Genetically modified organisms (GMOs)

Genetically modified organisms (GMOs) are defined as organisms, with the exception of human beings, in which the genetic material has been directly manipulated in the lab. Genetically modified organisms may alternately be referred to as GM, GEOs, or organisms/food produced through bioengineering.

Corn, cotton, and soybeans are the three major agricultural crops that have relied most heavily on the application of GMO technology. Since 1996, when genetically engineered crops were first planted in the US, this technology has increased exponentially in the US with percent of acreage rising to 85% of corn, 88% of cotton, and 91% of soybean crops planted in 2009.[1] Gene-altered corn and soybeans are now used in two-thirds of processed foods made by US food companies.[2]

Two classes of engineered traits make up nearly all GMO acreage: herbicide tolerance and insect resistance. Roundup Ready soybeans are one example of a crop engineered for herbicide tolerance. Soybean plants containing the Roundup Ready gene (glyphosate tolerance), are not harmed by the application of the herbicide Roundup which can then be sprayed on the field to kill weeds. *Bt* corn is an example of a crop engineered for insect resistance. *Bacillus thuringiensis* (*Bt*) is a bacterium that produces a protein toxic to insects. *Bt* corn has been engineered to contain that toxin in all parts of the plant, thereby killing insects that may consume it.

The application of GMOs to agriculture has allowed farmers to initially decrease use of herbicides and insecticides and to increase profitability. Recent studies have confirmed that Roundup- and Bt-resistant weeds and insects have emerged and overall chemical use has increased[3].Significant long term risks associated with genetically engineered agriculture include the transfer of chemical resistance to wild plants, loss of biodiversity, and the possible health effects of these new genes and gene products on the human consumer. Considerable scientific and public controversy exists around these issues.

To date, scientific study of the associated benefits and risks of biotechnology has been limited, primarily industry-funded, and has sparked significant debate. Advocates of the Precautionary Principle support regulatory decision makers to err on the side of caution when there is scientific uncertainty. To that end, the Ecological Society of America supports the recommendation that environmental release of GMOs should be prevented if scientific knowledge about possible risks is clearly inadequate.[4]

The U.S. Food and Drug Administration (FDA) has repeatedly sided with biotechnology companies, concluding that new gene-altered products are “substantially equivalent” or “virtually” identical to their conventional counterparts. This position has been central for the FDA’s decision to prevent labeling of foods containing gene-altered ingredients. Across the Atlantic, European consumers have shunned GMO cropsand foods made from genetically-altered ingredients. The Food Alliance and the USDA Organic certification programs have followed suit in their stance against GMOs.[5,6]

Critics argue that since the 1996 harvest, the entire U.S. population has been part of an uncontrolled experiment to demonstrate the long-term safety of gene-altered corn and soybeans.[7] Without food labeling it is virtually impossible to do public health monitoring, and individuals suffering unanticipated health effects are likewise unable to assign blame or determine liability.

Controversy also exists around the patenting of genetically modified materials, a legal right that emerged from a US Supreme Court decision in 1980 allowing biotechnology companies and other researchers to experiment, change seeds, and patent the results[8]. Farmers who wish to use patented seeds pay a "technology fee" to the patent holder. The potential for corporations to patent traditional seeds, long in use by farmers in developing countries, presents a challenge to seed availability and farmers' costs. Critics also express concern over the consolidation over the last twenty years of dozens of seed companies into a very small number of corporations that hold seed patents affecting major sectors of the international food supply[9]. Private control of widely-used seeds has also inhibited scientific development of new varieties in public laboratories. Recently, corporate mergers have restricted the availability of thousands of openly-pollinated seed varieties, narrowing the base of agricultural biodiversity.

Bryce Carlson for the Sustainable Food Committee at Emory University

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[3] Committee on the Impact of Biotechnology on Farm-level Economics and Sustainability (2010). *Impact of Genetically Engineered Crops on Farm Sustainability in the United States*. Washington, DC: National Research Council.

[4] http://www.esa.org/pao/policyStatements/Statements/GeneticallyModifiedOrganisms.php

[5] Food Alliance: http://www.foodalliance.org/

[6] USDA - National Organic Program: http://www.ams.usda.gov/AMSv1.0/nop

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[8] Diamond v. Chakrabarty, 447 U.S. 303 (1980). Available at: [http://laws.findlaw.com/us/447/303.html]

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