

# **INSTITUTIONS, ORGANIZATIONS, AND POLICIES AFFECTING AGRICULTURE: PROTECTING FAMILY FARMS, SPECIES, AND FOOD AND WATER SAFETY**

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## **Summary**

In the United States, much social and environmental legislation required of nonfarm firms has eluded the farming industry. For the most part, the US government has used the “carrot” of payments rather than the “stick” of regulation to correct externalities in farming. Agriculture also has received large income transfers and favorable tax treatment to save family farms. The nation might have been better served by more resources devoted to building human capital of the disadvantaged and to reduce pathogens in food. Political failure, not market failure, has dominated agriculture. For sound political decisions, the political process needs to be better informed regarding the consequences of its policies.

## **1. Introduction**

In the United States, public regulation of the food and agricultural industry began with public bestowal and protection of property rights and continued with the Homestead Act and other measures to further the Jeffersonian idea of the small, independent family farm. Early laws also were designed for food safety, aiming to end adulteration and false labeling of foods. This paper examines more recent public efforts to promote family farms and food and water safety drawing especially on the experience of the United States.

## **2. Regulating Genetically Enhanced Organisms (GEOs)**

The public is wary of GEOs despite their promise. Dealing with that fear not only means testing for food safety, before release, but also consumer education and labeling.

Regulation of biotechnology foods in the US is instructive in illustrating the scope and complexity of the task. Several agencies are involved:

1. *Food and Drug Administration (FDA)*. The Federal Food, Drug, and Cosmetic Act (FFDCA) gives FDA broad authority to regulate foods by prohibiting adulterated or misbranded foods. The FDA reviews whether food, feed, food additives, and veterinary drugs are *safe* to sell and consume. It holds voluntary premarket consultations with food companies, seed companies, and plant developers to ensure that biotechnology derived foods meet regulatory standards for safety.

Food additives ordinarily must obtain FDA approval. However, substances added to foods that are generally-recognized-as-safe (GRAS) do not need agency approval. GRAS status has been attained by most naturally occurring foods not by testing but by virtue of a history of not causing food safety problems when consumed by people.

In 1992 the FDA determined that bioengineered food posed scientific and regulatory issues no different substantively than “natural” foods, and thus need not be regulated differently than foods produced by conventional means. Nevertheless, companies developing genetically enhanced food must undergo special review in FDA if:

- The gene transfer produces unexpected genetic effects;
- The levels of toxicants in the food are significantly high than present in other edible varieties of the same species;
- Nutrients in the bioengineered food differ from those in traditional varieties;
- The sources of the newly introduced genetic material come from a food plant associated with allergies;
- The food from the new variety differs significantly in composition from food of comparable varieties;
- The food contains marker genes that theoretically may reduce the therapeutic effects of clinically useful antibiotics;
- The plants are developed to make substances like pharmaceuticals or polymers, and will also be used for food; or
- The food to be used for feed has changes in nutrients or toxicants.

Thus a food containing a genetically enhanced organism in wheat for example must be labeled if it introduces allergens, toxins, carcinogens, substantive changes in nutrients from conventional wheat, or chemicals that may interact with clinical pharmaceuticals such as antibiotics. A genetically enhanced canola oil not substantively changed in composition from conventional canola oil need not be labeled and need not undergo extensive testing. If the fatty acid composition has changed, however, the canola oil must be given a new name such as “high laurate canola”. Although most GEO additives are GRAS and hence are exempt from extensive testing and regulation by the FDA, in fact all GEO developers seem to be making use of voluntary consultation with FDA before release (Vogt and Parish, p.8) to ensure that foods meet regulatory standards for safety.

2. *US Department of Agriculture(USDA)*. The USDA’s Animal and Plant Health Inspection Service (APHIS) licenses field testing of crops prior to commercial release to

determine if they are safe to grow. It issues permits for importation and interstate shipment of plants and animals. The Agency prepares an environmental agreement to determine proper control measures and the environmental impact of the release of a genetically modified or other “exotic” organism. APHIS evaluates whether an organism could damage the environment by interbreeding with other domestic or wild organisms. In short, APHIS determines if growing a GEO threatens the environment.

