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Social and Ethical Challenges Associated with Genetically Modified Organisms (GMOs)

SWAPANIL[1] AND PROF. (DR.) SANJAY PRAKASH SRIVASTAVA[2]

ABSTRACT

The DNA of one organism is inserted into the genes of an unrelated species, generating the desired trait in every cell of the target organism and producing genetically modified food. This genetic engineering is having some benefits but create social and ethical challenges for the society. In the process, scientists created a technology that has deformed into a creature of economics, of the privatization of the natural world, and of international trade. It is obvious, that the next frontier in the issue over genetically modified organisms (GMOs) distinct itself in the reference of intellectual property rights. Policy makers should use a broader view to examine the critical implications for the international community and reshape this application of intellectual property in line with the long-term public interest. The problem is not that genetic engineering technology subsists, but how that technology is being used. This article has raised for discussion some important issues to consider as to social and ethical dimensions of the technology and how it is being utilized.

Keywords: *Genetically Modified Organisms (GMOs), Genetic Engineering Technology, Social, Ethical, Intellectual Property rights.*

I. INTRODUCTION

In the sphere of technological development human life is touching new heights, biotechnology is one of the most advance technology in the globlisation era. Biotechnlogy means scientific knowledge uses life or living entitles like micro organims, plants and animals for practical and commercial purpose to get desired result. Through biotechnology like genetic engineering, the DNA of one organism is inserted into the genes of an unrelated species, generating the desired trait in every cell of the target organism and producing genetically modified food[3]. Now, this genetic engineering is having some benefits but create social and ethical challenges for the society. This genetic engineering is having some benefits but create social and ethical

[1] Author is a Research Scholar at CUSB, Gaya, India.
[2] Author is an Professor at CUSB, Gaya, India.
[3] Debra M. Strauss, The International Regulation of Genetically Modified Organisms: Importing Caution into the U.S. Food Supply, 61 FOOD & DRUG L.J. 167, 167 (2006)

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challenges for the society.[4].

Genetically Modified Organisms (GMOs) are created when the genes of one organism are inserted into the DNA of another organism, causing the target trait to be expressed in that non-related species. In the case of a genetically modified plant, the desired trait is typically a resistance to sprayed pesticides or toxicity towards predatory insects[5]. In the process, scientists created a technology that has deformed into a creature of economics, of the privatization of the natural world, and of international trade. It is obvious, that the next frontier in the issue over genetically modified organisms (GMOs) distinct itself in the reference of intellectual property rights. The issues raised are no longer only matters of science and the answers no longer merely on scientific knowledge, which has proven incapable.[6] Instead, policy makers should use a broa der view to examine the critical implications for the international community and reshape this application of intellectual property in line with the long-term public interest.

II. DISCUSSION

This article is focusing on the GMO which are developed through genetic engineering. As ethically and socially concerns may also animate market forces in the form of consumer demands, as well as objections once the GMO's are commercialized, what will impact on society and especially farmers. But between the research technology and its commercialization stages in the development of emerging GMOS, the regulatory-approval step provides perhaps the best opportunity to expressly and formally consider the ethical and social impacts of GMOS. Yet, when confronted with making regulatory decisions that raise such ethical and social concerns, apex regulatory agencies often seem prevented by legal and practical restraints from addressing those very issues[7].

III. SOCIAL ISSUES

The promoters of technology in agriculture showed huge benefits of genetically engineered crops. A study commissioned by the World Health Organization (WHO) cited several expected benefits of this food technology, including the potential for increased agricultural productivity and improved nutritional values, along with "reduced agricultural chemical usage and

[4] Debra M. Stauss, "Defying Nature: The Ethical Implications of Genetically Modified Plants" (2007). Business Faculty Publications. 222.
[5] World Health Organization, 20 Questions on Genetically Modified (GM) Foods, http://www.who.int/foodsafety/publications/biotech/20questions/en/index.html
[6] Debra M. Strauss, Feast or Famine: The Impact of the WTO Decision Favoring the U.S. Biotechnology Industry in the EU Ban of Genetically Modified Foods, 45 AM. BUS. L.J. 775 (2008)
[7] Gary Marchant, Ann Meyer & Megan Scanlon, Integrating Social and Ethical Concerns Into Regulatory Decision-Making for Emerging Technologies, 11 MINN. J.L. SCI. & TECH. 345 (2010).

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enhanced farm income, and improved crop sustainability and food security, particularly in developing countries[8]."But the same study found that many of these goals have not been met. "Some farmers report lower yields, continuing dependency on chemical sprays, loss of exports, and critically reduced profits for farmers as a consequence of using genetic modified crops."

