

GENETICALLY MODIFIED FOOD - CONSUMER PROTECTION AND TRADE REGULATIONS

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Abstract: *Technology of genetic engineering represents powerful tool in biotechnology that opened new modern era of genetic modification of living organisms which could be used in food production. Introduction of food that contain genetically modified organisms on market polarized human society. From the early beginning production and trade of genetically modified food has been followed with some ethical, safety and law controversies. Public attitudes towards genetically modified food is largely a consequence of the information placed by various social, political, economic or religious groups. On the other hand, public attitude dictate trade regulations and safety precautions. Here we discussed, consumer protection and trade regulations of genetically modified food in modern era of massive globalization with specific importance on the potential impact on Serbian agriculture and society in global.*

Keywords: *genetically modified food, health safety, law regulation*

INTRODUCTION

The era of genetic modification of organisms in order to create living organisms with desired features begin in 1970's when technology of recombinant DNA has been introduced. Genetic modification was first applies on simple prokaryotic organisms like bacteria and few years later in plants and animals. Technology of recombinant DNA, or molecular cloning, or genetic engineering, represent group of techniques that allow insertion of DNA sequences (i.e. genes of specific organism) into other self replicated DNAs, so called cloning vectors [1]. Insertion of cloning vector in to certain cell leads to creation of hybrid cell that is easy to multiply. Every single new multiplied cell represent clone with the same hybrid molecule of DNA that originate from two different organisms. The term GMO (genetically modified organism) represent any living organism with genetic material that is altered using techniques of genetic engineering. At first it was demonstrated that it is possible to express genes of one prokaryotic bacterial organism in different bacteria. Later had been shown that it is possible to use techniques of recombinant engineering to express even eukaryotic genes in prokaryotic organisms, like bacteria.

Common primary structure of DNA in all living organisms made possible to express gene or DNA sequence of any organism in any other living organism. In order to express gene from eukaryotic organism in bacterial prokaryotic organism appropriate regulating sequence should be used. This means that hybrid DNA sequence should be regulated by bacterial promoter in order to be expressed in bacterial cell [2]. Bacteria are organisms with high rate of proliferation which means that one could get a huge number of expressed genes in very short period. Besides, bacteria live in easily accessible and cheap medium and could be cultivated in in reactors. Therefore, bacteria could be used as cheap source of proteins that have application in medicine, pharmacy, science or food production.

Conventionally cultivated plants today were brought into the state that their survival depends entirely on man, especially in terms of the necessary addition of fertilizers and plant protection products. Overcoming the dissimilarities between dissimilar types of recombinant DNA techniques has allowed the creation of plants with combined features of unrelated plant species and even the production of plants with characteristics derived from the animal genome. Such scientific and technological accomplishments dramatically transformed a vision and strategy of food production and plant protection.

Genetically modified foods (GM foods), also known as genetically engineered foods or bioengineered foods, are foods made from organisms (plants and animals) that have had changes introduced into their DNA using the methods of genetic engineering. Main requisite for fruitful genetic modification of plants is that transformed cells can

develop into a complete fertile plant. Probably the most popular products of biotechnology companies for agricultural producers are genetically engineered plants resistant to herbicides.

Nowadays is apparent that huge food production companies that were based on conventional agricultural methods and appropriate technologies like fertilizers, pesticides, hormones, etc., are the greatest opponents of genetically modified food. Quite opposite, companies that have established commercial technology for producing genetically modified food are also its greatest advocates. Consumers are therefore confused. Should they buy only food produced in conventional manner knowing that that kind of food often has been treated with chemicals, or they should trust also genetically modified food that one day in the future might become “new kind of conventional food”. Organic food might be appropriate alternative but it should be considered that its cost is 2-3 times more than conventional and genetically modified food.

Public attitudes towards genetically modified food mirrors the level of confidence of consumers to the government agencies responsible for food safety. In example the residents of the United States demonstrates great degree of assurance in the security of the US Agency for Food and Drug Administration (US Food and Drug Administration). On the other hand, European consumers are traditionally distrustful of their governments and government agencies. Results of research conducted by the Pew Research Center in 2003, revealed lowest public resistance to GM food in the United States and Canada (55% and 63%), and the largest public resistance in Germany and France where even 81-89% of the population opposes to introduction of genetically modified organisms into the food chain [3]. Research study made in Sweden showed that males, younger respondents and those with higher level of education were more positive towards GM foods than were females, older respondents and those with lower level of education. A majority of the consumers had moral and ethical doubts about eating GM foods and did not perceive attributes like better taste or lower price beneficial enough to persuade them to purchase GM foods. However, tangible benefits, like being better for the environment or healthier, seemed to increase willingness to purchase GM foods [4].

