

PROJECT OF IMPLEMENTATION OF
NATIONAL BIOSAFETY FRAMEWORK FOR TURKEY

SOCIO-ECONOMIC EVALUATION CRITERIA IN DECISION-MAKING PROCESS FOR GMO AND GMO PRODUCTS



TAGEM
R&D AND INNOVATION



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FOREWORD

In an effort to protect the environment and biodiversity against the potential risks of genetically modified organisms, the Cartagena Protocol on Biosafety -the first international document that is of a binding nature in this area- took effect around the world on 11 September 2003 and in Turkey on 24 January 2004. The protocol seeks to ensure an adequate level of protection in the field of the safe transfer, handling and use of living modified organisms resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity, also considering its risks to human health, and specifically focusing on transboundary movements.

The Biosafety Law, which was prepared by taking the Cartagena Protocol, the EU Acquis, the situation and needs of the country into consideration, was approved by the Turkish Grand National Assembly on 18 March 2010, published in the Official Gazette no. 27533 of 26 March 2010 and entered into force on 26 September 2010. The Biosafety Law aims to establish and implement a biosafety system in order to prevent the potential risks of the genetically modified organisms and products thereof obtained through modern biotechnological means within the context of scientific and technological advancements and protect human, animal and plant health; safeguard and ensure the sustainable use of the environment and biological diversity and to determine the procedures and principles governing the control, regulation and monitoring of these activities.

Within the scope of the Biosafety Law the "Regulation on the Genetically Modified Organisms and Their Products" and the "Working Principles and Procedures of the Biosafety Board and Committees" were published on the Official Gazette No. 27671 of 13 August 2010.

In order to develop the capacity needed for ensuring biosafety within the scope of the national and international legislations, the project titled "Support for

the Implementation of the National Biosafety Framework of the Republic of Turkey” was prepared and accepted by the Global Environment Facility (GEF). The project was implemented between 2013 and 2017 under the coordination of the Directorate General of Agricultural Research and Policies (DGARP). Within the scope of the project, five guidelines were prepared by considering the works of national consultants and the contributions of the relevant partners obtained during the workshops, which were conducted at the preparation stages of some of the guidelines. The following guidelines have been developed: “Application Guideline”, “Technical Guideline for the Risk Assessment of Genetically Engineering Crops and Derived Food And Feed”, “Socio-economic Evaluation Criteria for the Decision-Making Process Regarding GMOs and Products”, “Guidelines on Control and Traceability of Genetically Modified Organisms and Products” and “Legal Guideline”.

Our General Directorate considers the works conducted for raising public awareness during the project, the documents prepared as outputs of the project and overall project experience significant gains. I hope that these guidelines, which were prepared within the scope of the project, will be useful. I also congratulate and thank everyone who contributed to the project, especially the UNEP-GEF Portfolio Manager (Biosafety) Alex Owusu-BINEY, Project Assistant Birgül GÜNER, Project team consisting of Hilal YÜCE ARSLAN, Ayfer ŞAHİN and Serdar AYDEMİR, national consultants Professor Emine OLHAN, Professor Mustafa Fadıl YILDIRIM, Associate Professor Remziye YILMAZ, Dr. Seval ÜNALAN and Fatih KAYA.

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Modern biotechnologic techniques enabling species gain new genotypes by transferring genes from another living species and interfering in its current genetic structure are named *gene technology*, and the living organisms, except for humans, obtained by transferring genes through modern biotechnologic methods are named *Genetically Modified Organisms (GMO)*. In other words, GMOs are new organisms created by applying cell fusion techniques between different species and classes, with methods different from those used in traditional breeding and selection.

Modern biotechnology has found its largest area of utilization in the agricultural sector. The structures of conventional culture types and their wild relatives are modified in order to produce high amount of and quality crops. Cultivation area of GMOs, whose production has started in 1996, has multiplied more than 100 times and from 1,7 million hectares, it has now reached 181 million hectares in 2014. 40.4% of GMO cultivation area is located in the United States (James 2015).

The mostly emphasized industry in use of modern biotechnology is the agricultural sector in terms of biosafety. Since the genetically modified plants directly interact with the environment and are used in human and animal nutrition, they may create a risk for biodiversity and human life.

Taking necessary steps by defining the disadvantages of modern biotechnology on biodiversity, human health and social structure requires the "Biosafety System". Biosafety is the system of rules and precautions developed to enable the use of GMOs in a harmless way for other living creatures in nature, their persistence, and diversity, in other words, biodiversity and human health (Eser and Kılıncarslan 2005). Biosafety is defined as the guarantee for safe use of biotechnology (Mugwagwa 2012). Biosafety is a concept covering the process of defining the risks of using modern biotechnology (risk assessment), and the measures taken in order to eliminate the possibility of these risks, or to keep the damages arising from these risks under control (risk management) (DPT 2000). Risk assessment is consisted of scientific risk assessment and socio-economic evaluation. In some cases, scientific risk assessment may be insufficient in risk management and at this point, socio-economic evaluation gains importance.

