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## **An Agricultural Law Research Article**

# **Engineering a Solution to Market Failure: A Disclosure Regime for Genetically Modified Organisms**

by

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# ENGINEERING A SOLUTION TO MARKET FAILURE: A DISCLOSURE REGIME FOR GENETICALLY MODIFIED ORGANISMS

BY LUKE BRUSSEL<sup>1</sup>

## I. INTRODUCTION

The presence of asymmetrical information relating to the potentially harmful and beneficial effects of genetically modified organisms (GMOs)<sup>2</sup> on human health, agricultural production and the environment is preventing a functioning market for GMOs capable of achieving efficient, socially optimal results. Uncertainties about the effects of GMOs have motivated legislative action to block the use of GMOs primarily through the imposition of a regulatory "command-and-control" framework.<sup>3</sup> Such legislative attempts have failed to be enacted into law in any jurisdiction in the United States.<sup>4</sup> Recently, a second generation of anti-GMO legislative initiatives based on property rights has begun to take shape.<sup>5</sup> The initiatives implicitly recognize that market forces may provide a solution to the issues raised by the proliferation of GMOs. However, such a solution cannot be achieved without a functioning market. This article argues that a sys-

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<sup>1</sup> Luke Brussel, J.D., University of Pennsylvania Law School, 1999.

<sup>2</sup> GMOs are organisms that have been genetically engineered through the introduction of foreign genetic material to contain certain characteristics such as resistance to pesticides and herbicides and longer shelf life.

<sup>3</sup> Legislation banning the use of GMOs has been introduced H.B.99, 22nd Leg., Reg. Sess. (Haw. 2003) (imposing a moratorium on the release and planting of genetically modified coffee); S. 0165, 67th Biennial Sess. (Vt.2003) (imposing a moratorium on the production of GMOs and establishing a registration system), H. 0351-53, 67th Biennial Sess. 0162, 67th Biennial Sess. (Vt. 2003) (imposing a moratorium on the planting of GMOs); L.D. 1219 (H.P. 893), 121st Leg. Reg. Sess. (Me. 2003)(imposing a three year moratorium on planting GMOs); S.J. 8, 2003 Leg., Reg. Sess. (Mont. 2003) (regulating GMOs) and A. 2826, 2004 Gen. Assemb. Reg. Sess. (N.Y. 2004); S. 139, 2004 Gen. Assemb., Reg. Sess. (N.Y. 2004) (imposing a five year moratorium on the production of GMOs).

<sup>4</sup> As of the date of this article, no bill introduced in state legislatures aimed at regulating GMOs in the U.S. has been enacted. Laws regulating GMOs in member nations of the European Union have been in effect since 1998 with the imposition of a *de facto* ban on GMOs in food products. See, Julian Wong, iBrief, *Are Biotech Crops and Conventional Crops Like Products? An Analysis Under GATT*, 2003 Duke L. & Tech. Rev. 0027 (2003).

<sup>5</sup> See, e.g., S. 1912, 183rd Gen. Ct., Reg. Sess. (Mass. 2003) (establishing manufacturer liability for genetically modified foods they produce); H.B. 457, 92 Gen. Assemb. 1st Reg. Sess. (M. 2003) (producer liability for damages); H.B. 522, 58th Leg., Reg. Sess. (Mont. 2003) (placing liability on manufacturers of genetically modified wheat); A. 1911, 2004 Gen. Assemb., Reg. Sess. (N.Y. 2004) (providing a cause of action for contamination of soil or animal husbandry products by GMOs).

tem of mandatory disclosures tied to discretionary participation in the market for GMOs should be established to correct the problem of asymmetrical information and resultant GMO market failure.

