# Genetically Modified Foods

## Social Theories of Risks

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# Introduction

Recently we have witnessed a global food crisis that led to the price hike of crops across the globe, sparking public protests against the high price of foods across the third world and inflation in developed countries. The most vulnerable were countries like Egypt, Vietnam and Ukraine which have lifted a temporary ban of food exports to avoid public disturbances. More food problems are looming because of possible food shortages as the world population and soil erosion have been steadily rising. The sharp increase in demand in food is also caused by "competing" biofuels and increasing consumption of meat from grain-fed animals by a growing middle-class in emerging markets (15).

Ban Ki-moon, the United Nations secretary-general, called for a 50 percent rise in global food output by 2030 (15). As a solution to a future food crisis, it is claimed to be Genetically Modified (GM) foods, which are able to produce the second "green revolution".

Farmers acquiring GM seeds bring higher yields than farmers using organic ones. GM crops promise to feed the world. Nevertheless, many people consider GM organisms as a highly risky enterprise, which poses environmental and health hazards.

By GM foods I mean predominantly crops. I will not discuss genetically altered domesticated animals like pigs, chickens, lambs, cattle, etc.

The essay consists of two sections: overview and risk analyses.

In the overview we will discuss how, which and when GM organisms have been developed. Also, it is important to describe (at least superficially) techniques of the genetic alteration. Finally, we will learn why a GM food is such a notorious risk.

The main chapter analyzes GM food risks applying social theories of risk. The most relevant works are Starr's, a psychometric theory by Slovic, risk amplification theories by Kasperson et al., Palmlund and Renn and reflexive modernisation by Beck. I will introduce these social theories and then describe how they can be applied in assessment of my specific risk. I will describe only the most relevant articles to GM foods within the reading list and mentioned theories. For example, in the part of cultural theory, I did not mentioned seminal works of Douglas and Wildavsky. Instead, I concentrated on Rayner and Cantor's article (1987), which seems to be more applicable to GM foods.

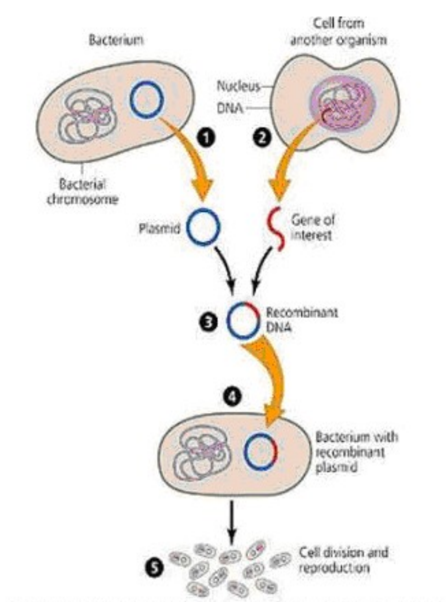
# Overview

Before we start to consider social theories of risks and their application to GM foods, we will review the background information about the history, description and debates on GM organisms.

## History

Genetics has been known since the 19th century when Austrian monk Gregor Mendel found out distinct inherited factors responsible for the way peas turned out. He formalized his findings of cross-breeding tall peas with short ones in the laws of independent segregation and gametic purity, all of which have been practiced by farmers for generations. (1)

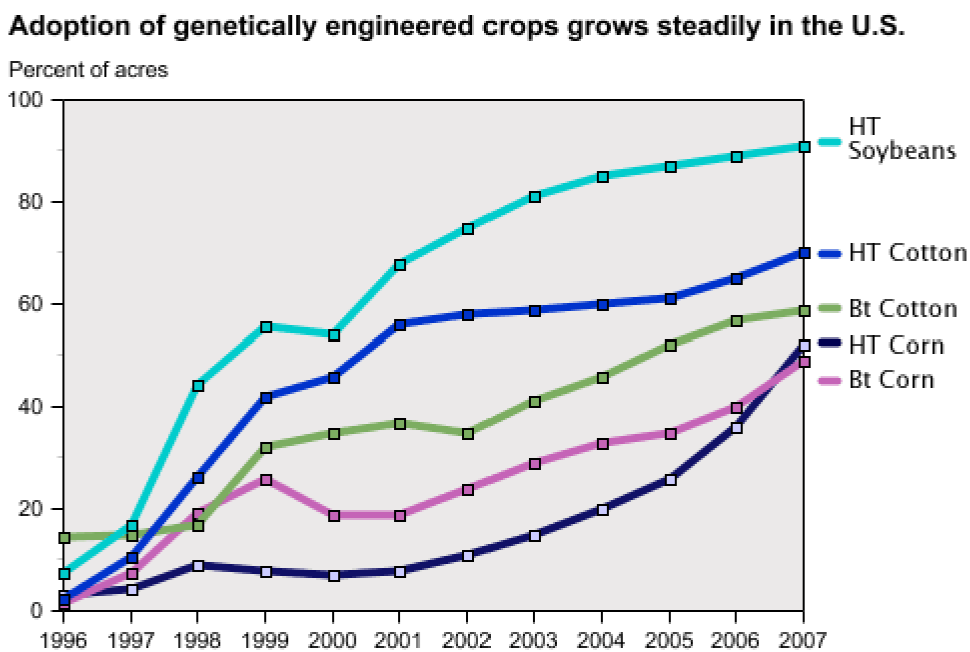
In 1953 Frances Crick and James Watson broke the genetic code, identifying the double helix structure of DNA. Nevertheless, the first GM products appeared on the market only two decades later. In the early eighties, the first transgenic plant is believed to have been produced when a gene from a bacterium was spliced into a petunia (see the picture at right hand side). Then a potato was given a disease-resistant chicken gene and an oilseed rape had a bay tree gene spliced into it, to improve its oil. (1)




Biotechnology left the laboratory for farms and shops in the nineties to become a fast growing market. The first GM food (yeast) was approved in the UK.

