The story by the experts has a negative effect on the attitude while the consumer perspective has a positive effect (Fig.4.).

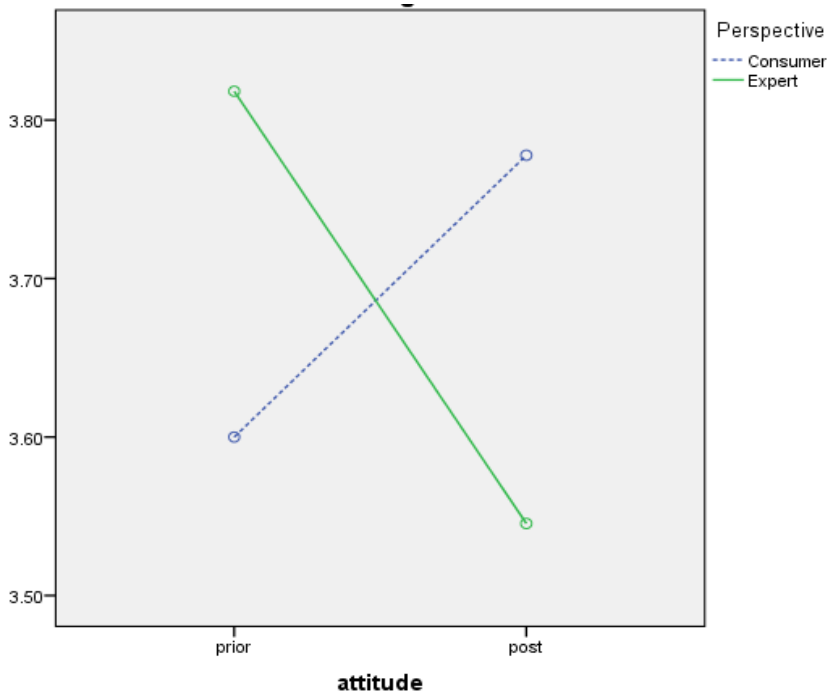

Fig.4. The attitude before and after of the given stories for the Biology, Plants and Animals students

The students from this field of studies they acquire enhanced knowledge about the topic; it seems the additional information was not taken into account seriously and this indicates that experts are also consumers and are influenced similarly like all the others. Regression analysis for this field shows that the predictor benefit is significant for health ($t=2.300$, $p<0.05$). The same is for the scientific field Technology and Nutrition ($t=5.603$, $p<0.05$) but also for the risk in health ($t=-2.887$, $p<0.05$) while the slope b for the first one is almost two times more important (health benefit $b=0.640$, health risk $b=-0.327$) In other words, the effect of the independent variable health benefit is greater on the dependent variable attitude. There are no significant predictors in the regression analyses in the other fields.

b. Respondents' gender

About the differences between the genders, Repeated Measures ANOVA shows non-significant differences in the within-subjects effects attitude under story interaction ($F=2.093$, $p>0.05$) for men but shows significant differences for women ($F=5.044$, $p<0.05$). Significant differences also are noticed for women between the two stories ($F=10.325$, $p<0.05$). (**Appendix, Analysis VIII**) The consumer perspective has a positive effect on the women's' attitude in contrast with the expert perspective which has a negative effect on the attitude (Fig.5).

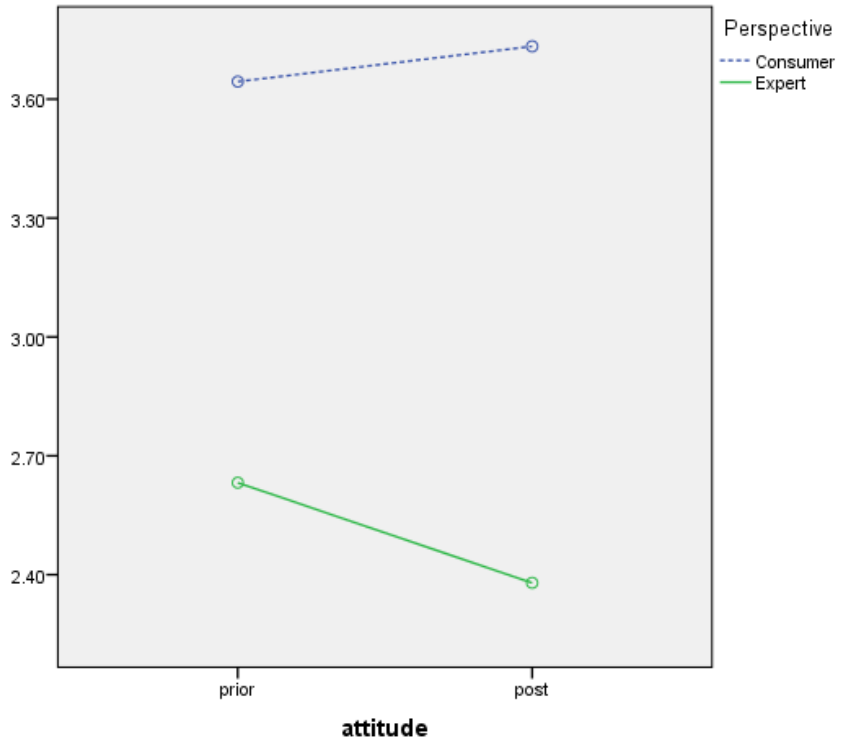

Fig.5. The attitude before and after of the given stories for the females

c. Respondents' country of origin

Differences between the respondents' attitude in relation with the country of origin arenoticed when the two bigger samples, the one of the Greeks (33 people) and the one of the Dutch respondents (31 people). (**Appendix, Analysis X**), are compared. There are no

significant effects of the within subjects factors for both countries' attitude (Greece F=0.302, p>0.005, Netherlands F=0.664, p>0.005) as well as with the interaction of the story (Greece F=0.302, p>0.05; Netherlands F=0.136, p>0.05). But there is a significant effect of the perspective on the attitude for Greeks (F=6.399, p<0.05) in contrast with the Dutch (F=.028, p>0.05). This means that the stories are perceived similar from the Dutch respondents but not from the Greek respondents. Indeed from the graph below (Fig.6) the consumer perspective increased the Greek respondents' attitude while the expert perspective did not change it.