The first binding legal document on global scale regarding the international movement of the GMOs, Cartagena Protocol on Biosafety (CPB) grants the countries the right to consider the socio-economic costs in the approval process of GMOs import (Falck-Zepeda, 2009). However, the number of countries performing socio-economic evaluation in this process is limited. The framework of the socio-economic evaluation has not been clearly defined in the countries conducting this evaluation. Socio-economic costs are generally defined as the effects of the genetically modified organisms on the conservation and sustainable use of biodiversity. Especially the effects on biodiversity are evaluated for local and domestic communities. In this sense, the ethical impacts and the impacts over the 3rd countries by the genetically modified organisms are taken into consideration in socio-economic evaluation, beside their economic, social and ecologic impacts.

Although the limits of GMOs' socio-economic evaluation cannot be explicitly defined, it has a very large scope. Apart from the potential results of biotechnology such as impacts on farmers' income and welfare, possible change in the social welfare, and impacts on conventional products and diversities; a large variety of subjects may enter into the scope of socio-economic evaluation such as possible change in country's rural employment, trade and competition, market condition of multinational companies, impacts on food safety and food security, impacts on consumers, change in country's agricultural pattern, possible impacts on biodiversity as well as ethical and religious subjects (LaVina and Fransen 2004).

When application for import of genetically modified (GM) agriculture products in Turkey is made, the risk committee and socio-economic committee working under Biosafety Board evaluate the applications in their own fields. This study has focused on why and how the socio-economic evaluation, which is mandatory before authorizing the import of GM agricultural products, is/should be conducted.

Since the production of GM plant and animals is prohibited (article 5) as per the Law on Biosafety in Turkey, socio-economic evaluation is conducted only for the products for which import application is made. Socio-economic evaluation for GM agricultural products in Turkey is conducted in two sections. Possible impacts of GM product import on producer and consumer are included in evaluation scope. Since it is not permitted to cultivate GM products, possible risks that may endanger environment and sustainability are exempted from socio-economic evaluation scope. Since the impacts on environment are included in scientific risk assessment, they are not taken into consideration in socio-economic evaluation. Possible impacts of import of GM agricultural product on environment may emerge with out-of-purpose utilization. Here, since its cultivation is prohibited and since the Ministry of Food, Agriculture and Livestock conducts the audit and monitoring of the imported products, the possible risks on the environment are exempted from the socio-economic evaluation.

There are two different approaches towards GMOs in the world. While the supporters of GM agricultural products present these as a technology to feed the world, the opposing parties claim that GMOs may cause unpredictable environmental and social disaster. In other words, the world is split in two regarding the GMOs and while one part presents it as a miracle, the other considers it as Frankenstein foods (Falk-Zepeda et al 2013). Thus, some countries act very cautiously for GMOs and apply very tough regulations while some others completely release them. These differences depend on the countries' conditions, whether they produce GMO or not, and even whether they provide food security or not.

Since the products of modern biotechnology are living creatures, it is obligatory to perform risk assessment per case according to purpose of use for each product. Only in this way humans and environment can be protected from damage. Similarly, the products' being living creatures requires the continuous follow-up, control, and following the impacts of the products on environment and human health, even if their production and consumption are allowed (Eser and Kılınçarslan 2005).

Cartagena Protocol on Biosafety (CPB), prepared as an additional protocol to the United Nations Convention on Biodiversity and came into force in 2003, is the first binding legal document in the world regarding the transboundary movements of genetically modified organisms. In other words, biosafety, defined as the safe use of biotechnology, is globally regulated by CPB (Mugwagwa 2012). It took a very long and challenging negotiation process to give the final shape to the Cartagena Protocol on Biosafety, which is the first binding legal document to regulate genetically modified seed and product market where high commercial and economic interests are in question. Despite compromises given as a result of intensive and effective opposing from the genetically modified seed exporter countries, the Protocol accepts a system where GMOs' transboundary movements, transit, handling and utilization are subject to prior notification to the importer country and the permission from that country (Kivilcim 2012). The principles regarding the recovery of the damages caused by the GMOs are regulated by Nagoya-Kuala Lumpur Protocol prepared as a supplementary protocol to the Biosafety Protocol and adopted in October 2010.