Two years later in 1992, the first food to be prepared from GM ingredients, a vegetarian cheese, reached British consumers. In 1995 supermarkets commenced selling GM tomato. (1)

An international trade agreement for labeling GM foods was signed in 2000 by more than 130 countries, including the US, the world's largest producer of GM foods. The accord stipulates that exporters are required to label all GM foods to enable importing countries to decide whether or not to reject GM foods. However, the policy does not stipulate the domestic food dilemma. For instance, the US government allows producers not to label GM foods intended for the domestic market. (3)

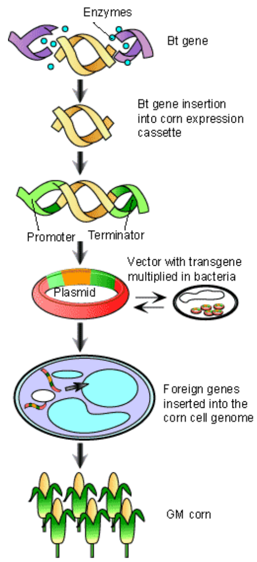



*(10)*

In 2006, a total of 252 million acres (almost a 60-fold increase compared with 1996) of transgenic crops were planted with about 60 different crops in 22 countries by 10.3 million farmers. Most of these crops were herbicide- and insect-resistant corn, cotton, canola, soybeans and alfalfa (see the upper graph). Other crops are rice with increased iron and vitamins that may alleviate chronic malnutrition in Asian countries, a sweet potato resistant to a virus that could decimate most of the African harvest, and a variety of plants able to survive weather extremes. The shares by countries that grew 97% of the global transgenic crops were the United States (53%), Argentina (17%), Brazil (11%), Canada (6%), India (4%), China (3%), Paraguay (2%) and South Africa (1%) in 2006. Although growth is expected to saturate in industrialized countries, it is growing in developing countries. However, the spread of GM foods across the globe was different. Unlike the US, Europe resists the commercial plantings. (10)

As researchers gain increasing and unprecedented access to genomic resources that are applicable to organisms beyond the scope of individual projects, the further GM product development is expected. GM optimists are looking forward to cows that are resistant to bovine spongiform encephalopathy (mad cow disease); fruit and nut trees that yield years earlier, bananas that produce human vaccines against infectious diseases such as hepatitis B; fish that mature more quickly; and plants that produce new plastics with unique properties. (3)

## Description




Genetic modification is the process of manipulating genes. Genetic engineering changes/alters, isolates and re-introduces the natural gene into cells (see the picture at the right hand side). A genetically modified food is derived in whole or part from a genetically modified organism (4). A product is called "Genetically Modified" if genes from one organism (plant species, animal or microorganism) have been relocated to the genetic material of another. The term “genetically modified” is used interchangeably with "transgenic organism," "genetically modified organism (GMO)," "genetically enhanced organism," or "living modified organism (LMO)." "Genetically modified food" is used when it is eaten in plant form (tomatoes, potatoes), processed (in tomato sauce, canola oil) or used as an additive in more complex products (cornstarch, soya lecithin). GM foods do not necessarily contain biologically active DNA, but may contain new compounds or metabolites derived from the activity of these new proteins or new proteins derived from the activity of the transgene.

Thus GM foods result from combining genes from different organisms or a recombinant DNA technology. GM products are represented by medicines and vaccines, foods and food ingredients, fibres and feeds (5).

Genetic engineering locates genes for certain characteristics, for example, desired nutrients or insect resistance (5). Unlike breeding, genetic engineering can create plants with a certain trait quickly and accurately. For instance, geneticists can isolate a gene responsible for drought tolerance and insert the gene into a plant. As a result, the new genetically modified plant will obtain drought tolerance (3). Biologists explore hundreds of different organisms to construct detailed maps along with data-analyzing technologies (5).

## Pros and Cons

A GM organism is a controversial issue generating heated debates among scientists, politicians and even the general public.

Supporters of GM foods have mentioned predominantly economic reasons such as a more "efficient" crop which is resistant to pests, herbicide, cold, disease, drought, salinity (3) and requires less fresh water and labour (15).

Excessive use of pesticides is associated with potential health hazards and harms the environment (poisoning the water supply). GM foods can help to mitigate the application of "dangerous" pesticides and decrease the cost of market access of a crop. A similar argument is applied to herbicide tolerance.

Many viruses, fungi, bacteria and plant diseases can be avoided by the introduction of genetically engineered resistance. Other threats such as frost, drought and salinity can be combated in the same way by inserting needed genes.

Also, some researchers (3) claim that GM crops are a solution to malnutrition. For example, if the world population accepts GM rice containing much vitamin A, it will prevent many cases of blindness, especially in the third world. Finally, GM foods have a potential to be widely used in new ways: pharmaceuticals (e.g., "vaccines in tomatoes") and phytoremediation (e.g., "poplar trees clean up heavy metal pollution from contaminated soil").

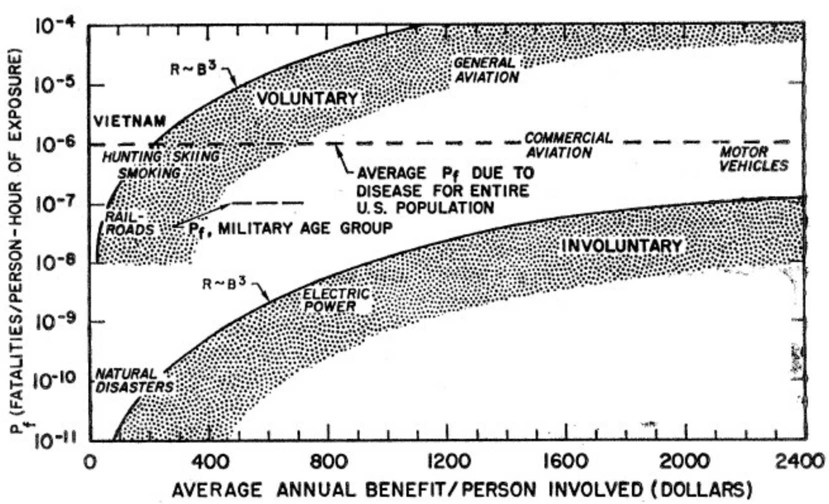
Opponents of the GM crops emphasize environmental hazards and human health risks. Environmentalists point out the threatened biodiversity (12): unintended harm to other organisms (non crop-damaging pests), reduced effectiveness of pesticides (insects' newly acquired resistance to GM crops) and gene transfer to non-target species (the threat of the transfer of the herbicide resistance genes from the crops into the weeds). GM foods might result in human health risks like allergenicity and other not-yet-known effects. It is fear even among biologists that the incorporation of genes of different species will bring new allergens (3). For example, a combination of genes of Brazil nut and that of soybeans was rejected because of the fear of instigating unexpected allergic reactions (14). Other potential problems with GM foods are access and intellectual property, ethics, labelling and wealth and risk distributions. (3, 5)

# Risk analyses

From the previous chapter, we learned that GM foods are an inherently controversial topic. We will use Psychometric, Cultural, Risk Amplification and Reflexive Modernization theories to analyze GM food risk.