Another USDA agency, the Food Safety and Inspection Service (FSIS) determines whether livestock and poultry in biotechnology experiments are adulterated either directly by molecular changes or by foods containing GEOs. It determines whether animals are safe to slaughter and sell for human consumption. It also determines whether transgenic carcasses can be safely rendered. Failure to perform that function properly could allow genetically modified proteins to be used as animal feeds that could in turn cause diseases. A worst case scenario would be similar to disease believed to have been passed on to humans in the United Kingdom who consumed beef infected by cattle fed protein supplements of sheep meat infected with scrapie.

3. *Environmental Protection Agency (EPA)*. A third regulator of genetically enhanced organisms is the EPA which regulates microbial/plant pesticides, new uses of existing pesticides, and novel microorganisms. A pesticide cannot be sold in the US unless it is registered with the EPA. The EPA registers certain pesticides produced in transgenic plants prior to their distribution and sale. It establishes pesticide tolerances for pesticide residues in food. It works with APHIS to review and approve field tests of modified plants and microorganisms. Thus the EPA determines if pesticides in GEOs are a threat to the people and the environment.

EPA refers to plant pesticides as plants that produce pesticides within their tissues. Herbicide resistant plants such as glyphosate (Roundup) tolerant soybeans are not plant pesticides but are subject to EPA regulation because they affect the use of herbicides. EPA regulates plant pesticides under The Federal Fungicide, Insecticide, and Rodenticide Act (FIFRA) and FFDCFA. Under FIFRA, EPA determines risk that pesticides pose to humans and the environment, and balances these risks against benefits before granting approval for use.

If the plant pesticide is a food crop, EPA must establish a “safe level” of allowable pesticide residue, defined as a level at which there is “reasonable certainty that no harm will result from aggregate exposure to the pesticide chemical residue, including all anticipated dietary exposures and all other exposures for which there is reliable information.” (section 408 of the FFDCFA as amended by the Food Quality Protection Act of 1996). All registered and approved plant pesticides to 1999 contain only *Bacillus thuringiensis* (*Bt*), which have shown no toxicity to humans, hence EPA has not had to impose requirements for tolerance levels. *Bt* affects only certain insects and is harmless to humans. The EPA also exempts from regulation certain GEO viral coat-proteins found mainly on fruits and vegetables because they have been found to be of low risk based on familiarity and presence in the food supply (Vogt and Parish, p. 14).

#### *Concluding Comments and Remaining Concerns Regarding GEOs*

If properly administered, the laws, regulations, and procedures appear to be in place to ensure safety of GEOs. Measures are available to detect GEO derived foods that are

allergenic, toxic, carcinogenic, differing in nutrition from non-GEO counterpart foods, and interacting to reduce effectiveness of antibiotics or other therapeutic substances.

Several concerns remain however.