The purpose of the Cartagena Protocol on Biosafety is to contribute to providing a sufficient conservation level in safe transfer, handling and use of genetically modified organisms obtained by modern biotechnology; that may have negative impacts on biodiversity and its sustainable use, by considering the risks on human health and focusing especially on transboundary movements.

The protocol states that use of GMOs may result in socio-economic impacts in the importer countries and it is stated in Article 26 titled "Socio-Economic (SE) Considerations" of the Protocol that importer countries have the right to avoid from these possible impacts (Catagora-Vargas and El-Kawy 2014, Perron-Welch 2012, Villar 2014). Accordingly, the provision; "The Parties, in reaching a decision on import under this Protocol or under its domestic measures implementing the Protocol, may take into account, consistent with their international obligations, socio-economic considerations arising from the impact of living modified organisms

on the conservation and sustainable use of biodiversity, especially with regard to the value of biodiversity to indigenous and local communities" was given regarding the importer countries (El-Kawy and Catagora- Vargas 2014). Although the protocol focuses on the potential impacts of GMOs on the environment, it emphasized that the parties may take into account the food safety and socio-economic costs (Falk-Zepeda, 2009).

Because of the fact that genetic engineering produces a new living creature that does not exist in nature, it is hard to predict the effects of GMOs on environment and human health in the future (Mugwagwa and Rutivi 2009). Socio-economic effects are the natural results of adopting a new technology and these effects might be positive or negative, and they may bring unexpected results as well (Catacora-Vargas 2012). It will take years for socio-economic impacts of any technology to emerge, as it did in green revolution. A new labor force class emerged after the green revolution and this increased women's power, and changed social gender relations. However, these impacts surfaced after years (Elenita 2007). The impact of a new technology may vary depending on different segments of the society. The effects of the green revolution on small agricultural businesses were different than on large businesses. In this sense, the impacts of GMOs, especially socio-economic ones, will vary from one segment of the society to another. The consumers may reach affordable food in short term, but in long term the prices may increase because the world seed sector will turn into oligopoly market structure. At the same time, local producers may give up production because of failing in competing and countries may become foreign- dependent in food and agricultural products.

Since the socio-economic impacts of the GMOs may change from one region to another, and even one person to another, it could not be specifically defined. Failure in clear definition of this framework caused the scientist not to show sufficient attention to this subject. Scientist generally define the socio-economic evaluation as to include social, economic, and ethical subjects (Foeeurope 2010).

As stated in Cartagena Protocol on Biosafety, SE considerations are related with the sustainability and the impacts on the environment are taken into account (Amin et al. 2011). In scope of this evaluation, answer is sought for the question “whether it endangers, or threatens the welfare of the society and nature?”. A comprehensive definition is made for SE evaluation as to include the potential results of biotechnology. For example, the impacts of GMOs’ cultivation and/ or import on income and welfare of the producers, cultural values, conventional products and varieties, rural employment, trade and competition and potential changes on the food prices in the country, are the primary effects.

Socio-economic costs are clearly defined in the Protocol (CPB) as the impacts on the conservation and sustainable use of biodiversity. On the other hand, it was stated in the protocol that even if the socio-economic evaluation is not obligatory, the importer countries might take the socio-economic costs into consideration (Catacora-Vargas 2012). Until 2010, 16 countries; Armenia, Austria, Bangladesh, Bhutan, Cambodia, China, France, Honduras, India, Lebanon, Mauritius, Nigeria, Norway, Philippines, South Korea, and Syria, have included socio-economic evaluation in the national biosafety regulations (Spök 2010). Australia, Brazil, Canada, Japan, and Thailand are some of the countries that do not take socio-economic effects of GMOs into consideration. In Europe, only Norway and France conduct the socio-economic evaluation (SEE) of GMOs (Spök 2010). Although SEE is obligatory in Switzerland, its scope is not clear and market launch of GMOs are approved if they do not have an impact on environment and health (Foeurope 2010). Even though it is not in the literature yet, with the Law on Biosafety legalized in 2010, Turkey has become one of the countries that make socio-economic evaluation obligatory in GMO’s market launch. Since there is not a clear definition of socio-economic evaluation in the Protocol, even the countries including SEE within their legal regulations, have featured the important topic for them in scope of SEE. For example, Argentina only takes the impact on export activities into account while Philippines focuses on the impacts on smallfarms/agricultural holdings, women

and local people, and Indonesia cares mainly for the impacts on religious, ethical socio-cultural issues (Falk-Zepeda, 2009).

As per the Cartagena Protocol on Biosafety, by taking the risks on human health into account, all transboundary movements, transit, handling and use of all genetically modified living organisms that may have negative impacts on the conservation and sustainability of biodiversity, will be subject to prior notification and permission conditions.