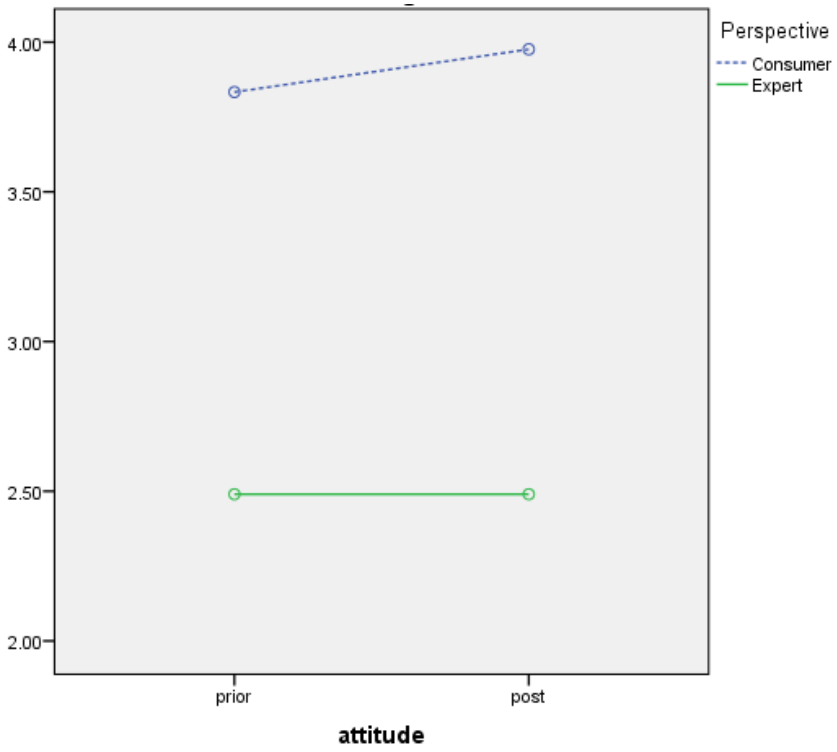

Fig.6. The attitude before and after of the given stories for the Greek respondents

7. Discussion and conclusions

The overall objective of the present study was to gain further understanding about the role the information has on the consumer's attitude towards GM foods. Moreover, the research was conducted to investigate how the negative attitude of the European consumers about genetically modified foods, can be influenced by the type of information is provided. At the same time it was tested if the consumers evaluate more positive the GM food towards two credence attributes, environmental sustainability or human health, helping the communicators to formulate their messages in the correct direction. The message which was provided, was formulated according to two different perspectives, the experts' and the consumers' one about the four identified main determinants of consumer's attitude. Therefore it was examined how effective the communication about GM foods can be and how it can address better issues in order the products of genetic engineering to be accepted by the European consumers with the negative attitude towards them.

The first hypothesis, which states that "The perspective in the message has different effects on the factors which determine the attitude", can only partly be confirmed. The outcome suggests a high influence of the perspective in a message on the factors which determine the consumer's attitude towards a food product, all the factors except the risk one. This factor is perceived the same from the respondents despite the two different perspectives on which was formulated. The perspective that had the larger effect was the consumer's perspective and this can be justified by the outcome of the second hypothesis.

From the second hypothesis, "The sustainability attribute on GM foods has the larger effect on the factors which determine the attitude than the health attribute", the outcome confirms the hypothesis. The results show that the main effect of the attribute is significant for all the factors. In all cases environmental sustainability of GM engineering and its products scored higher than the health attribute. This shows that the respondents perceive genetic engineering as more sustainable towards the environment but its products, the GM foods, are not considered healthy which is in accordance with the literature findings. (Magnusson et al., 2001) In all cases, as it was mentioned in the previous paragraph, the consumer perspective gave the higher (more positive) scores on the evaluation of the GM foods by the respondents.

The statistical results of the third hypothesis which explores "The information which is provided, no matter what type, does not change the attitude in spite of changes of determinants", they are in line with the studies that conclude that information alone has a small effect on the attitude of the consumers. (Frewer et al., 2000; Grunert et al., 2004) The negative attitude of the consumer toward genetically modified foods did not change to more positive by the influence of the provided information. That result proves the evidence of the hypothesis about the attitude activation effect (Grunert et al., 2004). Indeed the attitude of the majority of the respondents was negative and remained negative after the information independent from perspective. The differences in the means of the prior and post attitudes indicate a small but not significant decrease. As it was mentioned in the literature review the familiarity with the technology can be a possible reason for making the attitude even more negative. Specifically, this is consistent with the finds that suggest that more information about the new product increases consumer's uncertainty when the functionality of the product or the technology is unfamiliar. (Ronteltap et al., 2007) Thus the attitude decreases. It can be concluded that the provision of additional information on GM foods does not change the attitude to genetic engineering in food production but activates the existing attitude.

The fourth hypothesis "Consumer perspective is perceived as more positive than the expert perspective" can be confirmed and supports the outcome of the second hypothesis. The respondents evaluated the genetic engineering and the GM foods more positively with the text which was formulated according to consumer's perspective. Both hypotheses imply the more positive effect to the consumers' persuasiveness towards the technology and its products. Therefore, consumer's perspective in a message is more beneficial to inform consumers about a new product than the more complicated message according to expert's perspective.

The last hypothesis states that “The effects of the determinants on attitude are stronger for the health attribute than the environmental sustainable one” can be confirmed. The test results are consistent with the finds from studies about GM foods which suggest that risk and benefit are the main factors that influence consumer’s attitude positively or negatively. This evidence is consistent with the idea that risk perceptions are the results of both of perception of a potential disutility as well as a lack of important benefits to the public from a new technology like genetic engineering. (Grunert, 2004; Costa, 2008; Frewer, 2008; Paarlberg, 2010; Schenk et al, 2011)

Possibly the benefits derived from GM foods are an insufficient condition for increasing the consumer acceptance of GM food products. Those who are likely to identify high risks with regards to GM foods might be those who identify lower benefits. The results also are consistent with the general hypothesis that public opinion, usually the European one, on the benefits and risks is fragmented and subject to significant indecision. (Costa, 2008) The health attribute stands more important in the context of the before mentioned factors and this confirms also the outcome of the second hypothesis where the consumers evaluated the genetic engineering and its products as more sustainable than healthy. Therefore a desire for a healthy GM food is higher as it was discussed in the literature review (Verbeke, 2008); an aspect that this kind of foods still do not fulfill according to the consumers.

