

Contemporary Issues in Business, Management and Education 2013

## EU experts' attitude towards use of GMO in food and feed and other industries

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### Abstract

This article examines European Union (EU) experts' attitude towards use of genetically modified organisms (GMO) in food, feed and other industries with an eye to developing a general model of EU experts' opinion formation in this area. The gene engineering has seen rapid advances in recent years with a host of new applications in medicine, agriculture, and related fields.

Taking into account the history of consumption, social, economic, cultural and other aspects and the risk perception in general regarding these products the consumers' willingness to buy genetically modified (GM) products varies from country to country as well as attitude of the experts involved in the decision making process.

The objective of this study is to investigate opinion and attitude of the EU experts involved in GMO decision making process toward use of GMO in food, feed and other industries. To obtain this objective the relevant aspects have been analyzed using responses to a survey designed to elicit experts' reaction to various approaches to using of GMO. It is indisputable that the experts have higher level of knowledge about gene engineering technology, and their attitude towards GMO is not extreme as attitude of an average EU consumer. They make decisions based on knowledge, experience and safety of a particular GMO and not on GMO in general.

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Selection and peer-review under responsibility of the Contemporary Issues in Business, Management and Education conference.

*Keywords:* consumer attitude; decision making; GMO; risks perception.

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## 1. Introduction

This study was launched to find out the EU expert's attitude towards use of GMO in food, feed and other industries. This evaluation is not intended to be a scientific assessment; rather its main goal is to collect opinions and perceptions from the interviewed EU experts involved in GMO decision making process.

Nowadays, most of the decisions that have a significant impact either in societies or in organizations are commonly made by a group rather than a single decision maker, which might require more than a majority rule to obtain a real acceptance (Palomares, Liu, Xu, & Martínez, 2012). In the field of GMO the decisions regarding deliberate release into environment or placing on the market of GMO are made by a group of the experts. In the EU these decisions are reviewed and adopted by the national experts from the Member States (MS).

To obtain the objective the relevant aspects have been analyzed using responses to the survey designed to elicit the experts' reaction to various approaches to using of GMO. It is indisputable that the experts involved in the field of GMO have higher level of knowledge about gene engineering, and their attitude toward GMO is not extreme as attitude of the average EU consumer. The experts make decisions based on knowledge, experience and safety of a particular GMO and not on GMO in general.

The findings may contribute to comprehend risk perception of EU experts and their attitude towards use of different GMO in food/feed and agriculture. It will help to see possible relationships between knowledge and acceptance of GMO not just by experts but also by the average EU consumers in general and will help better reflect EU consumers' attitude.

In the market where supply of the products is huge there is a dilemma for the consumer to decide between tested and new products, between certainty and possible risk resulted from the new technologies. The research results showed that perceived benefits had the most important influence on consumer purchase decisions, such as environmental impact and health related concerns (Fortin & Renton, 2003).

## 2. Research results and discussion

In the beginning of the research the hypothesis was posed, that the experts make decisions based on knowledge, experience and safety of a particular GMO applying case by case approach. Although according Miller and Conko (2000) concerns regarding GMO cannot simply be imputed to a lack of knowledge in biology.

According Kayabası and Mucan (2011) the attitudes and perceptions towards GM food have nine dimensions: the perceived environmental risk, perceived benefit, long-term effects on human health, risk for the world, attitudes towards labelling, attitudes towards purchase, attitudes in terms of cultural- spiritual and moral values, perception of knowledge level and the perceived risk respectively. The most explanatory factor is the possible risks of GM food on human health in the long term. The least explanatory factor solution is the attitudes towards cultural- spiritual and moral values.

A study by Krystallis et al. (2007) contrasted the consumer and expert perceptions concerning several dimensions relevant to GMO, and found significantly differing views and attitudes. The survey was conducted in four different European countries indicating the different expert and consumer perspectives on food risk management, in order to assess the participants' reactions to these. It was found that, though there were areas of agreement between the experts and consumers (for example, they agreed that consumers lack relevant knowledge, that food safety is a shared responsibility and that scientific uncertainty cannot be completely avoided), there were other areas where disagreement remained (for example, on the acceptability of economic interests in food risk management and the role and quality of media reporting).

Consequences of genetic engineering are not directly observable and difficult to control. Acceptability thus depends on many factors related to perception of risks and to the importance of benefits that justify or offset them. But risk perception of GMO have been extended to a very wide field, including many socio-economic or political aspects, knowledge of the risk and familiarity with it, scientific uncertainty, controversy, delay in the appearance of undesirable consequences, advantages – or disadvantages – for the person exposed etc. (Bonny, 2003).