Each country, which is a party to the Protocol, must prepare their biosafety legislations and related substructures. Turkey has signed Cartagena Protocol on Biosafety in 2000 and ratified it in 2003. The content of the Protocol has largely shaped Turkey’s efforts for national legislation on biosafety. In Turkey, genetically modified agricultural products are considered different than conventional ones and are subject to a separate regulation and must be labeled as well.

With the Law numbered 5977 on Biosafety, importing, exporting, releasing for the purpose of experiment, placing on the market, transit and contained use of the genetically modified organisms or their products are subject to the permission to be given upon the risk assessment (OG 2010). The permission to be given is limited with ten years and extension of this period is bound with the decision of the Biosafety Board. Limiting the permission period in the law and stipulating socio-economic evaluation for each application decision to define impacts on biodiversity, users, and farmers is an appropriate regulation that complies with the precautionary principle.

As per Article 4 of the Law on Biosafety, it was decided to conduct separate risk assessment and socio-economic evaluation according to scientific principles for each application. For this purpose, as required both by the CB Protocol that Turkey is a party to, and by the Law on Biosafety, socio-economic evaluation is performed for each decision process for the application of GMO and its products’ import.

In Article 5 of the Law on Biosafety, the following actions regarding the GMO and its products are prohibited (OG 2010).

- a) Putting GMO and products thereof to the market without approval.
- b) Using or letting others use the GMOs and products thereof in breach of Board decision.
- c) Producing genetically modified plants and animals.
- d) Using GMO and products thereof beyond the purpose and indicated by the Board in the placing on the market decision.
- e) Using GMO and products thereof in baby food and baby formula follow on formula, baby and young children nutritional supplement.

Since it is prohibited in Turkey to produce genetically modified plant and animals, socio-economic evaluation is performed only for each import application. Besides, law also prohibits the use of GMO and its products out of the purpose and scope defined by the Biosafety Board for placing on the market. Preventing, monitoring, controlling and auditing of GMO residues is among the tasks of the Ministry of Food, Agriculture, and Livestock. For this reason, socio-economic evaluation is conducted according to the purpose of the import.

Socio-Economic Evaluation in GMOs is a highly-discussed topic on an international level. During the negotiation process of Cartagena Protocol on Biosafety (between 1995-2000), very critical discussions have taken place between two groups in terms of socio-economic evaluation. On one hand, developing countries wanted to include socio-economic evaluation in the risk assessment and decision making process. On the other hand, many developed countries have found socio-economic evaluation unnecessary (Catacora-Vargas 2012). US Delegation has clearly expressed during the negotiations that in terms of regulating GMOs, they would not accept a regulation, which takes the precautionary principle and socio-economic impacts of these organisms as a criterion (Kivilcim 2012). In the European Union (EU), with EC 1829/2003 numbered Directive, it was stated that socio-economic evaluation can be performed for GMOs (EC, 2003); however, socio-economic evaluation is not clearly defined and the criteria for such an evaluation are not determined (Greiter et al 2011). There are different approaches and views towards the scope of socio-economic evaluation in the world, which results from the social dimension of the evaluation. Socio-economic impacts generally have a large scope including the combination of social and economic factors (Spök 2010).

The literature on the socio-economic impacts of the GMOs is very limited. The majority of the studies in this field evaluate the impacts on the producers of GM products (impacts from adaptation of GM crops) (Smale et al 2009). These studies generally focus on the effects of cultivating GM product on the change of productivity and production cost. The social dimension and impacts on the consumers are not included in these studies. However, the production of GM products depends on the acceptance and demand by the consumer. It is suggested to label the GMOs, especially to protect the right to choose of the consumer. Similarly, African consumers state that labeling the GMOs may eliminate the religious, moral, and environmental concerns. African consumers believe that GMOs enter into their country via the food aids and import. Indeed, in various tests conducted in South Africa, it was reported that GMO was detected in foods despite the fact that they were not labeled and that there were GMOs on market shells of other African countries. Many countries approve this technology by considering only the economic impacts such as production increase, but SEE is seen necessary including the impact on environment and humans. This evaluation will protect not only the consumer rights but also the rights of environment, small farmers, and local people (Mugwagwa and Rutivi 2009).

In order to conduct a meaningful socio-economic evaluation, it is important to determine the fundamental criteria and indicators. On international level, socio-economic evaluation has generally focused on GMO cultivation's potential negative impacts. These criteria constitute three piers of the sustainability; economic, social, and ecologic dimensions. Besides, ethical evaluation and the impact on 3rd countries are also considered in this scope. European Commission has not established a clear view regarding whether ethical subjects and impact on 3rd countries are included in SEE (Greiter et al 2011). As defined by the member states, and as stated by the European Commission, SEE mainly focuses on the coexistence measures (such as the existence of GMO in neighbor areas, segregation in feed and food chain, consumer choices, costs, effect of biodiversity, change in agricultural systems, and marketing of the products) (Greiter et al 2011).