Also, possible gender, age and educational differences were investigated. The analysis of the two samples, Greeks and Dutch respondents, verify Bredahl findings (2001) that cross-country differences exist in relation to consumers’ perceptions related to GM foods. The consumer perspective in the message influenced the perception of the Greek respondents as it increased the attitude to more positive while the perspective in the message did not have any effect on the Dutch consumers’ attitude. The positive effect of the perspective was also found for the female gender. The consumer perspective had a positive effect on the women’s’ attitude in contrast with the expert perspective which had a negative effect on their attitude. Once again the statistical results show that women are more sensitive than men when they do their food choices taking into account more seriously all the aspects of the food production. The education background, the knowledge a person acquires is also important, but not essential. (Chen, 2008)The students from the Biology, Plants and Animals field where the majority of them have a good level of knowledge were influenced negatively by the expert information in contrast with the consumer perspective information. This suggests that also experts are consumers and they desire simple messages and not complicated information for their food purchases.

This study showed the relevance importance of the perspective in the prediction of the consumers’ attitude. Moreover, communication can be more effective if the message formulated in the consumer perspective and if the attribute that consumer values more it is addressed. In the case of GM foods, the attribute that has the most important value is the health one as the consumers evaluated the GM foods as more sustainable than healthy. Genetic engineering fulfills more the criteria of environmental sustainability than human health concerns and that is the point where the experts and communicators should focus to address it more positive. This is clearer from the scores in subjective norm and perceived behavioral control where the majority of the respondents expressed the desire to purchase

GM products that fulfill both, healthy and environmental friendliness. The benefits and risks are the main factors that determine the attitude as top-down processing happens in the consumers 'minds. Perceived risks, in our case in health, prevented the perception of benefits; high risk perception leads to lower acceptance of new technologies. (Frewer et al. 1998; Eiser et al., 2002; Schenk et al., 2011) Information alone does not change the attitude toward a new product or technology and this is consistent with the findings from other experiments. Provision of information resulted in an attitude activation effect which was already negative. (Frewer et al., 2000; Grunert, 2004) Direct experience through exposure and taste experience, things that are not available in the European market through the limited amounts of GM foods may influence the weaker bottom-up processing. Direct experience, provision of information according to the consumer perspective, effective communication focusing on benefits and at the same time cancelling the risks might be the key influence the attitude of the consumers towards genetic engineering and its products.

8. Research limitations and suggestions for future research

Besides the positive findings, there are number of limitations to this study. First and foremost, a major limitation is that the mean values of the two prior attitudes, each one for each perspective, are different (see Fig.3). This is a constraint as the respondents who received the consumer perspective story they were already more positive in comparison with those who received the expert perspective story. Therefore, they evaluated more positively the GM foods and this cannot support strongly the important role of the perspective in the information. The consequence maybe that the consumer-expert perspective main affects for the whole study needs to be taken with some care. A repeat of the experiment with another group of participants randomly assigned to experimental conditions might solve the problem and to achieve similarity in the means of prior-attitudes of the consumers.

Another important limitation is about the sample of the respondents which was small and quite homogenous to generalize the conclusions. From this sample, the most of the respondents (48%) aged from 24 to 26 while 64% from the total sample were from 2 countries only, Greece and Netherlands. The fact also that the respondents were students is associated with the acceptance of GM benefits as it was concluded by Traill et al. (2004). Thus, the decrease in the attitude was not significant as the low level of education is associated with perceptions of high levels of risks which could determine a lot the post attitude. Additionally a small student sample is unlikely to be highly representative of Europe or another continent and thus the use of student subjects may limit the generalizations of the findings. Suggestion for further research is the change of the target group.

A characteristic that was not taken into account is the knowledge the respondents had about genetic engineering technology. From the received comments about the study a minority expressed the opinion that it should have been included a short description about genetic engineering technology. This is consistent with the literature (Lusk et al., 2004) who states that individuals with high levels of subjective knowledge may less influenced by new information and this is highly related to acceptance.

Another limitation occurs in the representation of the stories online. The stories were formulated according to scientific literature but the references were not visible to the respondent. The dispatcher of the online survey was the author, a M.Sc. student, and that was visible in the introduction. Thus it is questionable if the respondents considered the information trustful and as the survey was involving two credence attributes, health and sustainability, the quality of those attributes is a question of trust in the information provided. (Grunert et al., 2004) Moreover, the level of trust placed on an information source determines the level of importance assigned to information from that source (Moon and Balasubramanian, 2004)

The fact also that the respondents were restricted to choose to accept the product based on one or both of the credence attributes without having the option none of them does not give the chance to them to express the opinion that they might not accept the GM foods for any of the given attributes.

The influence of the subjective norm was not significant and this is not consistent with the literature that states the important role this factor has on the intention. (Chen, 2008) Although the strength of social influences are different in different countries of different cultures and this factor is weak in the use in an online survey. The one item construct, one for each attribute per factor, represents a limitation in the study and perhaps a multi item construct maybe a better predictor. This applies for the other factors as well. Moreover, particular items might be removed or altered in order to develop improved scales and thus to enhance the reliability of the scale. This limitation of the current study merits further investigation in future research.

Some of the respondents took a lot of time before to submit the online survey and thus they may asked peers or they had time to read about GM foods and thus to get influenced towards the product. Others respondents on the other hand submitted the survey in short time. For a similar experiment in the future it is advisable to invite all the participants in a room and to give them limited period of time and in that way many distractions and lack of attention might be avoided. By employing also group interview techniques, like focus groups where the respondents influence each other, they can bring out further knowledge regarding beliefs and values related to GM foods.

In spite of the limitations, we are confident about the way this survey was conducted, the high reliability of the used scale to measure the consumers' attitude and for the statistical results, and we conclude that effective communication stands very important to shape consumer's attitudes towards new technologies and their products.

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Appendix questionnaire

STORY	PERSPECTIVE	BENEFIT	FACTORS	MESSAGE
1st	Consumer	Healthy	Benefit	Genetically modified food products contain more nutrients than other food products
			Risk	There is a possibility of creation of allergies if the food is genetically modified
			Norm	People from your environment think that we should buy GM food because is more healthy
			Control	If GM food products are available I could easily find them and choose one
2nd	Expert		Benefit	Genetic modification allows crops to be bred by selectively inserting one or more genes into a plant in order to confer specific advantages like bio-fortification of the micronutrient content of them
			Risk	The gene coding for Bt toxin which is used in some GM crops results in consuming continuously secreted insecticide toxins
			Norm	United States Department of Agriculture (USDA) (for general food quality and worker safety) and Food and Drug Administration (FDA)(for toxicity) approves genetically modified products and do not find any harmful consequence by the consumption of them
			Control	I can easily choose a GM food product by checking for the unique identifier which established by Commission Regulation (EC) No 65/2004
1st	Consumer	Sustainable	Benefit	Applying gene technology in food production can be beneficial for the environment as the pesticides are reduced
			Risk	Genetically modified organisms are likely to interfere with wild species in nature
			Norm	People who influence the way

				you think claim that GM technology is a mean for sustainable development
			Control	If GM food products are available I could easily find them and choose one
2nd	Expert		Benefit	Genetically modified Bt transgenic varieties can reduce the use of chemical pesticides because of their pest resistance due to the Bt toxin they contain
			Risk	The genes may flow towards related wild species and to create “super-weeds”, invasive plants, and thus an accelerated decrease in biodiversity
			Norm	Environmental Protection Agency (EPA) (for environmental impact) approves genetically modified products and does not find any harmful consequence to the environment
			Control	I can easily choose a GM food product by checking for the unique identifier which established by Commission Regulation (EC) No 65/2004

Appendix Statistics

Descriptive statistics

I.

