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Safeguarding Biosafety in the Context of the International Circulation of Genetically Modified Organisms

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Abstract:

Biotechnology has found numerous applications in various fields that benefit humankind. Nevertheless, it also entails risks that may be harmful to humanity. These risks may generally be classified into health-related and environmental risks. Environmental risks, in particular, are the most complex because of their connection to the sustainable development of peoples across the world. Such risks may be summarised in the emergence of products marketed and used as medicines or foodstuffs, namely genetically modified or engineered organisms. However, the latter have a direct impact on the environment and its biosafety because they rely on biological organisms, including plants and animals. They consequently lead to the disappearance of original and hereditary characteristics in favour of acquired ones, as modified and engineered products replace natural and original products, thereby affecting the sustainability of biological diversity throughout the world.

Keywords: Biosafety, genetically modified organisms, environment, medicines, foodstuffs.

Introduction:

The environment constitutes the vital sphere in which all living organisms humans, plants, and animals exist. With the expansion of industry and technological development, innovative techniques have emerged that rely on biological resources to develop marketable products, whether through a manufacturing process or as finished products. These technologies are known as biological techniques, or biotechnology. Patents and intellectual property rights are granted in connection with them, while the resulting products are referred to as genetically modified or genetically engineered organisms. The European Union directive relating to biotechnology defines a genetically modified organism as: “Any organism whose genetic material has been altered in a manner that does not occur naturally through mating and/or natural recombination. This implies the necessity of human intervention and excludes ‘natural’ genetic modifications resulting from mating...”

Examples of such products include the modification of certain plants to make them resistant to herbicides and insects, thereby reducing the use of chemicals that are harmful to the environment. Other examples include genetically modified plants designed to remove radioactive pollution from the atmosphere, as well as alternatives to organic plastics. In the agricultural sector, this technology has produced crops that can withstand unfavourable biological or environmental conditions and has improved plant quality. In the fields of health and medical treatment, it has enabled the manufacture of medicines based on natural components involving bacteria and other substances...

However, despite the benefits derived from genetic modification, concerns about its potential risks to the environment are increasing. Genetically modified plants pose a genuine ecological threat to agriculture and its future. They may lead to a decline in certain plant species that feed on genetically modified plants, or such products may disrupt the integrity of biological diversity that is, biosafety. Another issue lies in the connection between the genetic modification of products and intellectual property rights, which may result in the monopolisation of plant patents and negatively affect the rights of indigenous farmers. Although this technology offers considerable benefits to humankind, it also entails risks that inevitably lead to the disappearance of hereditary characteristics in favour of acquired ones.

In this regard, the need arose for an international legal framework governing genetically modified products in order to protect human safety in particular and the environment in general. This was achieved through the Cartagena Protocol on Biosafety, adopted in 2000 as a supplementary instrument to the 1992 Convention on Biological Diversity. Its general objective is to ensure an adequate level of protection and safety in the transfer, handling, and use of living modified organisms resulting from modern biotechnology that may have adverse effects on biological diversity and human health.

Furthermore, the Protocol established a scientific approach to assessing the potential risks posed by these organisms, while its Conference of the Parties called for the development of a system of liability and redress for damage caused by them.

In light of the foregoing, and for the purpose of examining this subject, the following research problem may be raised: What harm results from the circulation of genetically modified organisms, what liability arises therefrom, and how can environmental safety, or biosafety, be ensured during the transfer and modification of genetically modified organisms?

To answer this question, this research will be divided into three sections:

Section One: The general framework governing genetically modified organisms.

Section Two: Damage resulting from genetically modified organisms.

Section Three: International environmental regulation of the circulation of genetically modified organisms for the preservation of biosafety.

Section One: The General Framework of Genetically Modified Organisms

Biotechnologyⁱ is one of the most significant revolutions taking place in the world today, as it is closely connected to living organisms and biological resources. This revolution has opened broad prospects for resolving many human problems, particularly in the fields of food and medicine. It has contributed to the provision and improvement of foodstuffs and to finding solutions for incurable diseases that once claimed human lives. These technologies have produced what are known as genetically modified organisms, through processes referred to as genetic modification or genetic engineering...

