Dangers posed by Genetically Modified Organisms on Food Security and Public Health: Analytical Study

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ABSTRACT

The concept of food security pertains to the availability and accessibility of the wholesome food. It is often said that biotechnology has resolved the food requirements of the society by guaranteeing the right to food. Moreover, the biotechnological advancements have preventive, curative and therapeutic effect on the public health which refers to all organised measures (whether public or private) to prevent disease, promote health and prolong life of the population as a whole. However, here are various apprehensions regarding genetically engineered microorganisms, as once released into the natural environment, they may have a good chance to survive, multiply, and exchange genetic material, or hybridize with other microorganisms in the environment; and might become impossible to arrest subsequently. The strengthening of the Intellectual Property Rights protection for living organisms, especially plants, would limit free acquisition or exchange. Access can now be gained through plant licences, material transfer agreements, bag-label contracts and technology use agreement. In addition, *patents on biotechnology produced healthcare products would push the control of the much-needed healthcare products into private hands, which might make them unaffordable. All these concerns require a thorough analysis of the problem and improvement of the established mechanisms.*

Keywords: *Food security, public health, genetically modified organism, Cartagena Protocol on Bio-safety, Agreement on Sanitary and Phyto-sanitary Measures*

"The inherent dangers of tampering with nature must always be heeded and addressed."

1. Introduction

Genetically Modified Organism (GMO) refers to an organism whose genetic material is altered through genetic engineering in such a way that the organism possesses certain non-natural, genetically modified physical and chemical properties, qualities, and features that make it unique and special. **[1]** A number of multinational companies across the globe offer to generate genetically transformed plants that would have not only the desirable characteristics normally attainable by conventional breeding programs but all the extra advantages such as high yield, growth in arid conditions, additional nutritional quality, increased shelf life **[2]** and others that would be necessary **[3]** in order to be able to meet the growing demand for food.

Similar in fashion to transgenic plants, transgenic animals can give a high yield of flesh, milk, and wool with imbedded capacity to resist and withstand diseases.

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There is great uncertainty as to whether grant of patent to Genetically Modified Organisms is justified. The main reason behind such uncertainty is the lack of thorough study of the plausible effects of GMOs on food security and public health. Hence, a thorough and deep-rooted analysis is necessitated.

This research paper is a humble attempt to present a to-the-point quality study, after comprehensively examining the dangers posed by Genetically Modified Organisms on food security and public health and consequently, to examine the justification behind the prevailing practice of granting patents to GMOs.

2. Food Security

Food security is a matter of concern to be looked into by every nation as it has serious repercussions on economic, social and political stability. It is all the more important for developing countries like India which has limited resources for its unlimited vast population. **[4]** The concept of food security as understood in present context is the availability and accessibility of the wholesome food.

It is often said that biotechnology has resolved the food requirements of the society by guaranteeing the right to food. **[5]** For example, the green revolution in India played a significant role in achieving self-sufficiency in food-grain production.

3. Public Health

The World Health Organization (WHO) defines health **[6]** as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity", and, the public health "refers to all organised measures (whether public or private) to prevent disease, promote health and prolong life of the population as a whole". **[7]** The developments in biotechnology have preventive, curative and therapeutic effect on the public health. The regenerative and stem cell technologies could possibly lead to unprecedented treatments and potential cures for Alzheimer's disease, cancer, diabetes, Parkinson's disease and several other debilitating diseases. **[8]**

4. Overhauling the dangers posed by GMOs on food security and public health

There are various apprehensions regarding genetically engineered microorganisms, as once released into the natural environment, theoretically they may have a good chance to survive, multiply, and exchange genetic material, or hybridize with other microorganisms in the environment; such hybridization between GMOs and naturally occurring counterparts may create new hazards. For example, wheat that has been genetically modified to resist pesticides may pass its pesticide-resistant gene on to a weed, creating the risk of disrupting ecological cycles. Further, the GMOs are capable of spreading to the limits of their ecological niche, oblivious to international boundaries, and once released into the environment the spread of a GMO would be difficult to arrest because on release they may cross international borders, spreading diseases by the airborne transport of spores. Hence, both the citizens and the environment of one country can be affected by a deliberate release originating in another country, thereby creating an international concern. **[9]**

The technology such as the GURT (genetic use restriction technology) may further render the harvested crop turning sterile. However, safeguards are provided under the Indian law, where registration of the plant variety is not allowed if the variety in question involves any technology such as the Genetic Use Restriction Technology (Terminator Technology) which is injurious to health of humans, animals and plants. **[10]**

5. Safety Mechanisms at International Level against GMO associated risks

5.1 Agreement on Sanitary and Phyto-sanitary Measures (SPS Agreement)

While allowing member states to take the sanitary, i.e. human and animal health-related, and phyto-sanitary, i.e. plant health-related measures necessary to protect health, *the agreement seeks to prevent unnecessary trade obstacles*. **[11]** The SPS agreement requires the members to ensure that measures are "based on scientific principles and are not maintained without sufficient scientific evidence", and that these measures should be "based on an assessment appropriate to the circumstances taking into account risk assessment techniques developed by the relevant international organizations".