## Contemporary risk discourse

“How safe is safe enough?” is the question for which Starr (1969) tried to give an answer. She adopted quantitative research to evaluate risks’ “maximum benefits at minimum costs” (Starr 1969, p.1233). Starr’s indices are quite straightforward, combining benefits and costs. On the one hand, the benefit is roughly an amount spent on different activities of an individual. On the other hand, the cost is the mortality rate of different activities. However, Starr admits that the measures might not represent benefits and costs accurately because detailed statistics introduces “inconvenient complexity” (Starr 1969, p. 1234). For example, in the case of GM foods, it is possible to evaluate quantitatively benefits but difficult to estimate risks that are still not clearly understood.

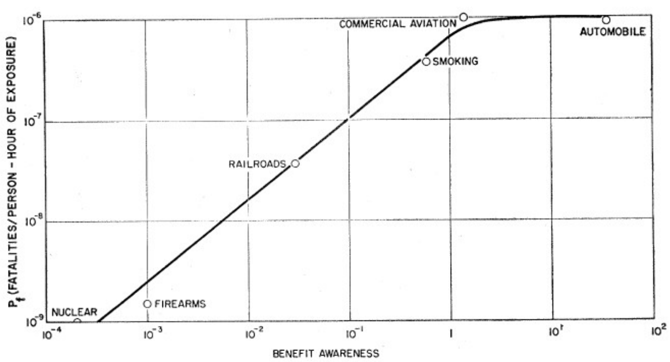



Starr (1969) elaborates on risks, distinguishing the two types coming from voluntary and involuntary activities (see the graph at the right hand side). Unlike voluntary activities (e.g., traffic accidents), involuntary activities (e.g., war) are hardly managed by an individual herself. Involuntary activities are determined by an organization such as the government, councils, “opinion-makers”, etc.

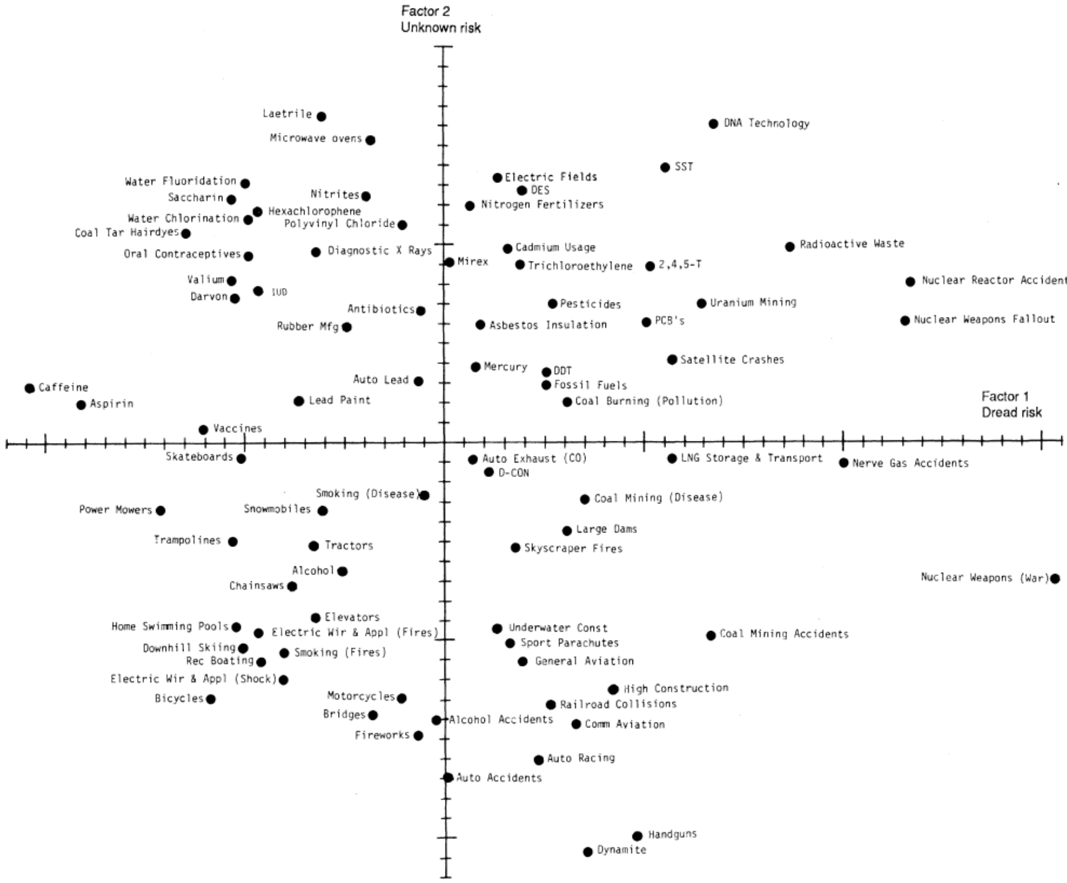
Starr concluded "that the public is willing to accept voluntary risks roughly 1000 times greater than involuntary risks" (Starr 1969 p. 1237).