## II. UNCERTAINTIES EXIST AS TO POTENTIAL ADVERSE CONSEQUENCES OF GMO PRODUCTION

Great uncertainty exists as to whether GMOs have harmful or beneficial effects on human health, agricultural production and the environment. Several potential harms have been identified which contribute to consumer and agricultural producer aversions to GMOs. Such uncertain harms include:

### *Potential harms to human health*

- The transference of proteins from one organism (including from organisms that have never been used as food) to another can cause the transference of allergens, virtually all of which are proteins, into foods that previously did not contain allergens.<sup>6</sup>
- “Genetic engineering often uses genes for antibiotic resistance as ‘selectable markers.’ Early in the engineering process, these markers help select cells that have taken up foreign genes.” “[E]ating these foods could reduce the effectiveness of antibiotics to fight disease when these antibiotics are taken with meals. Antibiotic-resistance genes produce enzymes that can degrade antibiotics.”<sup>7</sup>
- “Addition of new genetic material through genetic engineering could reactivate . . . inactive pathways or otherwise increase the levels of toxic substances in plants.”<sup>8</sup>
- “Some of the new genes being added to crops can remove heavy metals like mercury from the soil and concentrate them in the plant tissue.”<sup>9</sup> Such metals may become imbedded in edible parts of plants and be introduced into the food supply.
- The removal of certain characteristics of plants may dis-

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<sup>6</sup> MARGARET MELLON, UNION OF CONCERNED SCIENTISTS: FOOD AND ENVIRONMENT: COMMENTS ON GENETICALLY ENGINEERED FOOD, CITIZENS AND SCIENTISTS FOR ENVIRONMENTAL SOLUTIONS (April 8, 1994), [http://www.ucsusa.org/food\\_and\\_environment/biotechnology\\_archive/page.cfm?pageID=381](http://www.ucsusa.org/food_and_environment/biotechnology_archive/page.cfm?pageID=381).

<sup>7</sup> UNION OF CONCERNED SCIENTISTS, FOOD AND ENVIRONMENT: BACKGROUNDER RISKS OF GENETIC ENGINEERING, : CITIZENS AND SCIENTISTS FOR ENVIRONMENTAL SOLUTIONS (April 8, 1994), [http://www.ucsusa.org/food\\_and\\_environment/biotechnology\\_archive/page.cfm?pageID=346](http://www.ucsusa.org/food_and_environment/biotechnology_archive/page.cfm?pageID=346).

<sup>8</sup> *Id.*

<sup>9</sup> *Id.*

able their natural resistance to toxic organisms such as fungi.<sup>10</sup>

*Potential harms to agricultural production and the environment*

- gene movement from crops modified for enhanced resistance to herbicides and insecticides may transfer to weeds and insects creating “super-weeds” and “super-bugs”<sup>11</sup>
- cross-pollination of non-GMO crops by GMOs can contaminate crops intended to be marketed asGMO-free<sup>12</sup>
- genes associated with certain toxicities within one organism can be transferred to organisms that are food sources for other species, thus harming such species<sup>13</sup>

Conversely, uncertainties that exist as to potential benefits of GMOs include:

- “[I]ncreased crop yields” from GMO herbicide and pesticide resistant crops “translate to less urgency to convert lands for agriculture”<sup>14</sup>
- decreased use of pesticides on GMO crops engineered for resistance to pests<sup>15</sup>
- enhanced nutritional value of the crops produced by engineering plants containing previously foreign nutritional substances<sup>16</sup>
- the ability to produce crops with pharmaceutical properties<sup>17</sup>

<sup>10</sup> *Id.*

<sup>11</sup> Sean D. Murphy, *Biotechnology and International Law*, 42 HARV. INT'L L.J. 47, 59 (2001).

<sup>12</sup> Mike Holmberg, *I-P Crops: Mission Impossible; Problems in Producing Non-genetically Modified Identity-Preserving Crops*, SUCCESSFUL FARMING (February 15, 2001) available at [http://www.findarticles.com/cf\\_sccfrm/m1204/3\\_99/71888203/p1/article.jhtml](http://www.findarticles.com/cf_sccfrm/m1204/3_99/71888203/p1/article.jhtml).

<sup>13</sup> Neil D. Hamilton, *Legal Issues Shaping Society's Acceptance of Biotechnology and Genetically Modified Organisms*, 6 Drake J. Agric. L. 81, 95 n.19 (2001).

<sup>14</sup> Wong, *supra* note 4.

<sup>15</sup> *Id.*, citing Richard Cowan, *Biotech Food Fight Moves to Calif.*, REUTERS, Jun. 23, 2003.

<sup>16</sup> Murphy, *supra* note 11, at 56.