Does local economy and home income influence on one's individual attitude on genetically modified food? Consumers from high and middle class of Western countries has the option to choose between food produced according to the principles of organic farming, traditional biotechnology, and the use of genetically modified organisms. Nevertheless, the societies of so-called Third World and the lower income groups in most of the countries simply cannot pay for such food choice.

TO TRADE OR NOT TO TRADE, TO LABEL OR NOT TO LABEL?

Since public attitude on genetically modified food reflects quality of information given to the consumers there is no wonder that cultural, political and economic differences between the population of different countries determine their legislative. Therefore, US, EU countries, Asia and Third World countries established significant variety of legislations that regulate the production, labeling and trade of genetically modified food. Absurdly, the trade does not recognize national boundaries. Consequently, food trade has to be considered on a global level, thus requiring global regulations that would reconcile the conflicting interpretations of concerned parties. Main international institution that is facing a number of obstacles associated to the transport of genetically modified food is World Trade Organization (WTO).

National legislative are obviously different, but it is also obvious that they are not changeless. Although many institutions and social groups advocates for a complete ban of GM food since it's appearing on the market, the truth is that this type of food is progressively present in the global world market. One should admit that many of legislative changes occurred after strong pressure made by huge international companies. For example, the European Union banned the production of GM seeds in 1990., nevertheless, under strong pressure made from some companies, EU allowed in 1998. the production of GM foods [5]. Genetically modified food entered EU market under the conditions restricted by EU directives that insists on the labeling of foods containing genetically modified organisms. GMOs that are legally produced for food and feed consumption in third countries require a separate authorization for their specific use in the EU according to Community legislation. This requirement entails a risk that authorizations may be granted in third countries earlier than in the EU, which can lead to cases of "asynchronous authorization", where a GMO is fully approved for commercial use in food and feed in the exporting country, but not in the EU [6].

Although, many European nations opposed cultivating genetically modified organisms or importing some genetically modified foods, Europe is one of the largest importers of GMO grain as animal feed. Data from 2009. show that about 134 million hectares of agricultural land worldwide are planted with genetically modified plants. The largest part, 64 million hectares of genetically modified the plants are located in the United States. Track them Brazil, then Argentina, India, Canada and China. It is obvious that after the US most important area for GM breeding are South American countries. The list of most common genetically modified foods includes: corn, soy, yellow crookneck squash and zucchini, alfalfa, canola, sugar beets and milk. Almost 60% of American citizens believes that never consumed this type of food, although chances for this to be true are almost 0%.

One of the rising question is what genetically modified food is. According to the EU, GMO refers to plants and animals "in which the genetic material has been altered in a way that does not occur naturally by mating and/or natural

recombination”. Everyone agree that genetically modified food is the food made from parts of the genetically modified organisms. What about food made from natural domesticated plants and animals feed with genetically modified organisms?

Biotechnology inventions in agriculture have been targeted, and have been the focus of evolving non-tariff trade barriers. These limitations to world trade, the U.S. government and some agriculture groups charge, discriminate against “GMOs” in violation of rules of international trade. In addition, the US government is opposed to the labeling of genetically modified food, with the argument that it threatens the principle of free trade. EU believes that free trade is not really free without the consent of an informed consumer. American producers of genetically modified food reasonably believe that it’s labeling in positions where the public awareness developed a negative attitude, considerably decreases the attractiveness of this merchandise. It should be noted that the European position on labeling GM foods strengthened when it was found that huge quantities of low-priced genetically modified foods (that largely originates from US) flood the world market, which makes the food manufactured in EU commercially uncompetitive. Obviously, financial interest of the European Union in this context, conveniently overlays with the interests of the consumers to have a full information about the products they consume. Therefore, arguments of both sides are often not based only on concern for their citizens, but reflect commercial interests.