But what kind of risks are GM foods? It is true that GM food producers in many countries have legal obligations to label foods giving information about GM contents. Hence, consumers might be aware about the GM products. In that case consumers can decide whether or not to buy GM foods, taking risks voluntarily. However, the label is not required everywhere (e.g., the USA). So Americans are hardly able to avoid eating GM foods. In addition, even in the UK where the label is obligatory, the British might consume involuntary GM foods because of lack of knowledge about the genetic engineering. So consumption of GM foods in many cases is an involuntary activity instigating distrust towards GM products.

However, consumers might be willing to take even an involuntary risk if they perceive it as something that brings many benefits (Starr 1969). She noted that acceptability of individual and social risks are determined by real or imagined "power of benefits" and "public awareness of the benefits of an activity" (Starr 1969, p. 1237), respectively. From the graph at the right hand side, we can see the trade-off. People are reluctant to abandon "involuntary" commercial aviation because of its benefits. A similar case might be the consumption of GM foods that may be promoted by, for example, a lower price or longer shelf life compared with organic foodstuffs.




An interesting approach was devised by Paul Slovic (1987) on risk perception. He used a matrix (see at the next page) to classify risks using two factors: familiarity with risks (e.g., unknown risks) and magnitude of potential consequences (e.g., dread risks). His main point is that we do not perceive a certain risk, using a single scale (e.g., mortality rate).




"The psychometric paradigm" implies that GM foods are likely to be classified as unknown risks, which are characterized by "effect delayed", "new risk", "risks unknown to science", "being not observable" and "being unknown to those exposed". The more unknown a risk, the more dangerous it is perceived (Slovic 1987). That explains why laypersons are sensitive to a GM food as they tend to "exaggerate" its potential consequences.

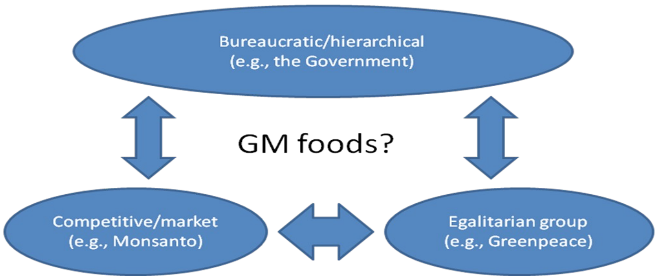
One would wonder to what extents GM foods are dreaded risks. Biologists would argue that GM crops are safe because no evidence of health hazards caused by them has been recorded. However, skeptics would respond that the fact that there is no proof of harm done by GM foods does not mean that the food is safe because of the "delayed effect" (Slovic 1987). In addition, GM foods might trigger a whole bunch of "new risks" (Slovic 1987). For example, Greenpeace urges that "*GM organisms are also serious threat to biodiversity. Designed to grow faster and stronger, they out-compete native varieties and, again, cross-pollination (which its supporters insisted was impossible) could result in their genetic material spreading far and wide, potentially altering entire species. Once they make it out into the wild, there is no way to recall them and we will have to live with the consequences.*" (12)

It seems that GM organisms are closer to a dreaded risk than otherwise thought as they have contained so far dormant but still global, irreversible and harmful capabilities. If so, potential consequences of GM foods can be characterized as "uncontrollable", "global catastrophic", "fatal", "not equitable", "high risk to future generations", "not easily reduced" and "risk increasing" (Slovic 1987).

What Slovic (1987) tried to prove is that "riskness means more to people than expected number of fatalities" (Slovic 1987, p. 285). So we cannot measure the "riskness" of GM foods using a single scale such as mortality or poisoning rates caused by them.

Psychometric theories encourage us to estimate "actual" GM food risks accurately (adopting statistical testing and modeling), assuming that risk is an objective hazard. However, a psychometric model doesn't include cultural or symbolic meanings of GM food risks. By doing that the theory over-simplifies the phenomenon (Lupton 1999). In the next section we will consider the cultural theory, which enriches our understanding of the risk by embracing political and cultural frameworks.

## Cultural theory




Cultural theory (Rayner and Cantor 1987) changed the question on social risk from Starr's "how safe is safe enough?" to "how fair is safe enough?", implying that risk is politicized. Rayner and Cantor encourage understanding social risks as a "multifaceted phenomenon" (Rayner and Cantor, 1987, p. 3), which is difficult to quantify. They are skeptical about the risks as something that is measurable in terms of probability, magnitude and time. Their approach to societal risk management (1987 p. 3) is based on reviewing a conflict over a social risk, rather than calculating probability of the risk. By conflict they understand a disagreement in interpretations of risks between social groups such as market, egalitarian and hierarchical societies (see the upper picture and table 1). Let us study these three social groups that have their own attitudes and reasons toward GM foods.

**Table I.** Summary of Preferred Principles of Consent, Liability, and Trust According to Type of Constituency

| A. Competitive/market | B. Atomized individual | C. Bureaucratic/hierarchial | D. Egalitarian group |
|---|---|---|---|
| Liability: loss-spreading | No special principles elaborated for liability or consent | Liability: redistributive | Liability: strict-fault system |
| Consent: implicit/revealed preference | | Consent: hypothetical | Consent: explicit/expressed preference |
| Trust: successful individuals (Red Adair, Lee Iaccoca) | Trust: nonhuman forces (nature, luck, spirits) | Trust: long-established formal organizations (AMA, USCG, etc.) | Trust: participatory information institutions (town meetings, affinity groups, etc.) |
| Justification: consequentialist | No consistent justification | Justification: contractualism | Justification: rights-based |
| Goal: market success | Goal: survival | Goal: system maintenance | Goal: new social order |