The research by Marris et al. (2011) reveals a more complex picture, in which the distinctions often made between "real risk" and "perceived risk", between "risk" and "ethical" concerns, or between "scientific" and "non-scientific" concerns, are blurred.

**3. Methods**

The EU experts’ survey was conducted during January – June, 2013. The experts from 27 EU Member States were asked to complete the survey of 24 questions that elicited information about the role of the expert’s institution in the decision making process, opinion towards use of GMO in food/feed and cultivation, possible risks and benefits of GMO and satisfaction with the process of the issue of permission.

Most of the selected experts were first contacted personally. After briefly informing them about the purpose of the survey, incentives to participate were offered in form of a free copy of the final report. It was assumed that the results would interest them since they also revealed how other experts assess GMO decision making process and different aspects of GMO. They were also assured that their views would be kept confidential. The selected experts then either accepted or refused to participate. At the end 67 experts from 23 Member States representing all EU regions took part at the survey and expressed their opinion on different aspects regarding GMO.

To compare the gap of the risk perceptions among EU experts regarding GMO, the series of questions were analyzed. The full survey is available from the author upon request.

**4. Results**

The first two questions were about the role of the expert’s institution in decision making process towards GM food/feed and cultivation of GM plants. In responding, the participants had to choose one of four options (plus “Other”) and to assess level of involvement on a scale from one to ten; “one” indicated “not involved at all”, respectively; “ten” indicated “strongly involved”, respectively. Figure below shows the aggregated results regarding general role of the expert’s institution in decision making and rate of the involvement in different processes. The y-axis shows the rating scale from one to ten and the x-axis lists the four main segments in decision making process (plus “Other”).

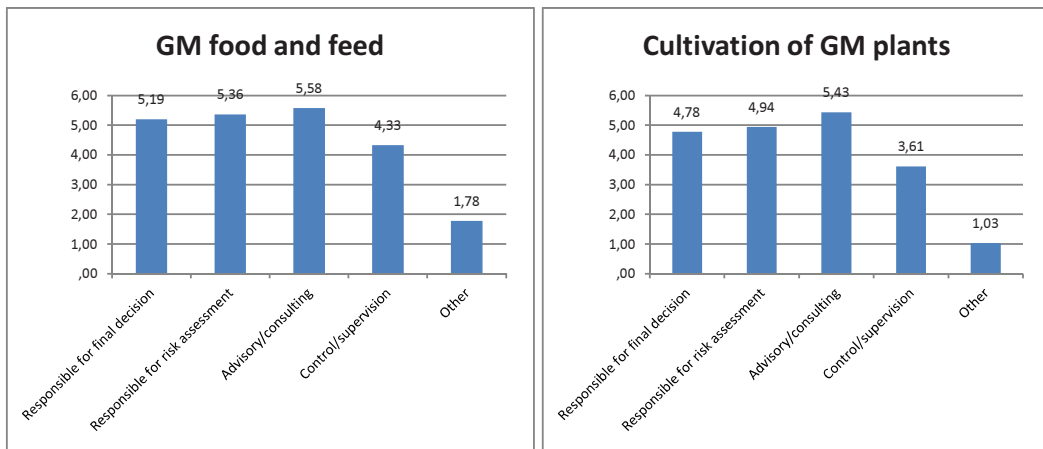


Fig.1. The role of the expert’s institution in decision making process and rate of involvement. *Source:* the author’s calculations based on EU experts’ (n = 67) survey results obtained in 2013

From the figure above we can see that the responsibility of the experts is divided quite similar among different areas of decision making process and the experts from different responsibility areas were involved in the survey process.

Analyzing experts’ educational background (Fig. 2) according data obtained from the survey it was found that 37.3% of the experts are with education in biology, 14.9% - in agriculture and 9% in bioengineering and environment. Also experts with background in chemistry, food science, microbiology and other were represented.

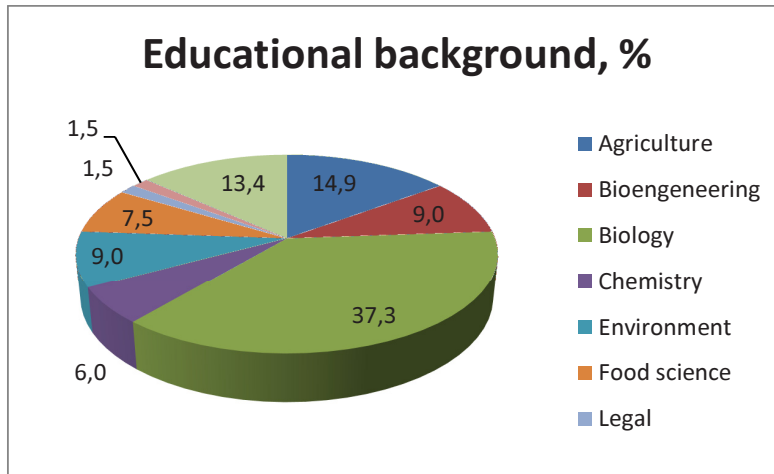


Fig.2. Educational background of the experts involved in decision making process. *Source:* the author's calculations based on EU experts' (n = 67) survey results obtained in 2013.