What is your age?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-20	4	4.0	4.0	4.0
	21-23	25	25.0	25.0	29.0
	24-26	48	48.0	48.0	77.0
	27-29	15	15.0	15.0	92.0
	30+	8	8.0	8.0	100.0
	Total	100	100.0	100.0	

II.

What is your gender? * Story Crosstabulation

Count

		Perspective		
		Consumer	Expert	Total
What is your gender?	Male	19	22	41
	Female	30	29	59
Total		49	51	100

III.

Perspective * Field Crosstabulation

Count

		Field				
		Biology,	Environm	Societya	Technolo	Total
Perspective	Consumer	15	6	12	16	49
	Expert	11	8	15	17	51
Total		26	14	27	33	100

Analysis

I.

Multivariate Tests[b]

Effect			Value	F	Hypothesis df	Error df	Sig.
Between Subjects	Intercept	Pillai's Trace	.985	1527.109[a]	4.000	95.000	.000
		Wilks' Lambda	.015	1527.109[a]	4.000	95.000	.000
	Perspective	Pillai's Trace	.138	3.813[a]	4.000	95.000	.006
		Wilks' Lambda	.862	3.813[a]	4.000	95.000	.006
Within Subjects	Health_Envir	Pillai's Trace	.208	6.235[a]	4.000	95.000	.000
		Wilks' Lambda	.792	6.235[a]	4.000	95.000	.000
	Health_Envir * Perspective	Pillai's Trace	.116	3.128[a]	4.000	95.000	.018
		Wilks' Lambda	.884	3.128[a]	4.000	95.000	.018

a. Exact statistic

b. Design: Intercept + Perspective

Within Subjects Design: Health_Envir

Univariate Tests

Source	Measure		Type III Sum of Squares	df	Mean Square	F	Sig.
Health_Envir	Benefit	Sphericity Assumed	28.528	1	28.528	21.245	.000
		Greenhouse-Geisser	28.528	1.000	28.528	21.245	.000
	Risk	Sphericity Assumed	7.064	1	7.064	5.157	.025
		Greenhouse-Geisser	7.064	1.000	7.064	5.157	.025
	SocNorm	Sphericity Assumed	5.441	1	5.441	6.498	.012
		Greenhouse-Geisser	5.441	1.000	5.441	6.498	.012
	Control	Sphericity Assumed	3.832	1	3.832	6.843	.010
		Greenhouse-Geisser	3.832	1.000	3.832	6.843	.010
Health_Envir * DO_BL_Block3	Benefit	Sphericity Assumed	2.528	1	2.528	1.882	.173
		Greenhouse-Geisser	2.528	1.000	2.528	1.882	.173
	Risk	Sphericity Assumed	4.424	1	4.424	3.230	.075
		Greenhouse-Geisser	4.424	1.000	4.424	3.230	.075
	SocNorm	Sphericity Assumed	.001	1	.001	.001	.979
		Greenhouse-Geisser	.001	1.000	.001	.001	.979
	Control	Sphericity Assumed	1.192	1	1.192	2.129	.148
		Greenhouse-Geisser	1.192	1.000	1.192	2.129	.148

Tests of Between-Subjects Effects

Transformed Variable:Average

Source	Measure	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	Benefit	3039.161	1	3039.161	799.653	.000
	Risk	4160.202	1	4160.202	1060.908	.000
	SocNorm	2088.061	1	2088.061	695.278	.000
	Control	2617.585	1	2617.585	585.783	.000
Perspective	Benefit	40.121	1	40.121	10.556	.002
	Risk	5.362	1	5.362	1.367	.245
	SocNorm	23.061	1	23.061	7.679	.007
	Control	35.665	1	35.665	7.981	.006

II.

3. Perspective * Health_Envir

Measure	Perspective	Health_Envir	Mean	Std. Error	95% Confidence Interval	
					Lower Bound	Upper Bound
Benefit	Consumer	1	4.082	.212	3.661	4.502
		2	4.612	.245	4.126	5.099
	Expert	1	2.961	.208	2.549	3.373
		2	3.941	.240	3.464	4.418
Risk	Consumer	1	4.735	.213	4.311	5.158
		2	4.061	.250	3.565	4.557
	Expert	1	4.765	.209	4.350	5.180
		2	4.686	.245	4.200	5.172
SocNorm	Consumer	1	3.408	.190	3.030	3.786
		2	3.735	.205	3.327	4.142
	Expert	1	2.725	.187	2.355	3.096
		2	3.059	.201	2.660	3.458
Control	Consumer	1	3.980	.227	3.529	4.431
		2	4.102	.226	3.654	4.550
	Expert	1	2.980	.223	2.538	3.422
		2	3.412	.221	2.973	3.851

		N	Mean	Std. Deviation	Std. Error
3. The genetic engineering and its products can give benefits for:	Consumer	49	3.47	.868	.124
	Expert	51	3.43	1.253	.175
	Total	100	3.45	1.077	.108
6. The highest risk from the use of genetic engineering is in:	Consumer	49	2.59	1.019	.146
	Expert	51	3.00	1.296	.181
	Total	100	2.80	1.181	.118
9. My social environment would be more supportive if I buy GM food for:	Consumer	49	3.14	1.080	.154
	Expert	51	3.16	1.223	.171
	Total	100	3.15	1.149	.115
12. If GM food products are available I can easily choose one for:	Consumer	49	2.90	.963	.138
	Expert	51	3.31	1.010	.141
	Total	100	3.11	1.004	.100

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
3. The genetic engineering and its products can give benefits for:	Between Groups	.036	1	.036	.031	.861
	Within Groups	114.714	98	1.171		
	Total	114.750	99			
6. The highest risk from the use of genetic engineering is in:	Between Groups	4.163	1	4.163	3.048	.084
	Within Groups	133.837	98	1.366		
	Total	138.000	99			
9. My social environment would be more supportive if I buy GM food for:	Between Groups	.005	1	.005	.004	.952
	Within Groups	130.745	98	1.334		
	Total	130.750	99			
12. If GM food products are available I can easily choose one for:	Between Groups	4.320	1	4.320	4.434	.038
	Within Groups	95.470	98	.974		
	Total	99.790	99			

III.