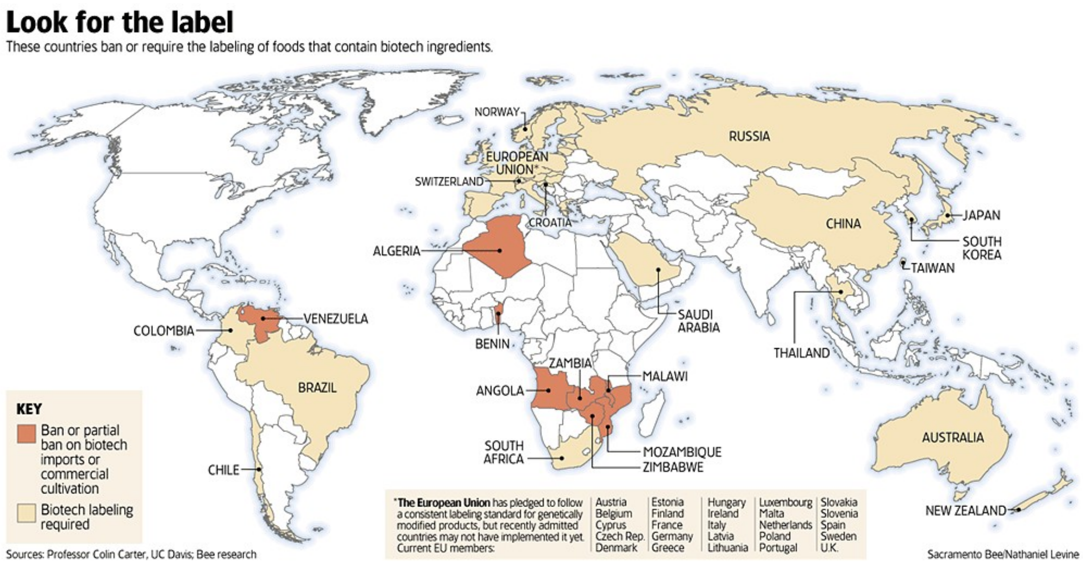
A ***Market society*** is associated with companies which incline towards "a pragmatic consequentialism" (Rayner and Cantor 1987, p 6) to achieve a market success. A competitive group sees risks precisely/narrowly as technological or economic in origin (Rayner and Cantor 1987, p. 5). In our case, Monsanto, the biggest producers GM seeds, is a good example of a market culture. The giant agricultural corporation claims to promote more "efficient use of natural resources" (less fresh water, herbicides and pesticides) through "more sustainable agriculture" (6). The company sells GM seeds, which are intended increase yields (15) leading to "market success", the goal of a market society.

An ***Egalitarian group*** is often characterized by NGOs like Greenpeace who favors "a right-based approach" to reach "new social order" (Rayner and Cantor 1987, p. 6). An Egalitarian society seeks a certain set of values, "rather than the market or distributive approaches to losses favored by entrepreneurs or bureaucrats" (Rayner and Cantor 1987, p 6). Greenpeace argues against GM foods, which are considered by the environmental NGO as a threat to biodiversity and health (7).

Finally, ***Hierarchical culture*** aims "system maintenance" through "the contractualist principles of justification" (Rayner and Cantor 1987, p 6). Routines for risk management are ruled bureaucratic organizations. A hierarchical society might be represented by governments that interact with the other two stakeholders through regulations such as labeling and licensing of GM foods.

The Canadian government, for example, is concerned with "labeling issue" (2). The uncertainty is coming from the fact that Canada tries to solve differences between EU and US cases.

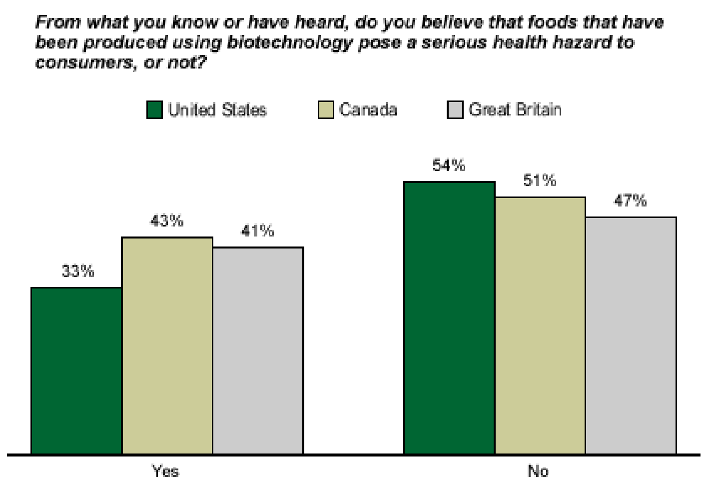
Unlike the EU, the US does not require the labeling of GM foods in order not to "stigmatize" them (Ellen and Bone 2008), allowing millions of Americans "blindly" consume GM foods. We can see from the graph at the next page that biotech ingredients either have been banned from importation or have been required labeling by many countries. The absence of a common GM food policy among governments is explained by bureaucratic values, which are characterized by respect to consent and "the institutional redistribution of liabilities" (Rayner and Cantor 1987, p. 8) between market and egalitarian cultures, which have different relative powers across the globe.



(11)

Europeans countries adopt the "precautionary principle" (Levidow 2000), which basically requires from governments "action on environmental issues (and by inference other forms of risk) should be taken even though there is scientific uncertainty about them" (Giddens 1999, p.9). European governments have "increased the burden of evidence for demonstrating safety, have broadened the practical definition of the 'adverse effect' which must be prevented, and have devised marketstage precautions for such effects" (Levidow 2000, p. 189). So it is unsurprising that it is easier to get license to harvest GM crops in the encouraging US than that in the preventive EU.

American enthusiasm and European precaution towards GM foods might arise because of different culture as there is hardly any difference between European and American competences in genetic engineering (Rayner 2003). From the graph at the right hand side, we can see that British and Americans have different attitudes toward "foods that have been produced using biotechnology" (13), which might be culturally determined.