(A) Pesticide Use

Monsanto promises to "use sound and innovative science and thoughtful to deliver high-quality products that are beneficial to customers and to the environment[9]. Contrary to its marketing materials will reduce pesticide use or chemical inputs, the herbicide resistant plants may in fact do the opposite. Experts have predicted that "though in a few instances herbicide-resistant crops may result in a reduction of toxic herbicide use, but mostly the use of herbicide resistant crops will increase herbicide and pesticide use which also increase the environmental pollution."[10] In addition, he notes that "farmers will suffer because of the high costs of employing herbicide-resistant crops particularly since herbicide-resistant crops may increase weed control costs two fold."

In addition, those plants are genetically engineered for pest resistance, such as Bt crops, may need the spray of pesticides. Moreover, these pest-resistant varieties may trigger the creation of Bt-resistant "super bugs." Bt crops violate the widely accepted principle of integrated pest management (IPM)–that reliance on any single pest management technology tends to trigger shifts in pest species or the evolution of resistance through one or more mechanisms.[11]

Theoretically, the use of genetic modified plants in sustainable and integrated agriculture should reduce pesticide use, but practically herbicide-resistant crops and Bt-resistant crops have negative environmental impacts." These facts are combined the risks associated with GMOs and the big threat that GM crops pose to the organic farming industry, reveal that the use of genetics to control weeds and pests in this situation may not be as beneficial as claimed. One ethical question arise that there is need to more strong herbicide and pesticide to the restraint weeds and pests for growing the crops.

(B) Nutritional content

The biotech industry has focused its marketing campaign on the production of rice that is

[8] World Health Organization (WHO), Modern Food Biotechnology, Human Health and Development: an Evidence-Based Study, at iii

[9] Monsanto, Our Pledge, http://www.monsanto.com/monsanto/layout/our_ pledge/monsanto_pledge.asp

[10] David Pimentel, Overview of the Use of Genetically Modified Organisms and Pesticides in Agriculture, 9 IND. J. GLOBAL LEGAL STUD. 51, 63 (2001)

[11] NATIONAL RESEARCH COUNCIL, NATIONAL ACADEMY OF SCIENCES, ECOLOGICALLY BASED PEST MANAGEMENT (1996)

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genetically modified with vitamin A, called "Golden Rice." This genetically engineered rice produces beta-carotene in its endosperm, giving it a distinct yellow color. The biotech industry has claimed that Golden Rice will aid people in developing countries who lack vitamin A in their diets[12].

Critics of the biotechnology industry explain that, GM products will not end vitamin A deficiencies because a paucity of a single micronutrient like vitamin A "seldom occurs in isolation, but is one aspect of a larger context of deprivation and multiple nutrient deficiencies."[13]Developing countries People suffer from vitamin A deficiency, not because their rice contains too little vitamin A or beta-carotene, but because of a lack of variety in their diet, and they suffer many other dietary illnesses that cannot be addressed by beta-carotene.[14] However, this situation presents a social problem in that "the hurdle of access and distribution," as with non-Genetic modified rice, "must still be overcome to get the rice to those who need it". The support of the golden rice means to support the monoculture which is harmful of the diet acceptability.

(C) Farmer's income

The WHO study set on that the cost-efficiency of GM crops appears to vary with the specific situations, such as growth conditions that are dependent on regional agro-ecological factors, particularly the baseline of pest pressure and pesticide uses.[15] In fact, in some countries prohibiting the planting of GM crops would give the region a marketing edge by guaranteeing that none of its food exports contain GM crops. In other countries, potentially expensive efforts to segregate GM crops from crops of conventional or organic farming include specific isolation distances, buffer zones, pollen barriers, control of volunteer plants, crop rotation, and planting arrangements for different flowering periods, as well as monitoring during cultivation, harvest, storage, transport, and processing. Moreover, the WHO study identified additional costs from the issues of liability and compensation for economic loss due to contamination.

A study of global hunger data examined the constraints affecting the productivity of small farmers in the third world and found that in impoverished nations, people are too poor to buy the food that is available and also poorly distributed or lack the land and resources to grow; in fact, overproduction and consequent low crop prices is one of the most tenacious problems

[12] Trisha Gura, New Genes Boost Rice Nutrients, 285 SCI. 98 (1999)
[13] Genetic Res. Action Int'l, Engineering Solutions to Malnutrition (March 2000)
[14] Peter M. Rosset, Transgenic Crops to Address Third World Hunger? A Critical Analysis, 25 BULL. OF SCI. TECH. & SOC'Y 306, 310 (2005),
[15] World Health Organization (WHO), Modern Food Biotechnology, Human Health and Development: an Evidence-Based Study,at 54

generating poverty and thus hunger in rural areas.[16] Rather than helping the situation, GM crops could have the opposite effect because "an examination of the special risks these varieties pose for poor farmers in the complex, diverse, and risk prone environments that characterize peasant agriculture on a global scale suggests that transgenic crop varieties are likely to be hurdled than a help to the income of poor farmers." In addition, most products and new technologies are designed for western agriculture systems, not for developing countries. "For example, if Terminator genes enter the seed market, it will not be possible for traditional or small farmers to use their plants to produce seeds.