Reliability Statistics

Cronbach's Alpha	N of Items
.929	3

Cronbach's Alpha	N of Items
.940	3

IV.

Within-Subjects Factors

Measure:MEASURE_1

before_after	Dependent Variable
1	attitudebefore
2	attitudeafter

Between-Subjects Factors

		N
Perspective	Consumer	49
	Expert	51

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
before_after	Sphericity Assumed	.597	1	.597	2.694	.104	.027
	Greenhouse-Geisser	.597	1.000	.597	2.694	.104	.027
	Huynh-Feldt	.597	1.000	.597	2.694	.104	.027
	Lower-bound	.597	1.000	.597	2.694	.104	.027
before_after * Perspective	Sphericity Assumed	.059	1	.059	.268	.606	.003
	Greenhouse-Geisser	.059	1.000	.059	.268	.606	.003
	Huynh-Feldt	.059	1.000	.059	.268	.606	.003
	Lower-bound	.059	1.000	.059	.268	.606	.003

Tests of Between-Subjects Effects

Measure:MEASURE_1

Transformed Variable:Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	2331.420	1	2331.420	481.180	.000	.831
Perspective	21.767	1	21.767	4.492	.037	.044
Error	474.831	98	4.845			

V.

According to the text, genetic engineering is: * Perspective Crosstabulation

Count

		Perspective		
		Consumer	Expert	Total
According to the text, genetic engineering is:	Very Bad	0	4	4
	Bad	5	12	17
	Neither Good nor Bad	24	29	53
	Good	16	6	22
	Very Good	4	0	4
Total		49	51	100

T-test

Group Statistics

	Storytype	N	Mean	Std. Deviation	Std. Error Mean
According to the text, genetic engineering is:	1.00	49	3.39	.786	.112
	2.00	51	2.73	.777	.109

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
According to the text, genetic engineering	Equal variances assumed	.333	.565	4.239	98	.000	.662	.156	.352	.972
	Equal			4.238	97.735	.000	.662	.156	.352	.972

is:	variances not assumed									

VI.

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	11. If GM food products are available I can easily choose one based on sustainability, 7. My social environment would be more supportive if I buy GM food for my health, 5. The GM food products involve risk for sustainability, 4. The GM food products involve risk for human health, 1. The GM food products are beneficial for human health, 8. My social environment would be more supportive if I buy GM food for sustainable development, 2. The genetic engineering is beneficial for sustainable development, 10. If GM food products are available I can easily choose one for my health	.	Enter

a. All requested variables entered.

b. Dependent Variable: attitudeafter

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.877[a]	.770	.749	.81065

a. Predictors: (Constant), 11. If GM food products are available I can easily choose one based on sustainability, 7. My social environment would be more supportive if I buy GM food for my health, 5. The GM food products involve risk for sustainability, 4. The GM food products involve risk for human health, 1. The GM food products are beneficial for human health, 8. My social environment would be more supportive if I buy GM food for sustainable development, 2. The genetic engineering is beneficial for sustainable development, 10. If GM food products are available I can easily choose one for my health

ANOVAb

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	199.715	8	24.964	37.989	.000[a]
	Residual	59.801	91	.657		
	Total	259.516	99			

a. Predictors: (Constant), 11. If GM food products are available I can easily choose one based on sustainability, 7. My social environment would be more supportive if I buy GM food for my health, 5. The GM food products involve risk for sustainability, 4. The GM food products involve risk for human health, 1. The

GM food products are beneficial for human health, 8. My social environment would be more supportive if I buy GM food for sustainable development, 2. The genetic engineering is beneficial for sustainable development, 10. If GM food products are available I can easily choose one for my health

b. Dependent Variable: attitudeafter

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1 (Constant)	1.072	.638		1.681	.096
1. The GM food products are beneficial for human health	.455	.072	.443	6.312	.000
2. The genetic engineering is beneficial for sustainable development	.174	.069	.187	2.529	.013
4. The GM food products involve risk for human health	-.246	.072	-.226	-3.440	.001
5. The GM food products involve risk for sustainability	.015	.067	.017	.225	.823
7. My social environment would be more supportive if I buy GM food for my health	.128	.079	.108	1.612	.110
8. My social environment would be more supportive if I buy GM food for sustainable development	.052	.078	.047	.667	.506
10. If GM food	.121	.095	.124	1.274	.206

products are available I can easily choose one for my health					
11. If GM food products are available I can easily choose one based on sustainability	.015	.089	.015	.172	.864

a. Dependent Variable: attitudeafter

VII.

attitudebefore

Field	Mean	N	Std. Deviation
Biology,	3.6923	26	1.56041
Environm	3.2619	14	1.26881
Societya	2.7531	27	1.39472
Technolo	3.9495	33	1.79529
Total	3.4633	100	1.61704

attitudeafter

Field	Mean	N	Std. Deviation
Biology,	3.6795	26	1.43133
Environm	2.9762	14	1.55505
Societya	2.7160	27	1.36094
Technolo	3.7778	33	1.82891
Total	3.3533	100	1.61906

VIII.