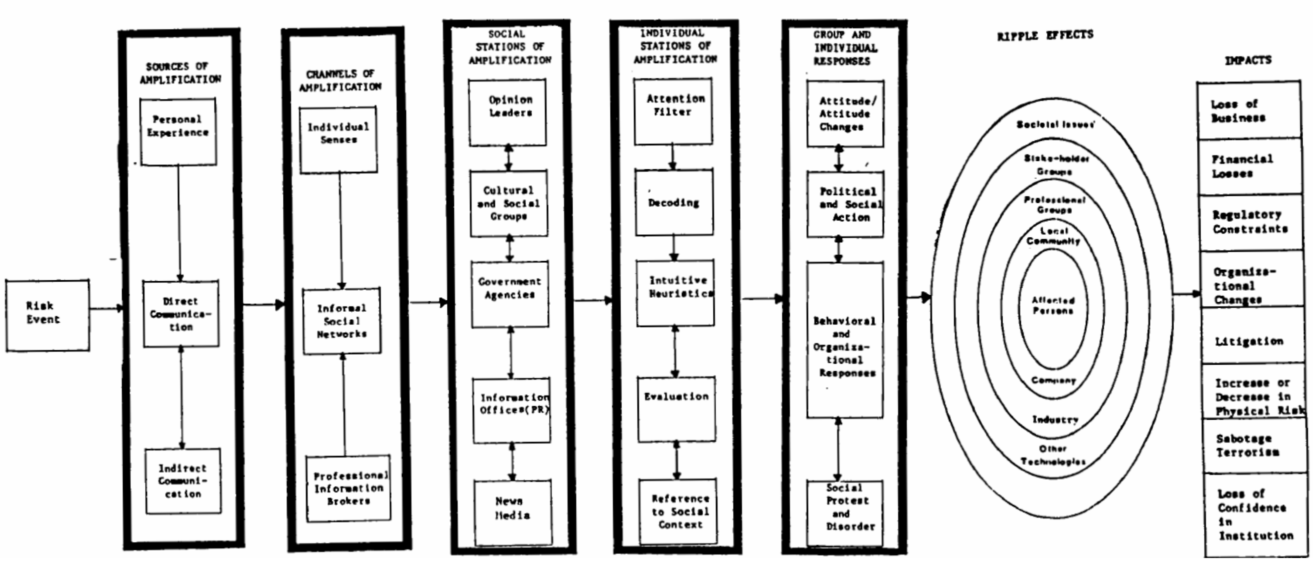



There is a strong contrast between Americans and Europeans in the way that they perceive farms. Unlike Americans who see pragmatically farms as "huge food factories", Europeans historically recognize countryside as "culture landscape". Because of an idealistic attitude, Europeans reject a GM innovation, which undermines "the lived-in environment, thus a potential threat to both nature and culture" (Rayner 2003, p. 168-169).

The cultural theory helps us understand how GM risks are interpreted, but it does not explain the perception of GM risks over time. The gap in explanation of dynamics of GM risk can be filled by the risk amplification theory.

## Risk amplification

It is important to observe how risks develop and how they shift from unknown to substantial ones with strong public concerns. A conceptual framework of the social amplification of risk (Kasperson et al. 1988) might explain how and why, for example, GM foods are perceived differently in time. Using risk analysis, Kasperson et al. (1988 p.177) try to explain "why some relatively minor risks or risk events, as assessed by technical experts, often elicit strong public concerns and result in substantial impacts upon society and economy" (Kasperson et al. 1988, p. 177). There are two main phases of the social amplification: "transfer of information about the risk" and "response mechanisms of society" (Kasperson et al. 1988, p. 177). A more detailed conceptual framework of social amplification of risk consists of the following stages: risk event, sources of amplification, channels of amplification, social stations of amplification, individual stations of amplification, group and individual responses, ripple effects and impacts (see the graph below).



Let us imagine risks with GM foods in terms of the social amplification and potential impacts on, for example, Monsanto, the biggest producer of GM feeds.

We can make up a story to demonstrate the social amplification. Ms Smith has eaten bread made from GM wheat (risk event). She felt bad afterwards. Seemingly, she was poisoned by the bread (sources of amplification). She complained to her family and friends (channels of amplification). Her friends promulgated “the news” via Facebook to hundreds of friends. One of the friend’s friends is a journalist who got interested in the first poisoning by GM foods. The journalist published a dramatic story that received a lot of comments (social stations of amplification). The editor involved experts to discuss the problems in more detail (individual stations of amplification). The story was published in great volume, heavily dramatized and from a reputable journal, all of which lead to panic among the readers (group and individual responses). The deep sense of danger was continued by other news media that expand the story from the poisoning of Ms Smith to poisoning by GM foods. Since people’s estimates of principal causes of the poisoning are related to the huge amount of dramatic media coverage they receive, people hugely overestimate (Kasperson et al. 1988) and generalize consequences of GM foods (ripple effects). The ripple effect spread from an individual poisoning by the GM food to the whole GM food industry. The effect resulted in loss of customers’ trust in safety GM foods. Many people stopped consuming. With the plummeting demand, farmers no longer require GM seeds, provoking Monsanto’s demise (impacts). Thus, the hazards are perceived through not only technical but also social, psychological, cultural and institutional processes, which may amplify or attenuate responses to the risk (Kasperson et al. 1988).

Frewer et al. (2002) show that perceptions of risks associated with GM food increased during the highest levels of reporting about GM foods. But risk perceptions were subsequently decreased as reporting levels diminished. Unlike perceptions of risks, perceptions of benefits stayed depressed a year after the volume of reporting had declined (Frewer et al. 2002). Acceptance of GM foods is driven by benefits to customers (e.g., cheaper foodstuffs) rather than that of the industry (e.g., higher yield). Demographics still matter. Old women with little education perceive risks with GM foods the most (Frewer et al. 2002). Scholars expect the effects of risk amplification to be greater for a relatively novel hazard not yet presented to the public in a crisis context (e.g., genetically modified foods) compared to more established hazards (e.g., nuclear energy), where people have been exposed to high levels of public debates in the past.

Renn (1992, p.181) used a social arena as a metaphor to illustrate the process of policy formulation and enforcement at the meso-level of society. He lists several constitutive elements of the arena, such as actors, rule enforcer and issue amplifiers, including stakeholders, social groups, the general public and political institutions. Each element of the arena interacts with each other in special ways.