Since the end of the last century, genetic modification or engineering has been used to improve environmental quality, enhance the standard of agricultural products particularly food products develop human healthcare and medical treatment, and generate economic returns for companies investing in this field and for individuals associated with it. The 2000 Cartagena Protocol on Biosafety expressed this by stating that biotechnology has great potential to promote human well-being if it is developed and used in accordance with adequate safety measures for the environment and human health.ⁱⁱ

Article 2 of the 1992 United Nations Convention on Biological Diversity defines biotechnology as: "Any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use."

Genetically modified organisms (GMOs) and their products are among the most prominent applications of this technology. The genetic characteristics of an organism are controlled by transferring desirable genetic traits from one species to another, strengthening or enhancing the presence of such traits, or eliminating other undesirable traits. This may involve transfers from plants to animals or vice versa, as well as from microorganisms to plants.ⁱⁱⁱ

A genetically modified organism was defined in the European Union Directive (EC/220/90/EC) relating to biotechnology as: "Any organism whose genetic material has been altered in a manner that does not occur naturally through mating and/or natural recombination." This means that human intervention is necessary and that "natural" genetic modifications resulting from mating or recombination are excluded. Organisms resulting from such processes are not regarded as "genetically modified organisms" unless these natural modifications have been carried out using genetically modified living organisms. The Directive also expressly excludes human beings from its scope of application.

They have also been defined as: organisms, whether plants or animals, into whose cellular genetic structure one or more "genes" from another plant or animal have been introduced for the purpose of producing one or more new and desirable genetic traits. These traits may include resistance to harsh environmental or biological conditions or improvements in the nutritional value and size of a plant. Such procedures were traditionally performed on plants and animals through hybridisation and conventional breeding methods, which are characterised by their lack of precision and the considerable time they require. Genetic engineering, by contrast, makes it possible to obtain these desirable traits in living organisms both accurately and rapidly.^{iv}

Genetically modified products are created through the use of a living organism, a part thereof, or one or more modified organisms to obtain a product of commercial value. They are therefore goods and products containing organisms whose genetic structure has been modified. Examples include soybeans and maize, both of which are used in the manufacture of numerous food products, as well as baker's yeast containing enzymes that benefit people with diabetes, among other products.^v

Section Two: Damage Resulting from Genetically Modified Organisms

Biotechnology techniques have brought about remarkable achievements worldwide and have transformed many fields, particularly medicine and human healthcare, as well as food security and the improvement of agricultural crops. However, despite the benefits derived from genetic modification, concerns about its potential risks to the environment are increasing. Genetically modified plants pose a genuine ecological threat to agriculture and its future. They may lead to a decline in certain plant species that feed on genetically modified plants, or such products may compromise the integrity of biological diversity that is, biosafety. Although this technology offers considerable benefits to humankind, it also entails risks that inevitably lead to the disappearance of hereditary characteristics in favour of acquired ones.

Multinational corporations seek to influence government policies in order to secure the acceptance of genetically modified materials.^{vi} Five international companies dominate the global market. The American company Monsanto controls 90% of the genetically modified seed market, alongside Syngenta, DuPont, Dow, and Bayer. Moreover, the United States of America, Argentina, Canada, and China account for 99% of cultivated genetically modified plants. In 2001, the market value of genetically modified materials reached 367 billion dollars.^{vii}

In this context, the United States threatened to take action against the European Union within the World Trade Organization because of the latter's refusal to import genetically modified foodstuffs. Mr. Zoellick, the United States Trade Representative, also travelled to Brazil at the end of May 2004 to pressure the country into lifting its ban on these foods. Similarly, at the 2002 Earth Summit in Johannesburg, the US Secretary of State attempted to pressure Southern African countries into accepting genetically modified food. In India, by contrast, two ships carrying an estimated 10,000 tonnes of such materials were turned away following a campaign led by organisations and women's associations.