Female

Between-Subjects Factors

		N
Perspective	Consumer	30
	Expert	29

Tests of Within-Subjects Effects

Measure:attitudebefore_attitudeafter

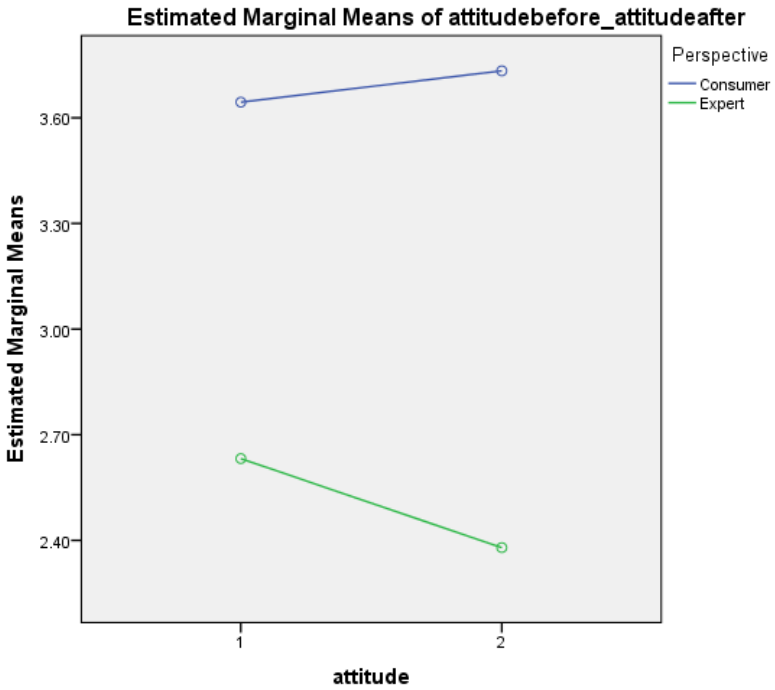
Source		Type III Sum of Squares	df	Mean Square	F	Sig.
attitude	Sphericity Assumed	.198	1	.198	1.161	.286
	Greenhouse-Geisser	.198	1.000	.198	1.161	.286
	Huynh-Feldt	.198	1.000	.198	1.161	.286
	Lower-bound	.198	1.000	.198	1.161	.286
attitude * Perspective	Sphericity Assumed	.861	1	.861	5.044	.029
	Greenhouse-Geisser	.861	1.000	.861	5.044	.029
	Huynh-Feldt	.861	1.000	.861	5.044	.029
	Lower-bound	.861	1.000	.861	5.044	.029

Tests of Between-Subjects Effects

Measure:attitudebefore_attitudeafter

Transformed Variable:Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	1131.694	1	1131.694	283.032	.000
Perspective	41.283	1	41.283	10.325	.002
Error	227.913	57	3.998		



Male

Between-Subjects Factors

		N
Perspective	Consumer	19
	Expert	22

Tests of Within-Subjects Effects

Measure:attitudebefore_attitudeafter

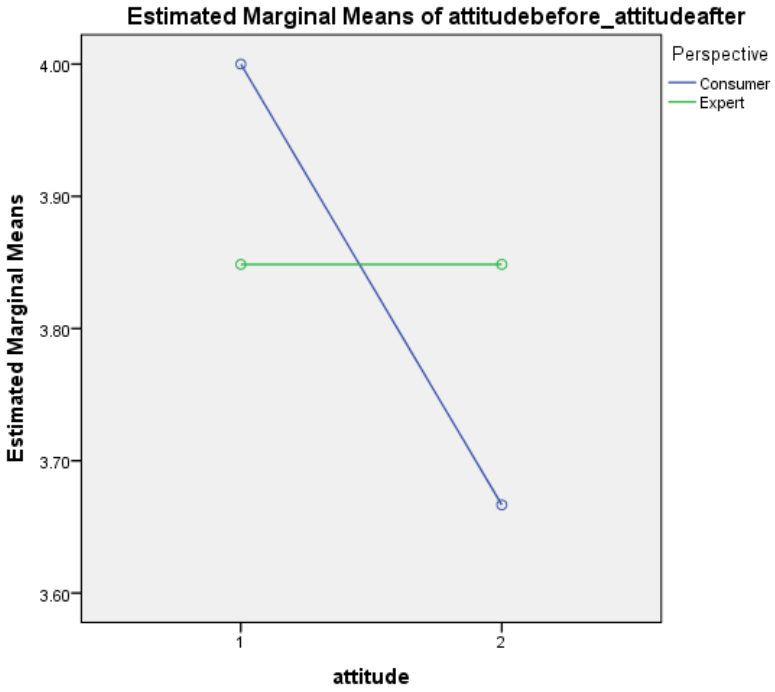
Source		Type III Sum of Squares	df	Mean Square	F	Sig.
attitude	Sphericity Assumed	.566	1	.566	2.093	.156
	Greenhouse-Geisser	.566	1.000	.566	2.093	.156
	Huynh-Feldt	.566	1.000	.566	2.093	.156
	Lower-bound	.566	1.000	.566	2.093	.156
attitude * Perspective	Sphericity Assumed	.566	1	.566	2.093	.156
	Greenhouse-Geisser	.566	1.000	.566	2.093	.156
	Huynh-Feldt	.566	1.000	.566	2.093	.156
	Lower-bound	.566	1.000	.566	2.093	.156

Tests of Between-Subjects Effects

Measure:attitudebefore_attitudeafter

Transformed Variable:Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	1203.235	1	1203.235	233.089	.000
Perspective	.005	1	.005	.001	.976
Error	201.323	39	5.162		



IX.

Within-Subjects Factors

Measure:attitudebefore_attitudeafter

attitude	Dependent Variable
1	attitudebefore
2	attitudeafter

F=1 (Society and Economics)

Between-Subjects Factors

		N
Perspective	Consumer	12
	Expert	15

Multivariate Tests[b]

Effect		Value	F	Hypothesis df	Error df	Sig.
attitude	Pillai's Trace	.011	.269[a]	1.000	25.000	.608
	Wilks' Lambda	.989	.269[a]	1.000	25.000	.608
	Hotelling's Trace	.011	.269[a]	1.000	25.000	.608
	Roy's Largest Root	.011	.269[a]	1.000	25.000	.608

attitude * Perspective	Pillai's Trace	.104	2.906[a]	1.000	25.000	.101
	Wilks' Lambda	.896	2.906[a]	1.000	25.000	.101
	Hotelling's Trace	.116	2.906[a]	1.000	25.000	.101
	Roy's Largest Root	.116	2.906[a]	1.000	25.000	.101

a. Exact statistic

b. Design: Intercept + Perspective

Within Subjects Design: attitude

Tests of Between-Subjects Effects

Measure:attitudebefore_attitudeafter

Transformed Variable:Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	411.934	1	411.934	120.539	.000
Perspective	8.593	1	8.593	2.514	.125
Error	85.436	25	3.417		

F=2 (Biology and Plants Sciences)

Between-Subjects Factors

		N
Perspective	Consumer	15
	Expert	11

Multivariate Tests[b]