Actors mobilize social resources to be successful in a social arena. The social resources are money, power, social influence, value commitment and evidence (Renn 1992). These resources are used to gain the support of the general public, to lobby the arena rules and to beat the other actors. Each resource represents a certain dominant sector, generalized medium and motivator. Using the framework of the social arena and social resources, let us evaluate relative strengths of the main actors of GM food debates, such as market, hierarchical and egalitarian societies (see the table below).

| **Social resources: sectors, media, and motivators** | | | | **Mobilization potential of the risk with GM food by actors** | | |
|---|---|---|---|---|---|---|
| **Resources** | **Dominant Sector** | **Generalized medium** | **Motivator** | **Market society(e,g., Monsanto and farmers)** | **Hierarchial society (e.g., government agencies)** | **Egalitarian society (e.g., Greenpeace)** |
| **Money** | Economy | Transfer of capital | Economics Incentives | High | Medium | Low |
| **Power** | Politics | Force | Punishment | Low | High | Low |
| | | Authority | Compliance | Low | High | Low |
| **Social influence** | Social systems | Reputation | Trust | Low | Medium | High |
| | | Reward | Prestige | Low | Medium | High |
| **Value commitment** | Culture | Persuasion | Solidarity | Low | Medium | High |
| | | Meaning | Cultural Unity | Low | Medium | High |
| **Evidence** | Sciences | Methodology | Expected Impacts | High | Low | Medium |
| | | Rhetoric | | | | |

Entrepreneurs, bureaucrats and NGOs have their own strengths and weaknesses in terms of social resources. Monsanto is strong in “money” and “evidence”. In contrast, the government is good at “power”. Finally, Greenpeace competes with the other two actors, engaging “social influence” and “value commitment”. Thus, each actor can influence public interpretations of risks with GM foods in a certain way.

Palmlund draws an analogy between a classical drama and political responses to risk events, making us “understand decisions about acceptability of risk as socially chosen agreements with some ingredients from science but mostly as reflections of the prevailing patterns of social power and dominance” (Palmlund 1992, p. 199). The metaphor brings a set of concepts – audience, roles and agents, the shape of the dramatic process, the characteristics of the plot and the choice of genre.

The theatrical key jargons are adopted to shed light on risk evaluation. Let us see how we can analyze the GM food risks using the analogy of classical drama and its vocabulary by answering the following questions:

- Who is the audience? What is the level of acceptable risk of GM foods? What kind of the audience is it (active or passive)?

- What are the roles and who are the agents? What are the generic roles associated with GM food risks (risk bearers, risk bearers' advocate, risk generators, risk researchers, risk arbiters and risk informers)?
- How can we characterize the dramatic process? What is the phase (exposition, complication, crisis and denouement) the GM food drama is experiencing?
- What's the plot? How much disorder in the plot? What conflicts does the plot involve (health, ecological and/or other safety hazards coming from GM organisms)?
- What is the dramatic genre (tragedy, melodrama)? To what extent are GM food consumers encouraged to participate beyond prescribed booing of the villain (e.g., Monsanto) and applauding of the hero (e.g., Greenpeace)?

Therefore, the studies on risk amplification explain how and why risk perception develops over time. But the rationalization is based on the meso level. On the contrary, the theory of reflexive modernization broadens our understanding of GM food risks to macro level and at the same time focuses on contemporary risks like GM organisms.

## Reflexive modernization

Reflexive modernization "implies coming to terms with the limits and contradictions of the modern order" (Giddens 1999, p. 6). Reflexive modernization means that we no longer exclusively tame nature. Instead, we are more obsessed with political and economic management of risks. Beck (1986) illustrates a shift from wealth to risk distributions. The shift has two explanations: 1) Welfare is achievable and protected; 2) Modern times have brought many unknown risks. The question "how to be rich?" is more and more substituted with the question "who is a risk-bearer?" Similarly, nowadays we are arguing whether or not we should widely accept GM foods rather than how to produce efficient GM organisms.

Ulrich Beck (1986) made an example of the fallacy "category error", which seems to be relevant to our case of GM foods.

*"What is particularly aggravating is that investigations which start from individual pollutants can never determine the concentration of pollutants in people. What may seem 'insignificant' for a single product, is perhaps extremely significant when collected in the 'consumer reservoirs' which people have become in the advanced stage of total marketing".* (Beck 1986, p. 26)

Thus we cannot make a judgment about health safety of GM foods from individual cases. GM food is unlikely to kill a consumer, but the food might trigger worsening health of the whole population, which has to rely more on medications to nullify the effect.

Beck (1986) has stated that unknown and unintended consequences are dominant. This idea is similar to that of Starr (1987) and Slovic (1987). Also, Beck's (1986) "implicit ethics" and "latent side effects" resemble Palmlund's "breach" (1992) in the dramatic process. "Implicit ethics" is the case when "the spreading talk of catastrophe" (Beck 1986, p.28) is avoided. "Latent Side Effects" is a legitimation (recognition) of new risks "whose non-existence is implied until cancelled" (Beck 1986, p.34). In the case of GM foods, we might witness how risks with GM organisms are denied by the GM producers and many state officials partly because of the "implicit ethics" and "chains of causality" (i.e., complexity) of GM food debates, which lead to a diversity of interpretations (Beck 1986, p.32).


There is a link between a social class and risks, but only inversely: wealth accumulates at the top and risks stays at the bottom (Beck 1986). It means that the poor will eat GM foods, but the rich will to continue to afford organic foods. The cartoon shows vividly how risk is intrinsically linked to a people's class as a destiny.

By 'organized irresponsibility' Beck (1986) means a case when risks for which people and organizations are certainly 'responsible' in a sense that they are its authors but where no one is held specifically accountable. For example, what if GM crops triggered 'superweeds' which are immutable to herbicides, who will be held responsible? Monsanto, the producer of GM seeds? The local farmer who 'allows' the breeding of superweeds? Or the government licensing GM seeds? Also we would ask other questions like "*Who is to determine how harmful products are, what side effects are produced by them, and what level of risk is acceptable? How can 'sufficient proof' be determined in a world full of contested knowledge claims and probabilities? If there are damages to be paid, or reparations made, who is to decide about compensation and appropriate forms for future control?*" (Giddens 1999, p. 8)

Giddens (1999) made a distinction between two types of risk such as external risk and manufactured risk. External risk "is risk of events that may strike individuals unexpectedly (from the outside, as it were) but that happen regularly enough and often enough in a whole population of people to be broadly predictable, and so insurable" (Giddens 1999, p.4). Manufactured risk is a new risk "for which history provides us very little previous experience" (Giddens 1999, p4). The share of manufactured risks increases (Giddens 1999). Eating GM foods is taking manufactured risks as we don't know much about them and have no idea how to calculate them accurately in terms of probability tables. If so, then GM food risks as manufactured ones brings irresponsibility as the links between responsibility, decisions and risk change (Giddens 1999, p. 8).