For the organic farmer, too, the effects of GM crops could prove dangerous due to contamination and cross pollination. Organic farmers are now struggling to isolate their fields with only limited success and greater economic costs because they need to leave fields uncultivated as a buffer. Once contamination has been detected, their crops are useless. Organic farmers may even lose their organic certification and face income loss during the years needed to be recertified as organic producers. Worse yet, if this contamination goes undetected, these foods can cause potential harm to the consumers who purchased the organic food precisely to avoid ingesting GMOs and without their knowledge and consent. Moreover, these largely unrealized benefits in fact may be outweighed by the potential of new dangers to human health and the environment[17].

(D) The other potential risks

Scientists have warned of the uncertainties and dangers inherent in genetic engineering of food products and crops. In the international community, the WHO study identified several risks presented by GMOs and GM foods to human health as part of its safety assessment, including: "(a) toxicity; (b) allergenicity; (c) stability of the inserted gene; (d) nutritional effects associated with the specific genetic modification; and (e) any unintended effects which could result from the gene insertion."[18]

The amount that is unknown about genes significantly exceeds the amount that is known, inducing serious questions about how much risk and who should bear the burden of this risk. The dangers to the ecosystem and biodiversity may return to affect the inventors; once the creation is let loose, it may spread through the planet and become the dominant species. The

[16] Peter M. Rosset, Transgenic Crops to Address Third World Hunger? A Critical Analysis, 25 BULL. OF SCI. TECH. & SOC'Y 306, 310 (2005)
[17] Debra M. Strauss, "Defying Nature: The Ethical Implications of Genetically Modified Plants". Journal of Food Law & Policy 3.1 (2007): 1-37.
[18] World Health Organization (WHO), Modern Food Biotechnology, Human Health and Development: an Evidence-Based Study, at 12

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WHO study concludes that "the risks of biotechnology, the problems of interfering with nature, evolution and creation, and ethical considerations are of increasing importance in the civil-society debate on the development and introduction of GMOs."[19] The scientific community has framed different methods to handle disagreements over scientific facts, but did not consider the value and ethical components of food-safety assessments to resolve. Yet, analysis of the ethical implications is necessary to society's decision on how to go ahead in this area.

IV. ETHICAL ISSUES

To consider from an ethical view the claims being made in the recent debate on Genetically Modified Organisms (GMOs), the first report of the Food and Agriculture Organization (FAO) panel, Ethical issues in food and agriculture, ask ethical questions related to its mandate, such as: What is the value of food? What is the value of human health? What is the value of nature and natural resources? The FAO's second report, Genetically Modified organisms, consumers, food safety and the environment, highlights the role of ethical considerations in food and agriculture, both in view of discussions on GMOs and in relation to food safety and the environment.[20]

These economic and moral concerns have induced the European Union (EU) and other countries to restrict the import of GM foods or to require labeling of foods with genetically modified ingredients. The continued development of genetically modified Organisms raises broad ethical issues, several of which will be discussed below: Nature and the value of life; contamination in conventional crop; monoculture affect conflicts of rights etc.

(A) Nature and the value of life

In the international community, the United Nations' Convention on Biological Diversity (CBD) recognizes the implied value of nature itself. In describing the CBD, the World Health Organization report observes, "The summary of objectives shows that all the main points usually opined in a risk benefit evaluation of food biotechnology interfere with each other, there is a need of high level of ethical consideration."[21] From an ethical perspective, Terminator seeds represent an example that the biotechnology companies have taken away the essential function of life to reproduce.[22] The biotechnology industry acts on a drive to convert into a marketable product all that is alive, altering the patterns of nature so as to suit the whims of the

[19] Id. At 56
[20] FAO ETHICS SERIES 2: GENETICALLY MODIFIED ORGANISMS, CONSUMERS, FOOD SAFETY AND THE ENVIRONMENT (2001)
[21] World Health Organization (WHO), Modern Food Biotechnology, Human Health and Development: an Evidence-Based Study, at 56
[22] Diamond v. Chakrabarty, 447 U.S. 303 (1980),

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commercial market. Genetic engineering contradicts the unpredictability and freedom that is an inherent component of life, to control that which cannot be the controlled.

In 2000, the United Nations (UN) through the CBD adopted a de facto moratorium on sterile seed technologies, which it calls Genetic Use Restriction Technologies (GURTs). However, this UN ban has not stopped the development of this technology or the support by other countries that continue to issue patents. Life continues to be treated as a static commodity.