While evaluating socio-economic impacts; environment, economic and socio-cultural conditions should be taken into account not only for the country but also for the regions. The socio-economic impact on a region where family business dominate would be highly different than on a region dominated by large size businesses. For this reason, a socio-economic evaluation for a country or region cannot be adopted in another country/region. Evaluations and results may vary from country to country or even from region to region. Although Norway is a European country requesting socio-economic evaluation in GMOs' market launch, it is indicated that there is data insufficiency in this country for SE evaluation (Gomez-Barbero et al. 2008). European Commission reveals that data are limited for economic evaluation and data insufficiency is larger for social evaluation (Greiter et al 2011).

While assessing economic effects of GMO production, generally the economic benefit on farmers is emphasized. Answer is sought for the question whether the income of the farmer will increase with the GMO production. The productivity, production cost, and price are taken account for this. The productivity may vary between the countries, and even between the regions. In the same vein, production cost (seed, pesticide, labor force, etc. and also coexistence measures) may vary from region to region (Greiter et al 2011). For example, coexistence measures should be considered for the ones not producing GMO. In order to make a correct interpretation for the profitability and productivity of GMOs, productivity values of both GM and non-GM agricultural products are important. However, mainly data of production are given in GMO-related reports more than data of productivity. At the same time, pest control makes this evaluation more complicated. If there is no or insufficient pest control conducted in the area before GMO cultivation, the productivity cannot be only related with GMO cultivation. Increase in the productivity may be related with the pest management as well. For example, there was an increase observed in soybean productivity after GM soybean cultivation in Romaine, but efficient weed control also played a great role in this productivity increase (Greiter et al 2011).

CB Protocol has focused upon the conservation and sustainable use of biodiversity regarding the socio-economic impacts of the GMOs. Sustainability covers not only economic and social factors but also environmental dimension. At the same time, sustainability includes ethical questions such as the responsibility for the next generations. For this purpose, it is important to work on the effects on traditional farmers, country's agriculture, and local people. Especially in the developing countries, the impacts of GM products on poverty and development should be worked on. GM seed exporter companies present this technology as a choice for the developing countries for food assurance and sustainability. However, GMOs have mainly been developed in the developed countries for agriculture for commercial purposes by the private sector. This technology may render the private companies seeking for monopoly more powerful. Thus, this may create a danger for the sustainability of the agriculture in the developing countries where conventional agriculture is performed.

In countries where cultivation is allowed, ecological aspects are included in SE Evaluation. For example, since there is cultivation permission in the European Union, although environmental risk assessment is a required procedure, ecological aspects are also covered in socio-economic evaluation. Ecosystem services, climate change, national and regional features are not in scope of environmental risk assessment, but within SEE ecological aspects.

Ecology is one of the fundamental pillars of the sustainability. The concept of sustainability indicates the relation between ecology economy and the society. These mutual relations must be considered as long-term while performing evaluation in terms of sustainability.

The most discussed part of GMOs' socio-economic impacts in societies is the religious and ethical discussions. For example, in Muslim societies, the mostly discussed topic is whether the GMOs are halal or forbidden (Elenita 2007).

It is discussed in some countries that GM products' use and production may result in export market losses. Some countries will not desire the import of GM products. Especially European consumers are very sensitive for this subject (Gruere and Sengupta 2009), similarly, the consumers in some Asia and Middle East countries do not want to consume GM agricultural products (Falk-Zepeda et al 2013). Indeed, the consumer will be the identifier of GM agricultural product market in the world, because unless the consumer demands, the producer will not produce. For this reason, consumer acceptance and demand should be taken into account for the socio-economic evaluation. Including consumers in this evaluation strengthens the social dimension of the subject, and the evaluation then differentiate from one country to another. The number of the countries conducting socio-economic evaluation is highly limited and there are not any common criteria for the countries performing SE Evaluation. This indicates that the socio-economic evaluation criteria may be different with the fact that the socio-economic conditions of the farmers, consumers, and users in countries are different.

Socio-economic evaluation is basically seeking answer to the question whether it will be beneficial for the society and support the sustainable development. The subjects to be researched for this evaluation are as follows;

- Benefit for the society: Will there be any increase in productivity, income, and food quality?
- Health and welfare: Will it affect the health and welfare of the sector workers, country population, and consumers?
- Freedom of choice: Will the producer and consumer be able to choose GMO and non-GMO products, find both product groups in the market, and access easily? Indeed, the controls over GMOs increase the product prices. The precautions to be taken against a potential contamination during transportation may also increase the prices.