It is very important to point out that 44.8 % of the interviewed experts have either doctor's degree or master's degree.

The mean time of the involvement in GMO decision making process among the experts was indicated 10.75 years. Although one of the experts indicated the experience less than 1 year, but the most experienced in this field was the expert with 37 years long experience.

Hence we can conclude that the most of the experts involved in GMO decision making process are with scientific background, skilled and experienced in respective field.

The next two questions of the survey regarding risks GMO can cause to human/animal health and environment were analysed to compare an official opinion of institution involved in decision making process with a personal opinion of the expert employed by this respective institution.

The results in Table 1 show that the official opinion of the institution involved in decision making process is not defined in approximately one-fifth of cases hence we may conclude that experts either express their personal opinion instead of an official one during decision making process or the institution just is not involved in one or another field of GMO and it is why it has not defined its official opinion.

According data in Table 1 about 50% of the institutions consider that decision regarding GMO should be taken based on case by case approach. We also can observe that attitude of the competent institutions regarding cultivation of GM plants are quiet precautious, in case of cultivation 25.8% of institutions are against cultivation and just 4.8% of the institutions support cultivation of GM plants.

Table 1. Official opinion of the institutions involved in decision making towards use of GMO, %. *Source:* the author's calculations based on expert (n = 67) survey results obtained in 2013

| Official opinion             | Food        | Feed        | Cultivation | Field trials | Contained use |
|------------------------------|-------------|-------------|-------------|--------------|---------------|
| In favor                     | 12.3        | 12.7        | 4.8         | 11.5         | 21.3          |
| Abstain                      | -           | -           | 1.6         | 1.6          | -             |
| Case by case                 | <b>53.8</b> | <b>54.0</b> | <b>45.2</b> | <b>50.8</b>  | <b>49.2</b>   |
| Against                      | 10.8        | 11.1        | <b>25.8</b> | 9.8          | 4.9           |
| Don't know                   | 3.1         | 3.2         | 3.2         | 4.9          | 3.3           |
| Official opinion not defined | 20.0        | 19.0        | 19.4        | 21.3         | 21.3          |
| Total                        | 100.0       | 100.0       | 100.0       | 100.0        | 100.0         |

From Table 2 we can see that the experts mostly have defined their personal opinion towards use of GMO in different fields, there are just few cases when experts haven't defined their attitude.

Table 2. Personal opinion of the experts towards use of GMO, %. *Source:* the author's calculations based on expert (n=67) survey results obtained in 2013

| Personal opinion | Food        | Feed        | Cultivation | Field trials | Contained use |
|------------------|-------------|-------------|-------------|--------------|---------------|
| In favor         | 21.2        | 24.6        | 13.8        | <b>31.7</b>  | <b>46.0</b>   |
| Case by case     | <b>54.5</b> | <b>56.9</b> | <b>52.3</b> | <b>46.0</b>  | <b>38.1</b>   |
| Against          | 18.2        | 12.3        | <b>27.7</b> | 17.5         | 12.7          |
| Don't know       | 6.1         | 6.2         | 6.2         | 4.8          | 3.2           |
| Total            | 100.0       | 100.0       | 100.0       | 100.0        | 100.0         |

According data obtained we can observe that personal opinion of the experts and official opinion of the institution they represent doesn't distinguish substantially in using of case by case approach regarding decision making on GMO. More than 50% of the institutions and more than 50% of the experts in case of GM food and feed consider that every single GMO should be analysed individually.

And if we compare the official opinion of institutions and the personal opinions of the experts towards use of GMO in food and feed we can conclude that personal opinion of the experts regarding GM food and feed is more supportive than official one. Just about 12% of institutions support use of GMO in food and feed in comparison with experts' support – 21.2% regarding food and 24.6% regarding feed.

On the other hand we can observe that experts are not only supportive regarding use of GMO for food and feed purposes but also more precautionous than the competent institutions. 18.2% of the experts in case of food and 12.3% in case of feed don't support use of GMO for these purposes in comparison with the opinion of the institutions – 10.8% and 11.1% – respectively. This difference could be explained also by the fact that official opinion of the institutions regarding GM food and feed is not defined in about one-fifth of cases.