(B) Contamination in Conventional Crop

Contamination having ethical prospects refers to the mixing of GM and non-GM crops before they reach the marketplace. Contamination greatly affects the ability of conventional farming to coexist with GM farming. For example, StarLink corn, a type of GM corn approved for animal feed and ethanol production only, in Kraft taco shells. StarLink corn expressed a transgenic protein that resembled known human allergens, but the EPA could not determine whether the corn would cause allergies in humans.[23] This incident exemplifies the difficulty of differentiate GM and non-GM food and highlights the inadequacy of GMO regulation in preventing contamination.

Contamination affects farmers who selling non-GMO crops. If an organic farmer's crops are contaminated, he could lose his certification, since; consumers are willing to pay for organic produce. Conventional farmer thus far have not been successful in suing GMO farmers, while, recovery for economic injury may exist under several theories of liability, including private nuisance and trespass.

(C) Monoculture effect

Alike seeds are rise to an industrial farming model which has decreased crop varieties. Lacking of crop varieties contribute the poor nutrition by reducing food choices. Monoculture disturbus natural balances, lead to soil exhaustion also disturb food chain. Monoculture i.e. increases a type of food habit which affects the health. GM monocultures can also increase the risk of large-scale crop failures. Decreased biodiversity increases the vulnerability of crops to disease and pests, meaning that a single blight or pest could potentially decimate hundreds of thousands of acres of crops. But, the same potato blight had much less impact in the Andes because farmers there had cultivated forty-six varieties of potato.[24]

Farmers of GM crops use pesticides to suppress the insects that the GM transgenes do not

[23] Gregory N. Mandel, Gaps, Inexperience, Inconsistencies, and Overlaps: Crisis in the Regulation of Genetically Modified Plants and Animals, 45 WM. & MARY L. REV. 2167, 2216 (2004)
[24] id

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control and use broad spectrum herbicides, like Monsanto's Roundup, to eliminate all vegetation in the fields besides the herbicide-tolerant GM crops. Such dependency on biotechnological fixes can expedite pest resistance and disturb natural balances in the ecosystem, promoting a cycle that leads to the need for more pesticides and herbicides and ultimately creates monocultures. For example; farmers who rely on Roundup to kill weeds limit themselves to a few varieties of GM-protected plants. Planting only a few types of crops can lead to soil exhaustion and create an environment that is harmful to the natural enemies of pests such as birds and insects that rely on a variety of weeds, seeds, and microhabitats that are not available in monocultures. Decreases in the number of natural enemies of pests in turn foster the need for more GM products and pesticides.[25]

V. CONFLICTS OF RIGHTS

The patentable status of GMOs has played a crucial role in precipitating a shift in the agriculture industry towards large agribusiness. Rapidly increasing, multinational corporations with little connection to local farmers or consumers control the food supply. One fear is that if farmers surrender their traditional control over the seed supply, they may no longer devote the same time and energy to breeding through traditional techniques. Critics claim that biotechnology raises long-term costs for farmers because farmers must continually buy next generation seeds. Technology licenses prohibit farmers from planting the seeds produced by their GM crops.

For claiming patent right, companies are filing patent suits against farmers for illegally appropriating GM seeds, even where the presence of GMOs in their fields is accidental or unwanted. For example, in Monsanto v. Schmeiser, a Canadian court found a farmer guilty for infringing Monsanto's patents for herbicide-resistant canola, despite evidence that the GM presence in the farmer's field was adventitious.[26]

VI. CONCLUSION

From an ethical view, the problem is not that genetic engineering technology subsits, but how that technology is being used. This article has raised for discussion some important issues to consider as to social and ethical dimensions of the technology and how it is being utilized. It is a big question that genetically modified (GM) plants are cultivated to produce food for the masses, or to create profits for a company whose seeds have been genetically modified to require purchase every crop and not regenerate as farmers have done for centuries in order to

[25] Miguel A. Altieri, The Myth of Coexistence: Why Transgenic Crops Are Not Compatible with Agroecologically Based Systems of Production, 25 BULL. OF SCI., TECH. & SOC'Y 361, 361 (2005)
[26] Monsanto Canada Inc. v. Schmeiser, [2004] 1 S.C.R. 902 (Can.)

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make their living.

Raising global concerns, the World Health Organization (WHO) study concluded that there is a need to discover opportunities where biotechnology can contribute to the secure generation of nutritious foods in keeping with regional needs, recognizing that "such opportunities should be based on sustainable food production preserving biodiversity and respecting the values of nature, while taking into consideration ethical objectives and social equity in respect to regional conditions, needs and wants.[27]

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[27] World Health Organization (WHO), Modern Food Biotechnology, Human Health and Development: an Evidence-Based Study, at 59

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