5.2 Agreement on Technical Barriers to Trade (TBT Agreement)

The TBT agreement applies to deals with standards and technical regulations, such as packaging, marking, and labelling requirements, which are not promulgated for sanitary or phyto-sanitary purposes. This agreement would likely apply to technical barriers imposed on the import of living modified organisms (LMOs), not to protect the environment or human health but to inform consumers or to protect a state's culture or economy. **[12]** Labelling of GM products is desirable for several reasons. Labels can provide information about allergens, toxins, change in cooking characteristics, or nutritional content of food, and the ethical or environmental concerns, and can help to prevent deceptive practices.

5.3 The Cartagena Protocol on Bio-safety

The precautionary principle enshrined under Article 1 of the Protocol implies that "where there are threats of serious or irreversible damage", lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation. The protocol permits the adoption of precautionary measures to restrict imports of such organisms when the risk they pose for the environment or health is deemed incompatible with the level of environmental protection and safety set by the importing state. **[13]**

Advanced Informed Agreement enshrined under the Protocol requires notifying the importing country in advance about the GMO in order to ensure the importing country takes necessary precautions and other required risk assessments **[14]** according to their local needs. The AIA procedure does not apply to LMOs in transit or destined for contained use, for example, in industrial production of enzymes or in fermentation processes. Further, it does not apply to LMOs intended for direct use as food, feed, or processing (the so-called LMO-FFPs), for which a different procedure has been provided wherein a country intending to export LMO-FFPs is merely required to inform the potential recipient country of its decision through a "Bio-safety Clearing-House". **[15]**

Article 20 of the Cartagena Protocol provides for the establishment of an Internet-based central Biosafety Clearing-House under Article 18(3) of the CBD in order to "facilitate the exchange of scientific, technical, environmental and legal information on, and experience with, living modified organisms."

6. Effect of patenting of GMO on Food Security

The strengthening of the Intellectual Property Rights protection for living organisms, especially plants, limits the possibilities of free acquisition or exchange. Access can now be gained through plant licences, material

transfer agreements, bag-label contracts and technology use agreement. From the developing nation's point of view, grant of patent poses a serious threat to the indigenous farmers who would be loaded with the burden of paying royalties to the suppliers of improved variety of seeds who would be the patent owners of the seeds.

An additional concern is that, most of the genetically modified plants which come from developed nations such as United States of America have their potential market in developing countries like India where safety norms are comparatively lenient, mainly due to inadequate institutional capacity or the regulatory framework or poor enforcement.

7. Effect of patenting of GMO on Public Health

It is argued that patents on biotechnology produced healthcare products would push the control of the much-needed healthcare products into private hands, which might make them unaffordable. It is very difficult to estimate the size of the "chilling effect" of patents on such research, which anecdotal evidence suggests may be substantial. **[16]** Gene patents on the various gene technology innovations act as gatekeeper patents, thus infringing upon both these facets of "right to health".

8. Conclusion

It is important that biotechnology is used for the social benefit and economic development of the nation. To fulfil this vision, it has to be ensured that research and application in biotechnology is guided by a process of decision-making that safeguards both human health and the environment with adherence to the highest ethical standards. A scientific, rigorous, transparent, efficient, predictable, and consistent regulatory mechanism **[17]** for biosafety evaluation and release system or protocol is essential to achieve these multiple goals. Biotechnology produced food (genetically modified food) with non-natural qualities and traits needs to undergo proper tests and trials before it is released for consumer use.

Moreover, compulsory licensing mechanism must be given a boost at national level so that essential health care drugs are readily available and accessible to the needy.

This research paper subsumes the responsibility of consolidating the dangers associated with release of genetically modified organisms in environment along with international safety mechanisms already in existence to safeguard against any contingency arising out of such dangers. Further, the research paper discussed the potential effects of granting patents to genetically modified organisms on food security and public health. It may provide useful insight to budding researchers in understanding the concept more clearly which may be utilized to advance benefit to humanity, by evading the conflict between biotech innovators and the society as a whole.

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[10] Section 29(3) of the Plant Varieties Act 2001 states that, Notwithstanding anything contained in sub-section (2) and sub-sections (1) and (2) of section 15, no variety of any genera or species which involves any technology which is injurious to the life or health of human beings, animals or plants shall be registered under this Act. Explanation- For the purposes of this sub-section, the expression any technology includes genetic use restriction technology and terminator technology.

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[13] Francesco Francioni and Tullio Scovazzi (eds.), *Biotechnology and International Law* (Hard Publishing, Portland, USA, 2006).

[14] Article 15(1) of the protocol mandates that the importing country should base its decision upon risk assessments carried out in a *"scientifically sound manner"*.

[15] Akech and J.M. Migai, Developing Countries at Crossroads: Aid, Public Participation, and the Regulation of Trade in Genetically Modified Foods, *Fordham International Law Journal, 29(2),* 2006, 265-298.

[16] Graham Dutfield, DNA patenting: implications for public health research, *Bulletin of the World Health Organization, 84(5),* 2006, 388-392.

[17] Regulation of any field or technology, for that matter, is required because anything that is left unregulated becomes abused, misused, or overused, leaving bad effects of such field or technology for the future generations.