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# The labeling of food with genetically engineered content: Understanding the context

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On June 16, 1980, the United State Supreme Court ruled that '*A live, human-made micro-organism is patentable subject matter under* [*Title 35 U.S.C.*] *101.*' The vote was 5–4. The majority focused on language in the original patent act written by Thomas Jefferson, and subsequent legislation, that 'anything under the sun' could be patented. The minority argued in its dissent that such a substantial decision as allowing the patenting of living organisms should be left to Congress; and that, at least regarding agricultural crops, Congress had settled the issue previously with the Plant Variety Protection Act of 1970. This 5–4 decision enabled firms to seek utility patents on new seed varieties.

Utility patents offered broader market protections for firms than available previously. For instance, the Plant Variety Protection Act had allowed farmer's to save and replant seeds, and permitted greater latitude for university researchers to perform risk assessment research on new plant varieties introduced by firms. With utility patents, farmers can no longer save and replant patented seeds and researchers can find it more difficult to receive permission to perform research on patented varieties, even though popular constructs like *Bacillus thuringiensis* (Bt) are often available for work on crops with limited market potential. Bt sugar cane reached commercial production this way. Farmers can only legally save and multiply seeds of landrace and heirloom varieties.

Also by using utility patents, agricultural chemical firms were able to attract investment to finance the purchase of seed firms and form a highly successful integrated pesticide–seed industry. The combination of pharmaceutical and agriculture companies as 'life science' firms had less success that led to a slew of spinoffs. Control of the agricultural seed market ended up in the hands of the Big 6 multinational corporations. It was never clear if the recent Monsanto–Syngenta deal was going to result in one firm (a Big 5) or two differently organized ones. Any deal now appears to be off. Indeed, Monsanto Company was not a seed firm until the advent of plant utility patents and waited only until 1981 to make major investments in biotechnology. They are now the largest seed firm controlling more than 25% of the market. And the largest four seed firms control more than 60% of the seed market. This level of concentration provides firms with a decided market advantage over farmers, who face a restricted set of seed technologies (Fuglie et al., 2012).

The primary reason that pesticide firms bought seed firms was to use high performing seed germplasm as a delivery device for genetically engineered (GE) traits. The initial GE crops to emerge in the 1990s, and that still dominate the market, are crops engineered to tolerate the herbicidal chemical glyphosate, or to manifest the Bt soil bacteria), which is toxic to certain insects, or even both traits. These crops are *transgenic* crops which mean that DNA from, in this case, soil bacteria was engineered into the plants using gene splicing techniques across species lines. Conventional plant breeding methods, such as hybridization or selection, cannot introduce traits across species lines.

The commercialization of transgenic crops has resulted in rapid adoption globally. At the same time there have been campaigns by environmental groups against the crops. Environmental groups believe the crops are not tested sufficiently for safety and that the crops cause environmental problems from overuse of herbicide and insect pests developing resistance to Bt. These criticisms have led to initiatives at the state and federal level to label foods made from GE crops (http://www.centerforfoodsafety.org/issues/976/ge-food-labeling/state-labeling-initiatives#). Multinational firms have countered by arguing transgenic crops are safe, are needed to feed the world's growing population and are environmentally benign. The firms have introduced and had passed through the U.S. House of Representatives, H.R. 1599, the *Safe and Accurate Food Labeling Act*. This legislation, which failed recently in the U.S. Senate, would empower the U.S. Food and Drug Administration (FDA) to prevent the labeling of transgenic crops by states.

Given the current level of controversy, it is critical to understand the science of the effects of transgenic crops. The U.S. National Academies of Sciences (NAS) made some important findings in its 2010 report on *The*

*Impact of Genetically Engineered Crop on Farm Sustainability in the United States*. Regarding productivity, the NAS found that Bt crops increased yield on average, but yield increases were highly variable. Herbicide tolerant crops did not increase yield in general and sometimes even depressed crop yields. The NAS went on to note, and recent research confirms, that the number of weed species tolerant of glyphosate and other herbicides due to the planting of herbicide-tolerant crops is increasing rapidly. Also the number of insect species showing resistance to Bt crops is increasing. Therefore, any yield increases might be short-lived.

Regarding safety for human consumption, proponents of GE crops argue that multitudes of studies prove conclusively that transgenic crops are safe. However, while most reviews confirm that scientific studies have found no significant hazards directly connected with GE crops, there are still open questions. For instance, recent findings by Zhang et al. (2012) have raised concerns about the potential effects that certain types of RNA engineered into some GE crops could have on human and animal health. Though these findings have been questioned, and contradict previous research potentially, '*further investigations are necessary to clarify* [these issues]' (Nicolia et al., 2014: 82). Also, there is a need to evaluate potential interactive effects between Bt and introduced herbicide tolerant genes in GE crops with both traits (Nicolia et al., 2014).

Given all this, should food containing GE material be labeled? I am not taking a position for or against labeling. However, I am not in favor of the life science industry sponsored bill, H.R. 1599 the *Safe and Accurate Food Labeling Act*, which restricts the ability of states to label such food products.

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