Effect		Value	F	Hypothesis df	Error df	Sig.
attitude	Pillai's Trace	.008	.183[a]	1.000	24.000	.672
	Wilks' Lambda	.992	.183[a]	1.000	24.000	.672
	Hotelling's Trace	.008	.183[a]	1.000	24.000	.672
	Roy's Largest Root	.008	.183[a]	1.000	24.000	.672
attitude * Perspective	Pillai's Trace	.147	4.130[a]	1.000	24.000	.053
	Wilks' Lambda	.853	4.130[a]	1.000	24.000	.053
	Hotelling's Trace	.172	4.130[a]	1.000	24.000	.053
	Roy's Largest Root	.172	4.130[a]	1.000	24.000	.053

a. Exact statistic

b. Design: Intercept + Perspective

Within Subjects Design: attitude

Tests of Between-Subjects Effects

Measure:attitudebefore_attitudeafter

Transformed Variable:Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	689.539	1	689.539	153.654	.000
Perspective	.001	1	.001	.000	.991
Error	107.702	24	4.488		

F=3 (Technology and Nutrition)

Between-Subjects Factors

		N
Perspective	Consumer	16
	Expert	17

Multivariate Tests[b]

Effect		Value	F	Hypothesis df	Error df	Sig.
attitude	Pillai's Trace	.051	1.664[a]	1.000	31.000	.207
	Wilks' Lambda	.949	1.664[a]	1.000	31.000	.207
	Hotelling's Trace	.054	1.664[a]	1.000	31.000	.207
	Roy's Largest Root	.054	1.664[a]	1.000	31.000	.207
attitude * Perspective	Pillai's Trace	.014	.428[a]	1.000	31.000	.518
	Wilks' Lambda	.986	.428[a]	1.000	31.000	.518
	Hotelling's Trace	.014	.428[a]	1.000	31.000	.518
	Roy's Largest Root	.014	.428[a]	1.000	31.000	.518

a. Exact statistic

b. Design: Intercept + Perspective

Within Subjects Design: attitude

Tests of Between-Subjects Effects

Measure:attitudebefore_attitudeafter

Transformed Variable:Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	991.061	1	991.061	162.764	.000
Perspective	12.515	1	12.515	2.055	.162
Error	188.757	31	6.089		

F=4 (Environment and Landscape)

Between-Subjects Factors

		N
Perspective	Consumer	6
	Expert	8

Multivariate Tests[b]

Effect		Value	F	Hypothesis df	Error df	Sig.
attitude	Pillai's Trace	.150	2.118[a]	1.000	12.000	.171
	Wilks' Lambda	.850	2.118[a]	1.000	12.000	.171
	Hotelling's Trace	.176	2.118[a]	1.000	12.000	.171
	Roy's Largest Root	.176	2.118[a]	1.000	12.000	.171
attitude * Perspective	Pillai's Trace	.004	.043[a]	1.000	12.000	.839
	Wilks' Lambda	.996	.043[a]	1.000	12.000	.839
	Hotelling's Trace	.004	.043[a]	1.000	12.000	.839
	Roy's Largest Root	.004	.043[a]	1.000	12.000	.839

a. Exact statistic

b. Design: Intercept + Perspective

Within Subjects Design: attitude

Tests of Between-Subjects Effects

Measure:attitudebefore_attitudeafter

Transformed Variable:Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	275.048	1	275.048	71.752	.000
Perspective	3.048	1	3.048	.795	.390
Error	46.000	12	3.833		

F=2(Biology and Plants Sciences)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.910[a]	.828	.747	.72002

a. Predictors: (Constant), 11. If GM food products are available I can easily choose one based on sustainability, 1. The GM food products are beneficial for human health, 7. My social environment would be more supportive if I buy GM food for my health, 8. My social environment would be more supportive if I buy GM food for sustainable development,

5. The GM food products involve risk for sustainability, 2. The genetic engineering is beneficial for sustainable development, 10. If GM food products are available I can easily choose one for my health, 4. The GM food products involve risk for human health

Coefficientsa

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.436	1.535		-.284	.780
	1. The GM food products are beneficial for human health	.427	.186	.396	2.300	.034
	2. The genetic engineering is beneficial for sustainable development	.214	.153	.229	1.403	.179
	4. The GM food products involve risk for human health	-.029	.198	-.029	-.146	.885
	5. The GM food products involve risk for sustainability	-.097	.153	-.114	-.637	.533
	7. My social environment would be more supportive if I buy GM food for my health	.219	.135	.236	1.621	.123
	8. My social environment would be more supportive if I buy GM food for sustainable development	.071	.116	.074	.612	.549
	10. If GM food products are available I can easily choose one for my health	.076	.177	.081	.429	.673
	11. If GM food	.195	.192	.190	1.015	.324

	products are available I can easily choose one based on sustainability					

a. Dependent Variable: attitudeafter

F=1 (Society and Economics)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.851[a]	.725	.602	.85847

a. Predictors: (Constant), 11. If GM food products are available I can easily choose one based on sustainability, 4. The GM food products involve risk for human health, 7. My social environment would be more supportive if I buy GM food for my health, 1. The GM food products are beneficial for human health, 5. The GM food products involve risk for sustainability, 2. The genetic engineering is beneficial for sustainable development, 8. My social environment would be more supportive if I buy GM food for sustainable development, 10. If GM food products are available I can easily choose one for my health

Coefficientsa

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.582	1.139		2.267	.036
	1. The GM food products are beneficial for human health	.290	.159	.336	1.820	.085
	2. The genetic engineering is beneficial for sustainable development	.106	.146	.142	.725	.478
	4. The GM food products involve risk for human health	-.183	.151	-.195	-1.212	.241
	5. The GM food products involve risk for sustainability	-.188	.155	-.241	-1.211	.241

	7. My social environment would be more supportive if I buy GM food for my health	.195	.239	.193	.816	.425
	8. My social environment would be more supportive if I buy GM food for sustainable development	.055	.248	.061	.223	.826
	10. If GM food products are available I can easily choose one for my health	.288	.250	.365	1.150	.265
	11. If GM food products are available I can easily choose one based on sustainability	-.309	.258	-.380	-1.200	.246

a. Dependent Variable: attitudeafter

F=3 (Technology and Nutrition)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.926[a]	.858	.811	.79553

a. Predictors: (Constant), 11. If GM food products are available I can easily choose one based on sustainability, 5. The GM food products involve risk for sustainability, 7. My social environment would be more supportive if I buy GM food for my health, 4. The GM food products involve risk for human health, 8. My social environment would be more supportive if I buy GM food for sustainable development, 1. The GM food products are beneficial for human health, 2. The genetic engineering is beneficial for sustainable development, 10. If GM food products are available I can easily choose one for my health