- Safety: Is it reliable for humans and environment? Potential impacts on human health in short and long term should be researched. Besides, environmental contamination risk must be investigated and it should be questioned whether they threat country's conventional diversities, and whether the gene source of the wild relatives of the product to be imported or produced exists in the country.

Certain indicators are required to perform these evaluations. The data to be used for the determination of the indicators for the evaluation of socio-economic impacts is of high importance. The data used in the developing countries during the SE evaluation process are generally on farm level. However, economic evaluation must be performed for overall economy. For example, GM cultivation or import, and its impacts on seed industry, food trade, food processing industry, feed industry, food prices, and agricultural employment should be separately evaluated. Moreover, these impacts should be considered on a regional level. During the SE evaluation, the environmental, economic, and socio-cultural conditions of the country or region must be taken into account. Since the data collected for the SE evaluation may vary even on regional level, the results will be different.

Answers to the following questions will be sought as a basis during the socio-economic evaluation to be conducted for the decision on cultivation/ import of a GM agricultural product.

- Is this product really needed?
- Will this product contribute to the solution of country's social problems such as poverty and starvation?
- Does this product have any superiority over the similar products already in the market?
- Does this product have any positive impact on the development of the industry?
- Will this product create any increase in the welfare or new employment?

- Will this product affect especially the development of the industry in rural, increase in welfare and creation of new job opportunities?
- Does this product impact the current production / producer?
- Will this product affect the cultivation of the conventional varieties?
- Will the consumers welcome this product?
- How will these products affect the prices of food, feed and commodity in the country?
- What will be the impact of this product on agricultural society (family businesses and agricultural employment)?
- Would this product affect the agriculture-based industry branches in terms of employment and income?
- Would this product have any effect on income and employment?
- How will this product affect the operational costs and competition?

These and other similar questions are asked for each country where socio-economic evaluation will be conducted at the decision stage of cultivation and/ or import of a GM agricultural product. However, these are not easy questions. As mentioned before, data insufficiency exists even in the developed countries. A detailed socio-economic evaluation is really challenging, time consuming and expensive (Ramatha and Andrew 2012). This also results from the social and environmental dimension of the subject. To set an example, it is hard to define the risk of local varieties that may go extinct with the import of a product, and the social and economic impact of a potential loss of a variety for the country. At the same time, the potential impacts of a product's import on the employment should be questioned, because although an imported product creates a new employment area, it may also cause many people to lose their jobs. It is again difficult to define how much and to what extent will the prices be affected, because the answers of these questions will change depending

on the geography, political system, and socio-cultural conditions of a country. As a result, socio-economic evaluation will vary from one country to another, and even from region to region within the same country. This is why the determination of the criteria to be used for our country's socio-economic evaluation is attached importance. In case this evaluation is imported on product basis, evaluation of soybean import and corn import, for example, may be very different from each other for our country.

The scope of socio-economic evaluation in Turkey is defined in Article 4 of the Law on Biosafety, which reads as “socio-economic evaluation will be conducted for GMOs for the conservation and sustainable use of biodiversity and define the impacts on the consumers and users, to be taken as a basis for the decision-making process for each application”. The definition of socio-economic evaluation in the law has been set forth as “all of the works performed to be evaluated before reaching a decision about an application based on scientific fundamentals to determine the socio-economic consequences to result from the impacts of GMO and its products on biodiversity, and users and farmers with its release in the environment and use”.

Since producing genetically modified plant and animals are prohibited activities in the Law on Biosafety, socio-economic evaluation has been identified as an evaluation to be performed before making a decision for each import application.

The following questions are asked to set a basis;

- Does it endanger the protection of biodiversity and sustainability?
- What can be the potential impacts on consumers and users?
- What can be the potential impacts on farmers?

Article 3, Paragraph 5 of the Law defines the conditions where the application will be rejected. Accordingly, in the events where the GMO and its products,

- a) Threaten human, animal and plant health and environment and biodiversity,
- b) It undermines the freedom of choice,
- c) It disrupts the ecologic equilibrium of the environment and of the ecosystem,
- ç) If there is risk of GMO propagating itself or its characteristics in,
- d) It dangers the sustainability diversity,
- e) If applicant does not have sufficient technical capacity to implement the measures to ensure biosafety

the applications are rejected. Since the conservation and sustainable use of biodiversity, and the impacts on consumers and users are included within the scope of socio-economic evaluation as per Article 4 of the Law, all of the impacts subject to the rejection of the application can be considered as criteria in scope of socio-economic evaluation.