For this reason, US President Bush criticised the European Union's rejection of genetically modified crops, arguing that their use formed part of the campaign against world hunger and that Europe, through its refusal, stood in the way of "the great cause of ending hunger in Africa."

Genetic engineering has thus become a slogan invoked in the fight against hunger and in the pursuit of human well-being. The problem, however, is that once the United States succeeded in pressuring the Brazilian government to lift its ban on these foods, the biotechnology company Monsanto proceeded to claim its ownership rights over soybean genes with comprehensive resistance. This demonstrated that generating profits through the collection of intellectual property royalties was the principal objective behind the promotion of these products.^{viii}

Another issue concerns the connection between the genetic modification of products and intellectual property rights^{ix}, which may result in the monopolisation of plant patents and adversely affect the rights of indigenous farmers. The companies that dominate agricultural biotechnology and protect their products through the intellectual property system are the same companies that manufacture agricultural pesticides and control the seed market. To cultivate their land again, farmers must therefore return to these companies to purchase seeds, fertilisers, and the appropriate pesticides. This places the future of farmers and the economies of entire countries in the hands of multinational corporations.

The expansion of genetically modified seed cultivation is encouraged by claims that such seeds are resistant to insects, reduce pesticide use, and produce abundant yields. These alleged advantages encourage local farmers to adopt them, only for it to become apparent after cultivation that the losses suffered by farmers and original genetic resources are even greater. In 2006, researchers at Cornell University conducted a study involving 481 Chinese farmers who had cultivated genetically modified Bt cotton. The study confirmed that, after four years of cultivation, pesticide use had become equivalent to that required in conventional farming. This resulted in lower yields, compounded by the high cost of genetically modified seeds.^x

Section Three: International Environmental Regulation of the Circulation of Genetically Modified Organisms for the Preservation of Biosafety

The circulation and transfer of genetically modified or engineered organisms have been regulated in order to safeguard biosafety and biological security through international agreements, the most important of which are the Convention on Biological Diversity and its supplementary Cartagena Protocol.

In this regard, the Convention on Biological Diversity adopted the principle of State sovereignty over the environment, under which States may exploit their resources in accordance with their own environmental policies. They are nevertheless responsible for ensuring that activities conducted within their jurisdiction or under their control do not cause damage to the environment of other States or to areas beyond the limits of national jurisdiction. Article 5 of the Convention on Biological Diversity stipulates that each Contracting Party must cooperate with other Parties, either directly or through competent international organisations, in the conservation and sustainable use of biological diversity. Article 6 requires each Party, in accordance with its particular conditions and capabilities, to develop national strategies, plans, or programmes for the conservation and sustainable use of biological diversity. Article 10 of the aforementioned Convention provides for the adoption of measures relating to the use of biological resources in order to avoid or minimise adverse impacts on biological diversity and to protect and encourage the customary use of biological resources.^{xi}

It should be noted that the Convention on Biological Diversity did not establish detailed rules and provisions concerning biosafety or the circulation and use of genetically modified organisms. Nor did it specifically regulate modified organisms; rather, it provided a general definition of biotechnology. This prompted States to adopt the Cartagena Protocol, a supplementary instrument to the Convention on Biological Diversity, which regulates the transfer, handling, and circulation of genetically modified organisms.^{xii}

With regard to the Protocol's general objective, Article 1 pursuant to Principle 15 of the Rio Declaration on Environment and Development^{xiii} provides that its purpose is to contribute to ensuring an adequate level of protection and safety in the 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, while also taking into account risks to human health and focusing particularly on transboundary movements.^{xiv}

Accordingly, the scope of the Protocol's provisions was determined by taking into consideration the type of living organisms involved, whether natural or modified, the products associated with them, and the types of risks they may cause. Its procedures therefore apply to any use or transboundary movement of living modified organisms that may have adverse effects on the environment, biological diversity, or human health. The express reference to the protection of human health is particularly important because the Protocol primarily addresses biological diversity. Article 4 provides:

"This Protocol shall apply to the transboundary movement, transit, handling and use of all living modified organisms that may have adverse effects on the conservation and sustainable use of biological diversity, taking also into account risks to human health."