What about public attitude concerning labeling of genetically modified food? Public opinion polls indicate that European consumers insist on marking of foods containing genetically modified organisms, while on the other side the US consumers declare that they would like to mark genetically modified food, but they do not insist on this. Clearly, public attitude in EU and US is in line with governmental policy, thus confirming once again that public attitude depend on information that is given to the consumers. According to European Commission traceability enables tracking GMOs and GM food/feed products at all stages of the supply chain. Traceability also makes labelling of all GMOs and GM food/feed products possible. It allows for close monitoring of potential effects on the environment and on health. Where necessary it can allow the withdrawal of products if an unexpected risk to human health or to the environment is detected.

US position on genetically modified food changed over the time also like European, although in different direction. US regulations on health and environmental safety were far stricter than European by the mid of ninety eighties. In the same period, Europe was far more flexible and enthused for the development of new technologies. Today situation has changed in the manner that EU laws become more limiting, while the US is becoming more engaged in the campaign of application of modern biotechnology. Approval of the Food and Drug Administration (FDA) for use of any particular type of food, in the American public was considered as a reliable indicator of product safety for a long period of time since recently. Nowadays in United States is prevailing a view that large companies influence the work of government agencies. This kind of opinion led to the decline of the American public trust in the FDA.

On July 1, 2016. Vermont becomes the first US state to require all food that contains genetically modified ingredients to be labeled as such. Other states will also be impacted by Vermont’s new rules, such as Maine and Connecticut, which have laws requiring GMO labeling if nearby states institute a labeling law. However, by 2018, Whole Foods Market will start labeling GMOs in the U.S. This grocery chains’ locations in Britain already provide GMO labeled products, as required by the European Union. In year 2016 the U.S. Senate has passed a bill that would create a national standard for labeling food made with genetically modified organisms (GMOs). In a 2013 study, Arizona State University professors Gary Marchant and Guy Cardineu identified five issues that are important to the decision of whether or not to label [7]:

- public opinion
- consumer choice
- the legality of labeling requirements
- costs and benefits of labeling, and
- risks and benefits of GM foods.

Unquestionably, influential multinational companies involved in the manufacture of genetically modified food, are lobbying against the requirement of marking food. Nonetheless, these companies are strongly targeted by stakeholder groups that promote for a prohibition on genetically modified food. The name of the international company most frequently mentioned in negative context is Monsanto [1]. Monsanto was for a long period of time involved in the production of seeds by traditional methods and manufacture of pesticides. This company was one of the largest producers of seeds, but also the producer of the best-selling herbicide in the world named glyphosate (Roundup). The patent for Roundup expired in 2000. and with imperative to preserve market share, Monsanto has established a "Roundup Ready" series of genetically modified crops. The list of these crops included soybeans, corn, sugar, and oilseed rape. Roundup Ready plants have the improvement that they are resistant to glyphosate, and it can be used in it’s massive concentration for the removal of weed species. The negative publicity in Europe raised around Monsanto has led, however, to complete the company's withdrawal from the market of the European Union, even in a segment of traditionally produced seeds. Recently one of the European largest company, Bayer announced plan for buying Monsanto. It should be expected that this merge of two largest world companies might influence EU legislative.

Composite affiliations in international politics, particularly in the global food market, awkwardly, are obstructing the adoption of unbiased scientific finding about the use-value and risks of food obtained by using techniques of genetic modification of organisms.

WORLD TRADE ORGANIZATION AND GMO FOOD

World Trade Organization (WTO), based in Geneva, Switzerland, is the fundamental international source of justice and administration of trade treaties. The trade settlements under the WTO's jurisdiction were negotiated, signed, and ratified by most of the world nations which conduct international trade. Until today, Serbia is not member of WTO, but significantly the first and main precondition for the joining this institution is to permit import and sale of genetically modified food [8]. Agreements made under WTO help makers of products and services, exporters, and importers in business. These agreements contain clauses that protect signing countries against environmental and health risks.