Analysing data regarding cultivation of GM plants we can see that in common with the competent institutions (25.8%), the experts in about one-fourth (27.7 %) of cases don't support cultivation of GM plants.

Analysing obtained data it is important to understand that the position of the institutions at decision making process often is impacted not just by responsible experts but also by other factors like political, social, economic and other considerations.

Besides personal opinion regarding use of GMO in food/feed and for cultivation the experts were also asked to express their personal opinion and assess possible risk GMO can cause to human/animal health and to environment (Table 3).

Table 3. Expert's personal opinion regarding risk GMO can cause to human/animal health and environment, %. *Source:* the author's calculations based on experts' (n = 67) survey results obtained in 2013

| Opinion                               | Risk GM food/feed can cause to human/animal health | Risk cultivation of GM plants can cause to environment |
|---------------------------------------|--|--|
| Safe as its conventional counterparts | <b>29.9</b>  | 13.4   |
| More safe than unsafe                 | 10.4   | 10.4   |
| Depends on case by case               | <b>50.7</b>  | <b>50.7</b>  |
| More unsafe than safe                 | 3.0  | 7.5  |
| It can cause significant risk         | 4.5  | <b>16.4</b>  |
| Don't know                            | 1.5  | 1.5  |
| Total                                 | 100.0  | 100.0  |

More than half of the experts (50.7%) think that it is not possible to consider risk of GMO equipollent. They are sure that it is complex issue and every GMO should be assessed using case by case approach.

Just 4.5% of the experts are sure that GM food/feed can cause significant risk to human or animal health and 16.4% of the experts are sure that cultivation of GM plants can cause significant risk to environment. 29.9% of the experts are sure that GM food and feed are as safe as its conventional counterparts and 10.4% think that it is more safe than unsafe.

The EU experts are less confident regarding safety of GM plants cultivation; just 13.4% of the experts consider that GM plants are safe as their conventional counterparts and 10.4% - more safe than unsafe.

Comparing data obtained from Table 2 and Table 3 we may conclude although the experts are not very supportive regarding cultivation of GM plants, just 7.5% of them consider that GM plants are more unsafe than safe and 16.4% of them believe GM plants can cause significant risk to environment. Hence we may conclude that support of the experts for cultivation of GM plants may be impacted with the aspects other than safety considerations, for example economic or social.

Furthermore the experts were asked to evaluate the extent of their personal satisfaction with the process of the issue of permission in the field of GMO (food/feed and cultivation) in EU (Fig. 3), where 1 – strongly unsatisfied and 10 – strongly satisfied.

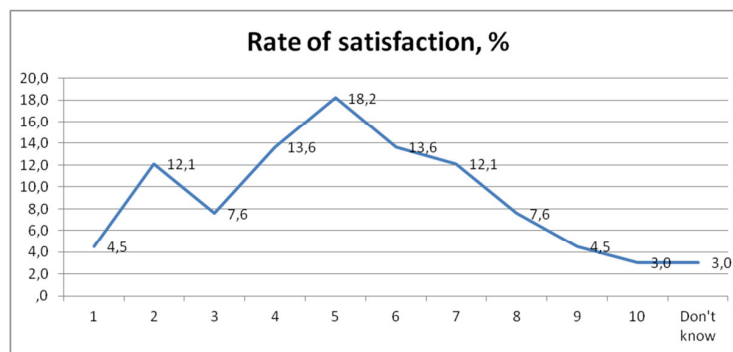


Fig.3. Rate of satisfaction with the process of issue of permission in the field of GMO. *Source:* the author's calculations based on EU experts' (n = 67) survey results obtained in 2013

Analysing information obtained it was concluded that the most of the experts are neither satisfied nor unsatisfied with the process of the issuing of the permit assessing their satisfaction on a scale from 4 to 7. Although it should be noted that 12.1% of them expressed negative attitude regarding the process of the issue of permission in the field of GMO. Many of the experts (Table 4) consider that in addition the grounds other than those covered by environmental and health risk assessment under the EU authorization system (for example, economic, cultural or social) should be taken into account during authorization process of GMO for food and feed uses or for cultivation.