<sup>17</sup> UNION OF CONCERNED SCIENTISTS: FOOD AND ENVIRONMENT: LETTER: TO USDA/FDA: PHARM CROPS REGULATION, Citizens and Scientists for Environmental Solutions. (Feb. 5, 2003), [http://www.ucsus.org/food\\_and\\_environment/biotechnology\\_archive/page.cfm?pageID=1114](http://www.ucsus.org/food_and_environment/biotechnology_archive/page.cfm?pageID=1114).

### III. ASYMMETRICAL INFORMATION PREVENTS SOCIALLY OPTIMAL ALLOCATION OF RESOURCES

The market for GMOs at both the consumer and producer level is currently unable to achieve a rational, efficient and socially optimal result due to asymmetrical information. There is no mechanism by which consumers can obtain adequate information to make rational decisions about whether to purchase and consume GMOs and, if so, at what price. The biotechnology industry is under no requirement to disclose information relating to the health effects of the GMOs it produces. In the absence of such information consumers are left to make decisions based on guesswork and assumptions. Similarly, farmers do not have the informational tools to decide whether to grow GMOs and what price to pay for GMO seed. For farmers who choose to produce organic or GMO-free crops the necessary information to determine what steps to take to protect their crops from genetic contamination from GMOs is not available.

Ronald Coase, in his seminal work, *The Problem of Social Cost*, presented a coherent framework through which to understand how the presence of asymmetrical information in the GMO market can prevent an efficient allocation of resources.<sup>18</sup> The Coase theorem provides that when external costs and benefits exist the effected parties can bargain to an efficient and socially optimal result where a property right is established.<sup>19</sup>

Predicate to arriving at an efficient and socially optimal result is the availability of perfect information and the absence of prohibitive transaction costs.<sup>20</sup> With the presence of imperfect or asymmetrical information, parties may overstate or understate the benefits and/or costs, thus leading to an inefficient result.

Currently, the lack of reliable, scientifically based information about the effects of GMOs on human health, agricultural production and the environment is preventing the socially optimal treatment of GMOs. Because of imperfect information, either consumers are spending too much or they are spending too little in an effort to avoid food containing GMOs. Consumers in the United States spent \$7.8 billion in 2000 on higher priced organic food.<sup>21</sup> In paying a higher price for organics, consumers are seeking, in part, the assurance that no GMOs are present in the food they eat.<sup>22</sup> In effect when consum-

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<sup>18</sup> Ronald Coase, *The Problem of Social Cost*, JOURNAL OF LAW AND ECONOMICS (1960).

<sup>19</sup> See *id.*

<sup>20</sup> See *id.*

<sup>21</sup> *Trends in the United States: Consumer Attitudes & the Supermarket*, Food Marketing Institute, 2001.

<sup>22</sup> Ababayehu Tegene, Wallace E., Huffman, Matthew Ruosu, Jason F. Shogren, *The Effect of Information on Consumer Demand for Biotech Foods: Evidence from Experimental Auctions*, USDA ECONOMIC RESEARCH SERVICE, TECHNICAL BULLETIN NO. 1903

ers pay a higher price for GMO-free organics, they are paying farmers not to use GMOs. Thus, to the extent that the motivating factor in paying a higher price for organics is to avoid GMOs, consumers are paying a premium to farmers not to grow, and to ensure that they do not eat, GMOs due to the fear that GMOs are harmful to human health and the environment.<sup>23</sup> If, in fact, GMOs are not harmful or are beneficial to our health, then consumers are overstating the benefits of organics. Conversely, if in fact GMOs are harmful to human health, consumers are understating the benefits of organics because with imperfect information, some doubt exists as to whether GMOs are harmful or beneficial (and is factored into the price consumers are willing to pay).

Farmers also experience the problem of asymmetrical information. Farmers who want to produce GMO crops because of the possible economic benefits of such crops do not have adequate information to determine what price to pay for GMO seed.<sup>24</sup> A standard practice in the biotechnology industry is to require farmers and GMO producers of seed to enter into a contract providing that the farmer may not use the seed his or her crops produce to grow crops in the future.<sup>25</sup> Such harvesting of seeds is a recognized and time-honored agricultural practice and has a significant economic effect on farmers' businesses.<sup>26</sup> Without adequate information available to them about the effect of GMOs on soil, other crops and human health, farmers do not have the tools to effectively negotiate with biotech seed producers. In negotiations between GMO seed producers and farmers, asymmetrical information prevents an efficient result.