Since GM plant and animal production are prohibited in Turkey, it is also prohibited to release them into the environment. Thus, the impacts over the biodiversity and sustainability are exempted from socio-economic evaluation and handled in scope of risk assessment.

For this reason, SE evaluation depends on defining the potential socio-economic

impacts on farmers, users, and consumers and evaluating these impacts accordingly.

Criteria to be used for determining the potential socio-economic impacts on the farmers

In the socio-economic evaluation conducted during the decision making process for the import application, several questions are asked in order to identify the potential effects on the producers. These are as follows;

- Does the country need the product to be imported?
- Is it possible that the producers cannot compete with the price of the product to be imported and lose their position in the related line of production?
- Will the foreign dependency increase with decrease in domestic production?
- Will the number of small sized producers diminish with the import of this product?
- Will the food security of the country be threatened with the foreign dependency in war and/ or crisis periods?
- Will the rural income decrease if the producer splits from production, and will the income distribution be spoilt with poverty, and rural-to-urban migration?
- Will the GM product import affect the export of the country's agricultural products? Would the countries, which are the export market of Turkey, give up import because of consumer preferences?
- Will the import of this product change the production pattern in the country? Will the potential change in production pattern affect the agricultural income?
- Will the GM product import occupy the market? Will it create foreign dependency and monopoly in the future?

- Does any potential decrease in the production of the product to be imported cause decrease in the biodiversity? Does quitting the production of the product to be imported cause decrease in the biodiversity? Does the gene source of the product to be imported exist in our country?

While seeking answers to the abovementioned questions, the criteria of socio-economic evaluation from the view of the producer are analyzed under three titles. These are;

- Production,
- Employment,
- Marketing and Creating an Added Value

Since the agricultural sector is a strategic sector, the continuity of the sector is vitally important for each country. The basis of evaluation of the production criterion is to evaluate the risk of producer's giving up the production after the import. The condition of the product in terms of meeting the domestic demand and the conditions of the producer to compete with the import product are evaluated; and the production conditions of and the supports to the product are taken into account. Any drop in domestic production will increase the foreign- dependency, and after a while, foreign dependency may cause monopolization in the market. Foreign dependency endangers the food security in war, embargo, and crisis times and may result in uncontrolled increase in food prices. At the same time, occupation of an imported product in the market will change the production pattern, and this may cause losing the varieties in time, whose production decreases, which, in return, cause a drop in biodiversity. The criteria to be used to evaluate the potential drop in production after importing the product are listed below.

- Product balance table (production, consumption, supply, losses, import, export, sufficiency rate by years)
- Product price

- Product costs
- Import price
- Export price
- Dependency to the product
- Whether the product is the main means of living in the region
- Existence of alternative (substitution) products and their production amounts
- Farmer habits
- Size of the farms
- Production projections
- Customs tax ratio
- Types of support to the product and change in the support amounts

The second important impact on producer's level of importing GM agricultural product is the drop in agricultural employment. If the producer gives up production because he cannot compete with the imported product, the producer may shift to alternative products. At the same time, he may detach from agricultural sector. This detachment causes poverty in the countryside and rural-to-urban migration. The people working in the line of production in countryside will turn into consumers in the cities. People migrating from rural parts will have to work in lower qualified works and poverty will increase. The share of the workers in the agricultural sector in the population participating actively in the labor force and the number of the producers of the product to be imported are very critical. The criteria to be used for the effects of the import of the potential GM agricultural product on the employment are given below.

- Rural population
- Rural-to-urban migration rate
- Employment rate in agriculture
- Average family size
- The number of small size farms in country's agriculture
- Employment in industries giving input to the agriculture
- Employment in agriculture-based companies
- The number of farmers on product basis
- The mechanization level on the basis of the product to be imported
- Share in the income/ share in the total production area
- Different employment opportunities in regions where this product is intensely produced

Another impact of importing GM agricultural product on the producer is the impact on product marketing and the added value it creates. Production, marketing, and consumption of agricultural products create an added value. The more this added value increases, the more contribution to the income, employment and welfare level increases. If it is a product, which creates an important added value in the country, the past and future connection of this product are taken into account. For this reason, the marketing and added value of the product to be imported will be effective for the decision whether to import the product. The following criteria may be used for this evaluation.