Policy makers balance between accusations of scaremongering, on the one hand, and of cover-ups, on the other. The problem is that manufactured risks are by definition little known and because of that it is hard to say beforehand whether or not we are actually scaremongering. There are a lot of discussions about GM organisms, but we cannot call the debate scaremongering, because we still have a short history of a GM food consumption to judge confidently (e.g., using statistics) (Giddens 1999, p.5).

The reflexive modernization is a useful approach to understand modern risks at the macro level. However, some scholars accuse Beck and Giddens for “making broad and loose speculations” (Lupton 1999, p.82).

# Conclusion

In the essay I reviewed GM foods, their history, portrayal and controversies. More importantly, I presented the relevant social theories and illustrated their applications in analyzing my specific risk, i.e. GM foods.

I have used several theories in my work. Each theory provides some unique insights into the problem. Psychometric theories bring approaches in measuring GM food risks. The cultural theory by Rayner and Cantor (1987) shifted to multifaceted risk assessment by including a social struggle over the meaning of GM foods. Risk amplification shows a genesis of GM food risks over the time. Finally, the reflexive modernization helps us to recognize GM food risks as a product of a contemporary risk society.

However, I think that psychometric and cultural theories are the “best” in terms of how much they explain. Unlike the psychometric theory, which aims to objectively calculate risks, the cultural theory considers a risk as a subjective (interpretive) phenomenon that is perceived differently by different social groups. The psychometric theory evaluates risks quantitatively bringing accuracy. The cultural theory explains qualitatively how a social risk is generated, developed and negotiated between social groups. I believe that a combination of the quantitative (i.e., the psychometric theory) and the qualitative (i.e., the cultural theory) analytical frameworks maximizes our understanding of the GM food risk.

Also, different methods adopted by psychometric and cultural theories highly enrich our understanding of GM food risks. It would be a limited view of the risks either as a probability of an objective fact or as an interpretation by social groups. I do not think these approaches are mutually exclusive. Instead, they mutually enhance our understanding of the GM organism risk as two sides of the same coin.

# Literature

Beck, U. (1986) "On the logic of wealth distribution and risk distribution, in Risk Society, Towards a New Modernity", Sage, London Ch 1 pp 20-50

Flewer, Miles and Marsh (2002) "The media and genetically modified foods: evidence in support of social amplification of risk" Risk Analysis, Vol.22, No. 4, 2002

Giddens, A. (1999) "Risk and Responsibility" Modern Law Review 62(1): 1-10

Ellen and Bone (2008) "Stained by the Label? Stigma and the Case of Genetically Modified Foods" American Marketing Association

Kasperson, R., O. Renn, P. Slovic, H. Brown, J. Emel, R. Goble, J. Kasperson, S. Ratcick (1988) "The Social Amplification of Risk: A Conceptual Framework", Risk Analysis 8(2):177-87, reprinted in S.L. Cutter, Environmental Risks and Hazards, Prentice-Hall, Englewood Cliffs, 1994

Levidow, Carr and Wield (2000) "Genetically modified crops in the European Union: regulatory conflicts as precautionary opportunities" Journal of Risk Research; Vol. 3 Issue 3, p189-208

Lupton, D. (1999) "Risk" Routledge, London

Palmlund, I. (1992) "Social Drama and Risk Evaluation", in S. Krimsky & D. Golding (eds) Social Theories of Risk, Praeger, London, pp 197-214

Rayner, S. (2003) "Democracy in the Age of Assessment: Reflections on the Roles of Expertise and Democracy in Public-Sector Decision Making" Science and Public Policy, 30(3):163-170

Rayner, S. & R. Cantor (1987) "How Fair is Safe Enough? The Cultural Approach to Technology Choice", in Risk Analysis: An International Journal, 7(1) pp. 3-9

Renn, O. (1992) "The Social Arena Concept in Risk Debates", in S. Krimsky & D. Golding (eds) Social Theories of Risk, Praeger, London, pp179-196

Slovic, P. (1987) "Perception of Risk", Science 236:280-85, reprinted in S.L. Cutter, Environmental Risks and Hazards, Prentice-Hall, Englewood Cliffs, 1994 and also in in R. Loftedt & L. Frewer (eds) Risk in Modern Society, Earthscan, London, 1998

Starr, C. (1969) "Social benefit versus technological risk", Science 165:1232-38, reprinted in S.L. Cutter, Environmental Risks and Hazards, Prentice-Hall, Englewood Cliffs, 1994

## Source


1. http://www.global-reality.com/biotech/articles/othernews024.htm
2. http://dsp-psd.pwgsc.gc.ca/Collection-R/LoPBdP/BP/prb9912-e.htm
3. http://www.csa.com/discoveryguides/gmfood/overview.php
4. http://vegetablegardens.suite101.com/article.cfm/genetic_engineering_overview
5. http://www.ornl.gov/sci/techresources/Human_Genome/elsi/gmfood.shtml
6. http://www.monsanto.com/default.asp
7. http://www.greenpeace.org.uk/gm
8. http://www.scq.ubc.ca/wp-content/uploads/2006/07/genetransferring.gif
9. http://www.worldproutassembly.org/GM-foods.jpg
10. http://journeytocrunchville.files.wordpress.com/2008/05/genengcrops.gif
11. http://www.sacbee.com/static/live/news/projects/biotech/imgs/grfx_c5_2.gif
12. http://www.greenpeace.org.uk/gm/problems
13. http://www.gallup.com/poll/19261/Britons-Show-Distaste-Biotech-Foods.aspx
14. http://www.celsias.com/2008/05/14/genetically-modified-foods-unsafe-evidence-that-links-gm-foods-to-allergic-responses-mounts/
15. Gapper "Bickering will never feed the world" Financial Times June 12 2008