Table 4. Number of the EU experts. *Source:* the author's calculations based on experts' (n = 67) survey results obtained in 2013

| Aspect               | Economic | Ethical | Cultural | Social | Don't know |
|----------------------|----------|---------|----------|--------|------------|
| GM food/feed         | 42       | 17      | 32       | 30     | 5          |
| GM plant cultivation | 44       | 17      | 41       | 33     | 4          |

More than half of the interviewed experts think that economic aspects are very important and should be taken into account during the authorization process of GM food/ feed and cultivation. About half of the experts also think that cultural and social considerations are very important as this technology affects the traditional agriculture methods, way of living and traditional food. The experts are sure that public opinion and involvement in decision making process is crucial and important when we talk about the gene technology. Although some of the experts

noted in the survey that only scientific assessment should be the basis for decision making and other aspects are not important or shouldn't be taken into account.

Next three questions were analysed to find out the opinion of the experts in respect of the use of the first, second (value-enhanced crops) and third (include those that produce pharmaceuticals, improve the processing of bio-based fuels, or produce products beyond food and fibre) generation of GMO. The experts were asked to evaluate the benefits regarding all three generations of GMO.

Table 5. The opinion of the EU experts in respect of the benefits of the first, second and third generation of GMO.  
Source: the author's calculations based on experts' (n=67) survey results obtained in 2013

| Opinion        | First generation |             |             | Second generation |             |             | Third generation |             |             |
|----------------|------------------|-------------|-------------|-------------------|-------------|-------------|------------------|-------------|-------------|
|                | Health           | Environment | Economic    | Health            | Environment | Economic    | Health           | Environment | Economic    |
| Yes            | 17,2             | 21,9        | <b>42,2</b> | 19,7              | 14,1        | <b>38,5</b> | <b>34,4</b>      | 16,9        | <b>46,0</b> |
| No             | <b>32,8</b>      | 25,0        | 10,9        | 18,2              | 21,9        | 10,8        | 12,5             | 20,0        | 4,8         |
| Depends on GMO | <b>39,1</b>      | <b>43,8</b> | <b>37,5</b> | <b>51,5</b>       | <b>59,4</b> | <b>38,5</b> | <b>43,8</b>      | <b>52,3</b> | <b>42,9</b> |
| Don't know     | 10,9             | 9,4         | 9,4         | 10,6              | 4,7         | 12,3        | 9,4              | 10,8        | 6,3         |
| Total          | 100,0            | 100,0       | 100,0       | 100,0             | 100,0       | 100,0       | 100,0            | 100,0       | 100,0       |

From the table above it is visible that most of the experts believe that the possible benefits on health, environment and economic in respect of GMO cannot be assessed equipollent and that the possible benefits depend on each individual GMO. Although about 40% of the experts consider that all three generation of GMO can provide economic benefits to society. But 32.8% and 34.4% of the experts respectively consider that the first and the third generation of GMO can benefit to health.

## Conclusions

This paper represents the first research of its kind investigating the opinion of the EU experts involved in decision making process on GM food/feed and cultivation of GM plants.

The survey results show that:

1. The most of the EU experts involved in GMO decision making process are with scientific background, skilled and experienced in respective field. Mostly the experts are involved in advisory, consulting and risks assessment issues and this information could indicate that the experts have become familiar with gene engineering technology and are more open and educated in these questions and are able to see also benefits this technology can provide to the consumers.
2. The EU experts are supportive towards use of GMO in food and feed and many of them consider that GM food/feed is as safe as conventional products or more safe than unsafe.
3. The respondents are more concerned about cultivation of GM plants as consider they can cause risk to environment. It is also necessary to take into account that the EU is one of the most conservative regions regarding cultivation of GM plants. In 2011 there were just 9 countries cultivating GM plants in 114.525 hectares in the EU (global areas of biotech crops – 170 million hectares). Most of the EU experts have more theoretical knowledge than practical experience. In some countries there are no even any field trials therefore the experts have quiet limited experience regarding assessment and activities in the field of deliberate release of GMO and this aspect could favour cautious attitude among the experts regarding cultivation of GM plants.

4. In general estimating the experts' attitude towards risk GMO can cause to human/animal health and environment we can conclude that it is based on case by case principle. More than half of the respondents are sure every single GMO have to be assessed individually.

5. Some of the competent institutions involved in GMO decision making process have not defined their official opinion regarding GMO. The experts either express their personal opinion instead of an official one during decision making process or the institution just is not involved in one or another field of GMO and it is why it has not defined its official opinion.

6. The EU experts mostly have defined their personal opinion towards use of GMO in food/feed and for cultivation, there are just few cases experts haven't defined their attitude. Analysing data obtained it is visible that the experts are more supportive regarding use of GMO in food and feed, and for cultivation in compare with official opinion of the institutions.

7. The position of the institutions in decision making process often is impacted not just by responsible experts but also by other factors like political, social, economic and other considerations.

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