- Marketing rate of the produced goods
- Contract farming opportunities
- Whether the products provide purchase guarantee
- The number and capacity use ratios of the industrial enterprises that will use the goods to be produced as raw material
- The number of the actors in the marketing chain of the products and the farmer price. that the farmers have to pay for the products

Criteria to be used for determining the potential socio-economic impacts on the consumers and users

Taking only the producer into account while conducting socio-economic evaluation may endanger the balance in the country and result in deficient evaluation. Consumer's consuming the product with an affordable price and industry's obtaining the product as a raw material with affordable price are as important for the state economy as the continuity of the producer to produce. Thus, the criteria to be used during the decision for import to define the potential impacts on the industry, which will use the product as raw material, and on the final user, are provided separately in this section.

In Turkey, permissions have already been granted to 7 soybeans and 25 corns, in total 32 GM varieties for the purpose of feed. In other words, these permitted kinds can only be used for feed purposes. As a result, some questions are asked regarding the impacts of GMO product import decision on feed industry.

- Is the product to be imported an essential product for the feed rations?
- Is this product vital for animal feeding?
- How will the feed industry and livestock enterprises be affected in the event of importing, or failure of importing this product?
- Are there opportunities in the country to increase the production and self-sufficiency rate for the feed purpose use?
- In the event of failing to provide sufficient raw material, how will a crisis in this sector affects the country?
- How will the final product export be affected in the event of import/ failure to import?

Depending on the questions above, the effect of the import decision on the feed industry will be evaluated. During the evaluation, the amount of production and consumption of mixed feed in the country and foreign trade data are considered and the dependency of the feed industry on this sector will be examined. At the same time, the sustainability of the livestock enterprises is evaluated. While evaluating GM product import on feed industry, the criteria taken into account are as follows:

- Raw material price
- Final product costs
- Import price
- Export price
- Raw material dependency
- Raw material quality
- Alternative (substitution) raw material (production amounts and price)
- Operational capacity and capacity use rates

- Production and demand projections
- Raw material accessibility
- Place of feed industry and animal husbandry in the state economy
- Custom taxes (liabilities set forth in international agreements)
- Rural-to-urban migration rate
- The number of households earning their livelihood from agriculture-based industry and sub-industry
- Employment in agriculture-based industry companies
- Employment in sub-industry
- Number of labor force required for full employment in agriculture-based industry and sub-industry
- Technology level
- Labor force potential of the region

The impact of the product to be imported on the consumer is examined within the socio-economic evaluation. The impact of GM product import on society's health depending on the international literature and the impact of importing/not importing the product on consumer welfare are evaluated. The questions during the evaluation of the effect of GM product import on consumer are as follows:

- How will the food prices in the country be affected by the importing / not importing the product?
- Do the precautions taken to prevent misuse increase the cost and food prices?
- Will the product prices increase due to costs stemming from the controls and analyses against the contamination risk of the imported GM product?

- Will the precautions to be taken to prevent spreading during GM product transport increase product cost and costs to the country?
- Will the consumer demand towards the products of animals fed with GM decrease?
- Will the consumer's right to choose be taken away as a result of the monopolization in the market?
- Is it proper for consumer's ethical and cultural values?
- Will there be an increase in non-GMO product prices?

These questions are asked during evaluation and the following criteria are used in this process.

- Demand estimations
- Consumer perception of GM products
- Consumer habits
- Ethical values
- Labeling
- Prices of the products, substitution products, and supplementary products
- Accessibility to food
- Accessibility to conventional product
- Product's place in nourishment
- Product's sale volume

Cartagena Protocol on Biosafety has focused on the conservation and sustainable use of biodiversity regarding the socio-economic impacts of GMOs. Sustainability includes the environment dimension in addition to economic and social factors. Sustainability also covers ethical problems such as the responsibility for the next generations. Ecology is one of the fundamental pillars of the sustainability. Sustainability concept indicates the mutual relations between ecology, economy, and society. During the evaluation for sustainability, these mutual relations should be taken into account for long term. Accordingly, it is important to study on conventional farmers, agriculture in the country and local people.

In Turkey's 2010 dated Law on Biosafety, Article 4 states the provision regarding the performance of socio-economic evaluation for the purposes of conservation and sustainable use of biodiversity and determining the impacts on consumers and users. In Article 3 of the Law, the reasons for which GMO import application will be rejected are defined, and these should be considered as the criteria set for the performance of socio-economic evaluation.

While performing the socio-economic evaluation, an answer is sought for the question is “does the GM product threaten the welfare of the society and the environment?”. In other words, the question whether an approved product be beneficial for the society and support sustainable development is assessed countrywide. The decision should be given by evaluating the farmers producing this product to be imported and the impacts on the industry that will use this product as well as impacts on final consumer.

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SOCIO-ECONOMIC EVALUATION CRITERIA IN DECISION-MAKING PROCESS FOR GMO AND GMO PRODUCTS

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