Farmers who seek to produce "identity-preserved non-GMO crops" use significant resources to protect their crops from contamination by genetic drift.<sup>27</sup> Land is left uncultivated to create barriers to

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(March 2003) (finding that consumers who were provided with negative information coupled with independent, third-party information regarding GMOs were willing to pay 17-22% less for "GM" labeled food than for plain labeled food).

<sup>23</sup> Consumers will pay a higher price for goods that do not harm or have a beneficial effect on the environment. DON COURSEY, *THE DEMAND FOR ENVIRONMENTAL QUALITY* (John M. Olin School of Business, Washington University, December 1992).

<sup>24</sup> See David, R. Moeller, *GMO Liability Threats for Farmers: Legal Issues Surrounding the Planting of Genetically Modified Crops 2* (November 2001), at <http://www.flaginc.org/pubs/arts/GMOthreats.pdf> (last accessed Apr. 8, 2004) (stating that "when making decisions about buying seed and planting and marketing their crops" farmers must consider "the possible loss of export markets and other market risks, as well as potential legal liability").

<sup>25</sup> *Id.* at 4.

<sup>26</sup> See, Jill Sudduth, *Where the Wild Wind Blows: Genetically Altered Seed and Neighboring Farmers*, 2001 DUKE L. & TECH. REV. 15, \*13 (discussing the fear of some farmers that "patented seeds will threaten the historic and economical practice of seed saving").

<sup>27</sup> Holmberg, *supra* at note 12.

cross-pollination by GMOs and a premium is paid for seed that is certified GMO-free. Without taking such precautionary measures, farmers could not produce certified organic produce, the certification of which has a substantial effect on the price that can be charged for such crops. Without adequate information as to the potential for GMO crops to contaminate non-GMO crops (e.g., which species are at risk for contamination and what is the range of genetic drift from GMO crops) and about what GMO crops are present, organic farmers cannot efficiently allocate their resources; either organic farmers are over-spending or under-spending on protective measures.

### III. A SYSTEM OF MANDATORY DISCLOSURE WOULD CORRECT THE PROBLEM OF ASYMMETRICAL INFORMATION AND ENABLE THE FUNCTIONING OF AN EFFICIENT MARKET FOR GENETICALLY MODIFIED ORGANISMS

In order to create the conditions for a socially optimal and efficient result the problem of asymmetrical information must be resolved. The market for GMOs can function efficiently if a mechanism is established for ensuring that rational, scientifically based information on the effects of GMOs on human health, agricultural production and the environment is available to the public. Because transaction costs would be prohibitively high for individual consumers or farmers to obtain such information, a system of mandatory disclosures tied to discretionary participation in the market for GMOs should be established by the government.<sup>28</sup>

Requiring GMO seed merchants to publicly disclose all material information they know or have reason to know relating to their products' effects on human health, agricultural production and the environment would correct the problem of asymmetrical information. Consumers would have access to information necessary to make rational decisions about whether to purchase and consume GMOs and, if so, at what price. Farmers would have the tools necessary to make the determination whether to produce GMOs, what price to pay for GMO seed (and the terms and conditions of such sales) and what steps are necessary to protect their GMO-free crops from genetic contamination.

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<sup>28</sup> Ronald Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1 (1960) at 17-18, (stating that "[i]t is clear that the government has powers which might enable it to get some things done at a lower cost than could a private organisation . . . [G]overnmental . . . regulation [can on occasion] lead to an improvement in economic efficiency. This would seem particularly likely when . . . the costs of handling the problem through the market or the firm may be high.") Particularly when "a large number of people are involved . . ."