Some members of the European Community have been successful at using some of these measures to block genetically engineered foods. In year 2003 the United States, Canada, Argentina and some other countries complained to the WTO against the European Union. Complaints involved accusations that the EU countries had imposed a *de facto* moratorium on the import of any genetically engineered “products”. In year 2006, the WTO court found that the EU member countries violated terms of the Agreement for Sanitary and Phytosanitary measures (SPS Agreement) several times. According to WTO court none of the “biosafety” regulations, purported to protect European citizens from “potentially harmful” genetically engineered agricultural products, met these requirements. WTO court ruled that EU member states breached their agreements when blocking the following 21 products: Falcon oilseed rape, MS8/RF3 oilseed rape, RR fodder beet, Bt-531 cotton, RR-1445 cotton, Liberator oilseed rape, Bt-11 maize (EC-69), RR oilseed rape (EC-70), BXN cotton, Bt-1507 maize (EC-74) Bt-1507 maize (EC-75), NK603 maize, GA21 maize (EC-78), MON810 x GA21 maize, RR sugar beet, GA21 maize (food), Bt-11 sweet maize (food), MON810 x GA21 maize (food), Bt-1507 maize (food), NK603 maize (food), and RR sugar beet (food) [9]. The EU had banned all GM-based animal feed, even though about 72% of its animal feed needs are met by imports and most of the sources of those feed imports come from producers growing genetically modified feed. EU legislative changed once again in year 2011 import of genetically modified feed that wasn't already prohibited and had a technically low-level of genetic modification was allowed again. This rule did not encompass crops and food.

A series of consultations and workshops of the Council of the European Union finished with no clarification towards the settlement required under the WTO judgement made in year 2006. Recent vote of the European Parliament (EP), which disallowed host countries from individually banning the import or use of a genetically engineered food product. While food and trade associations praised the vote, the European Commissioner for Health and Food Safety declared that the proposal, even though it lost the EP vote, would not be withdrawn [9].

Practically, traders of GM ingredients are left with a choice among two possible paths [10]. The first path is predicated on the point that scientific evidence has yet to show any harmful influence on human health from ingestion of GM foods. The unintentional release of GM material may pose some complications for the environment, but a ban on imports may not be deemed the least trade-disruptive response. Labelling on a voluntary basis allows consumers to be aware of the method of production if they are indeed interested. This path is followed mostly by US and Canada. Second path is that of “precaution” founded on the concept that scientific indication is insufficient to be certain of the long run influences of GM products. This view considers that strict regulation of imports and mandatory labelling is needed and that restrictions on domestic production are warranted until the safety and environmental issues become clear. This latter strategy is adopted by EU.

EU, SERBIA AND GM FOOD

Until today, any authorizations for the cultivation of genetically modified organisms for the use of food production in the European Union was not issued. Nevertheless, the marketing of products derived from GMOs or containing GMOs parts is acceptable under the conditions defined by EU law. Since year 1990. the EU applied a exact legal framework relating to genetically modified organisms. In all 25 EU countries a new, improved legal framework was applied, since year 2004. It includes that any GMO must be approved before they appear on the EU market. The EU legislative has the clause by which each separate state has the right to prohibit the farming of GM organisms and GM food marketing on its own territory, even if that GMO was authorized at EU level. Using this so-called “safeguard” clause, six countries of the European Union (France, Germany, Austria, Greece, Hungary and Luxembourg) have entirely banned the cultivation of GM organisms to produce food.

Even though limiting law of the European Union prohibits the farming of GM plants in order to produce food, genetically modified plants are legally grown in some European countries that are not members of the Union. In some

of the states that have lately joined the EU, such as Bulgaria, until recently it was practiced farming of genetically modified plants. Therefore, it is quite difficult to approximate what percentage of genetically modified crops in present on the territory of Europe. In addition, knowing that insects and pollen, involved into plants reproduction, do not distinguish the boundaries of agricultural parcels nor state borders, it is almost impossible to assess the degree of contamination of agricultural land with genetically modified plants at any state or territory.

Though the crops under genetically modified plants were destroyed, it is awfully demanding to approximate how many GM plants persisted in the territory of Europe. The cultivation of genetically modified plants has never been legal in Serbia. Nevertheless, it is known that significant amount of GM seeds arrived in the country by different illegal flows. There is a rational mistrust that the GM plants without control are still existent in the territory of Serbia on some smaller agricultural areas. Serbian companies involved in food production were based on conventional technologies and any involvement of GM food production in Serbia or free trade of GM food products would make them less competitive on national market.

CONCLUSION

Consumer's attitude on GM food is obviously under great influence of media that are under huge pressure of governmental institutions and private companies. Legislation of GM food in great deal reflects public attitude on this issue. Any regulatory progress, made under WTO, would be of great benefit for countries still in the process of developing their own regulatory framework in this area. On the other hand, the main player in the game of GM food are US and EU, or one may say their companies involved in the process of food production. Taking in to account recent development in this area one may predict that legislation of GM food will follow free trade of products containing GMO with mandatory labeling of such products. Serbia can meet its agricultural needs without GMO food. The question of potential free trade of GMO food in Serbia is more political issue.

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