Coefficientsa

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.540	1.229		.440	.664
	1. The GM food products are beneficial for human health	.640	.114	.611	5.603	.000
	2. The genetic engineering is beneficial for sustainable development	.234	.134	.240	1.744	.094
	4. The GM food products involve risk for human health	-.327	.113	-.274	-2.887	.008
	5. The GM food products involve risk for sustainability	.095	.128	.098	.742	.465
	7. My social environment would be more supportive if I buy GM food for my health	.014	.128	.010	.107	.916
	8. My social environment would be more supportive if I buy GM food for sustainable development	.196	.139	.137	1.405	.173
	10. If GM food products are available I can easily choose one for my health	-.142	.237	-.133	-.600	.554
	11. If GM food products are available I can easily choose one based on sustainability	.172	.207	.161	.833	.413

a. Dependent Variable: attitudeafter

F=4 (Environment and Landscape)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.914[a]	.835	.571	1.01908

a. Predictors: (Constant), 11. If GM food products are available I can easily choose one based on sustainability, 4. The GM food products involve risk for human health, 7. My social environment would be more supportive if I buy GM food for my health, 2. The genetic engineering is beneficial for sustainable development, 10. If GM food products are available I can easily choose one for my health, 5. The GM food products involve risk for sustainability, 8. My social environment would be more supportive if I buy GM food for sustainable development, 1. The GM food products are beneficial for human health

Coefficientsa

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.632	3.322		-.491	.644
	1. The GM food products are beneficial for human health	.494	.606	.421	.815	.452
	2. The genetic engineering is beneficial for sustainable development	-.008	.456	-.009	-.018	.987
	4. The GM food products involve risk for human health	.119	.325	.120	.367	.729
	5. The GM food products involve risk for sustainability	.046	.394	.053	.117	.911
	7. My social environment would be more supportive if I buy GM food for my health	.242	.672	.166	.359	.734

	8. My social environment would be more supportive if I buy GM food for sustainable development	-.210	.395	-.247	-.531	.618
	10. If GM food products are available I can easily choose one for my health	.650	.386	.685	1.685	.153
	11. If GM food products are available I can easily choose one based on sustainability	.111	.269	.118	.414	.696

a. Dependent Variable: attitudeafter

X.

Country=Greece

Between-Subjects Factors

		N
Perspective	Consumer	14
	Expert	17

Tests of Within-Subjects Effects

Measure:MEASURE_1

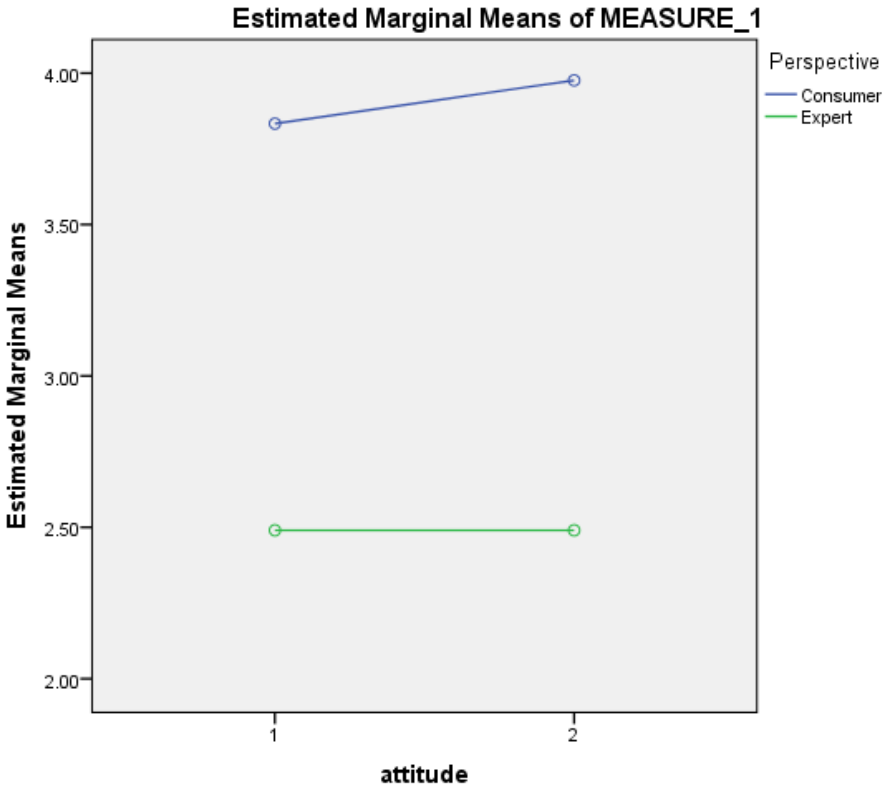
Source		Type III Sum of Squares	df	Mean Square	F	Sig.
attitude	Sphericity Assumed	.078	1	.078	.302	.587
	Greenhouse-Geisser	.078	1.000	.078	.302	.587
	Huynh-Feldt	.078	1.000	.078	.302	.587
	Lower-bound	.078	1.000	.078	.302	.587
attitude * Perspective	Sphericity Assumed	.078	1	.078	.302	.587
	Greenhouse-Geisser	.078	1.000	.078	.302	.587
	Huynh-Feldt	.078	1.000	.078	.302	.587
	Lower-bound	.078	1.000	.078	.302	.587

Tests of Between-Subjects Effects

Measure:MEASURE_1

Transformed Variable:Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	627.944	1	627.944	130.781	.000
Perspective	30.725	1	30.725	6.399	.017
Error	139.243	29	4.801		



Country=2 Netherlands

Between-Subjects Factors

		N
Perspective	Consumer	17
	Expert	16

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
attitude	Sphericity Assumed	.085	1	.085	.664	.421

	Greenhouse-Geisser	.085	1.000	.085	.664	.421
	Huynh-Feldt	.085	1.000	.085	.664	.421
	Lower-bound	.085	1.000	.085	.664	.421
attitude * Perspective	Sphericity Assumed	.017	1	.017	.136	.715
	Greenhouse-Geisser	.017	1.000	.017	.136	.715
	Huynh-Feldt	.017	1.000	.017	.136	.715
	Lower-bound	.017	1.000	.017	.136	.715

Tests of Between-Subjects Effects

Measure:MEASURE_1

Transformed Variable:Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	995.295	1	995.295	243.278	.000
Perspective	.116	1	.116	.028	.867
Error	126.827	31	4.091