In order to make rational decisions concerning the purchase and consumption of GMOs consumers would require current information about GMOs' effects on human health and the environment, including information relating to the effects of GMOs on:

- the human auto-immune system
- the toxicity of GM plants
- the presence of harmful foreign matter in GM plants
- the propagation of harmful non-GM plants
- the transference of genes from GM plants to potentially environmentally harmful species of non-GM plants
- the relationship between pesticide and herbicide use and the production of GM crops
- the recombination and transcapsidation of virus

Information required by farmers in order to make rational decisions relating to the production of GMOs would include information regarding:

- the effects of GMOs on soil productivity
- the potential for GMOs to contaminate non-GMO crops
- the range of genetic drift for each species of GMO
- the effect of consumers' knowledge about GMOs on the demand for GMO crops
- material events that have an effect on the market for GM crops

Establishing a regulatory regime requiring disclosure of GMO information, while novel, is not without precedent. The legal precedents for a mandatory system of disclosures relating to GMOs can be found in systems as diverse as state law regulating pesticides and federal and state securities regulations. Both regulatory regimes correct market failure due to imperfect information by requiring public disclosure rather than by imposing a command-and-control system.

In 2000, New York State enacted a law requiring commercial applicators of pesticides to provide notice to potentially effected parties prior to applying pesticides on school grounds, at day care centers and on home lawns.<sup>29</sup> Merchants that use, distribute, sell or offer pesticides for sale in New York State are required to register and make certain disclosure relating to the pesticides with the State Commissioner of Environmental Conservation.<sup>30</sup> Any regulatory regime requiring the disclosure of information relating to GMOs would necessarily track the New York State pesticide regulations in so far as both would govern the dissemination of facts relating to the potentially

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<sup>29</sup> Chapter 285 of 2000. N.Y. ENVTL. CONSERV. Article 33. The requirement of notice relating to application of pesticides on home lawns is left to the option of local laws enacted by the City of New York and the remaining 57 counties in New York State.

<sup>30</sup> *Id.*



harmful effects of substances used in agricultural production and thereby released into the environment. Similar to New York State's pesticide disclosure law, a GMO disclosure regime would require registration of GMO seed used or transferred within state borders and notification of neighboring farmers when GMOs are grown. Notification of neighboring farmers would enable producers of GMO-free crops whose crops may be in danger of contamination by genetic drift to allocate the necessary resources to protect their crops whether through preventative farming techniques such as creating land barriers, bargaining for cessation of near-by GMO production or seeking legal redress from the appropriate party. Because of the need for substantive information relating to the effects of GMOs on human health, agricultural production and the environment, a GMO disclosure regime would necessarily extend beyond the mere notification and registration provisions of the New York State pesticide law and require public disclosure of all material information relating the effects of GMOs. Such an extensive disclosure requirement would perhaps more closely resemble federal securities regulations.

The federal securities laws offer a working model for effective disclosure regulations and can be applied to a GMO disclosure regime. The federal securities regulations are promulgated under the Securities Act of 1933 and the Securities and Exchange Act of 1934. Under federal regulations the [sale and offer for sale] of securities to the public triggers disclosure requirements of all material information<sup>31</sup> by the issuer of such securities. The disclosure of false information or the failure to disclose material information may cause both civil and criminal liability.

The federal securities laws were enacted in response to the failure of the securities market that culminated in the stock market crash of October 1929. The laws' disclosure requirements removed great uncertainty in the securities market due to asymmetrical information and are credited with successfully establishing a fully functioning and efficient market.

Appropriate borrowing from federal securities regulations by a GMO disclosure regime could include: reliance on discretionary participation in the market as a trigger for jurisdiction under the regulations; the requirement to disclose all material information; an ongoing duty of disclosure tied to continuing participation in the market; penalties for violations that include liability to private actors and the government and both civil and criminal liability.

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<sup>31</sup> "Material" is defined as information where "there is a substantial likelihood that a reasonable investor would attach importance in determining whether to purchase the security registered." Securities Act Rule 405.

## VI. CONCLUSION

A mandatory disclosure regime for participants in the GMO market would correct the failure of the market due to the presence of asymmetrical information regarding the effects of GMOs on human health, agricultural production and the environment. Governmental imposed regulations requiring such disclosure would enable the dissemination of material information relating to GMOs without imposing prohibitive transaction costs on participants in the market.

By correcting the GMO market failure, such regulations would create the conditions for market participants to determine whether or not GMOs are produced, sold and consumed.