Conclusion

It may be concluded that biotechnology and its applications offer significant prospects and opportunities for humanity as a whole. They have improved human living standards and well-being and provided means of subsistence and

medical treatment that have helped prolong human life, after it had once been threatened by incurable diseases and epidemics. However, alongside these considerable benefits, there are risks to biosafety that affect the environment and the organisms living within it. It has therefore become necessary to protect biological organisms and to preserve the diversity and sustainability of biological resources within the framework of international agreements, the most important of which are the Convention on Biological Diversity and its supplementary protocol, namely the Cartagena Protocol on Biosafety.

Accordingly, the following recommendations may be proposed:

Developing countries should form alliances in order to contribute to bringing about change in the new international order, including the framework governing environmental issues and biosafety.

Greater attention should be given to the environment and the abundant biological resources of developing countries. The system governing these resources should therefore be reviewed, and developing countries should receive fair compensation for their use and conservation.

The diversity found in developing countries must be preserved through the protection of their biological resources, traditional knowledge, and folk medicine.

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ⁱ Dana Hama Baqi Abdel Qader, *Intellectual Property Rights Relating to New Plant Varieties and Pharmaceutical Products*, Dar Al-Kutub Al-Qanuniyya and Dar Shatat for Publishing and Software, Egypt, 2011, p. 1.

ⁱⁱ Muhammad Adel Askar, *International Rules Governing the Circulation of Genetically Modified Organisms*, Arab Studies Centre, Egypt, 1st ed., 2019, p. 7.

ⁱⁱⁱ Muhammad Adel Askar, *op. cit.*, 2019, p. 8.

^{iv} Muhammad Adel Askar, *ibid.*, pp. 28–29.

^v Muhammad Adel Askar, *op. cit.*, p. 29.

^{vi} It should be noted that major multinational corporations exploit the biological resources of developing countries and the traditional knowledge associated with them. They use this knowledge to conduct experiments and research, monopolise the resulting findings through intellectual property mechanisms, and deprive its original holders of fair and equitable compensation. Over past centuries, many distinctive genetic resources were transferred from their countries of origin to industrialised countries. On this matter, see Dana Hama Baqi Abdel Qader, *op. cit.*, p. 31.

^{vii} Ahmed Boukhni, "The Effects of the Intellectual Property Protection System for Genetically Modified Organisms on States' Genetic Resources," *Al-Haqiqa Journal*, Issue 41, p. 163 et seq.

^{viii} Djamel Laib, *Biological Diversity as a Dimension of International Law and International and Algerian Efforts to Protect It*, Master's thesis in International Law and International Relations, Faculty of Law, Ben Aknoun, Algiers, 2005, pp. 32–33.

^{ix} Abdel Rahim Antar, *The International Perspective on the Protection of Biological Resources and Traditional Knowledge: A Comparative Study*, Arab Studies Centre, 2014, p. 3.

^x Ahmed Boukhni, op. cit., p. 163.

^{xi} On this matter, see the Convention on Biological Diversity, adopted in Rio de Janeiro on 5 May 1992 and ratified by Algeria pursuant to Presidential Decree No. 163/95, published in the Official Gazette, Issue 32, dated 14 July 1995.

^{xii} Muhammad Adel Askar, op. cit., pp. 34–35.

^{xiii} For further information on the United Nations Conference on Environment and Development the 1992 Rio Conference see Muhammad Wajdi Nour al-Din Ali, International Protection of the Environment: From the 1972 Stockholm Conference to the 2012 Doha Conference, Zain Legal Publications, Beirut, Lebanon, 1st ed., 2016, p. 52 et seq.

^{xiv} Abdel Rahim Antar, The Impact of the TRIPS Agreement on Biological Diversity and the Traditional Knowledge Associated with It, Dar Al-Fikr Al-Jami'i, Alexandria, 2009, pp. 214–215.