- Are too many public agencies involved in GEO testing and regulation, creating possibilities of some hazards “falling between the slats?”
- Is it safe to rely on test data provided by firms producing GEOs? These firms have a vested interest in results confirming safety.
- Are long-term and interactive effects being properly considered?
- Are opportunities for transfer of transgenic traits into wild, related species, being considered? In the US, glyphosate tolerant soybeans have few relatives to interact with because soybeans are self pollinating and their precursors originated in Asia. But opportunities for transfer of glyphosate resistant genes to wild related species are greater in Asia.
- Is labeling adequate? The FDA does not require labeling of foods with GEO content where that GEO content is substantially equivalent to non-GEO counterpart foods and poses no additional allergy, toxin, or carcinogenic properties. Some people do not trust GEO safety certification, however. For such persons, at issue is whether to label GEO foods or non-GEO foods. There are strong reasons to allow voluntary certification and labeling of non-GEO foods. One reason is because GEO foods are already in the majority in the US. Identity preservation (keeping them separate from other foods), certification, and labeling seems to be an unnecessary expense. Because they have been tested and pose no food safety threat, consumers will learn little—except to ignore the label—a practice that would be costly indeed if they also ignore labels on food that truly poses a safety hazard. Certified non-GEO foods can be certified, labeled, and made available for consumers who wish to pay the additional price for them—just as in the case of organic foods. Thus consumers are given freedom to vote with their pocketbooks for the food they prefer—one type of food need not be forced on all consumers. The freedom to choose will become even more important as GEO foods will be released with improved vitamin, mineral, amino acid, low-fat, and disease-prevention content.
- Should public agencies be required to label food production processes and not (as is the current practice) merely certify the safety and nutrition content of food? Some consumers want to know if crops are produced with GEOs, livestock are produced in confinement systems on larger farms, chickens are produced in battery cages, and if fruits and vegetables come from foreign countries where child labor may be used at harvest. The cost of acquiring such labeling information, especially for processed food with many ingredients, could be prohibitive. Labels could be so lengthy and unreliable that few would read them. A preferred solution in such cases is not to force labeling of all foods, but allow labeling so that those who favor a certain production practice can vote for it in the marketplace.
- How should environmental tradeoff be resolved? GEOs provide environmental benefits as well as costs. *Bt* corn reduces aflatoxin and fumonisin and reduces synthetic pesticide use that kills a wide spectrum of insects, some beneficial

(Nelson et al., p.45). Glyphosate resistant soybeans reduce overall herbicide use and conserve soil by reducing tillage.

Much of the opposition to GEOs comes from persons who fear loss of landrace (native) varieties as farmers widely opt for GEOs. Some fear contamination of varieties by crossover of exotic genes from GEOs, and the burden on low income producers required to pay high costs of GEO seed. The latter concern should not be decisive because producers have the option to plant traditional open-pollinated varieties, because the ability to charge for seed each year supports continuous development of ever superior varieties, and because terminator genes reduce opportunities to spread genes from GEO crops into local varieties. Furthermore, hybrid seed has a long history of “terminator” genes that farmers have long accepted because of yield and profit opportunities. Finally, some seed producers have agreed not to insert terminator genes for the whole seed, only for the transgenic genes in the GEO seed. Thus the seed continues to be viable.

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### **Bibliography**

- Ames, Bruce and Lois Gold. August 31, 1990. “Too Many Rodent Carcinogens.” *Science*. 249:970-971.
- Batte, Marvin. 1991. “Farm Chemical Use and Profitability.” Paper presented at *Farm Income Enhancement Conference*, March 25-26, 1991. Columbus: Department of Agricultural Economics and Rural Sociology, The Ohio State University.
- Chism, John and Richard Levins. Spring 1994. “Farms Spending and Local Selling: How Much Do They Match Up?” *Minnesota Agricultural Economist* 676:1-4.
- EPA. October 6, 1999. *Clean Water Act*. Washington, DC: <http://www.epa.gov/owow.cdwa/history.htm>.
- Gardner, Bruce. September 1993. *The Impacts of Environmental Protection and Food Safety Regulation on US Agriculture*. Arlington, VA: Agricultural Policy Working Group.
- Helmert, Glenn, Azzeddine Azzam, and Mathew Spiker. March 1990. *US Agriculture Under Fertilizer and Chemical Restrictions*. Report No. 163. Lincoln: Department of Agricultural Economics, University of Nebraska.
- Henderson, David, Luther Tweeten, and Dean Schreiner. 1989. “Community Ties to the Farm.” *Rural Development Perspectives* 5(3):31-35.
- Innes, Robert. Third Quarter 1999. “Takings and Endangered Species Protection.” *Choices*, pp. 10-16.
- Knutson, Ronald, C. Robert Taylor, John Penson, and Edward Smith. 1989. *Economic Impacts of Reduced Chemical Use*. College Station, TX: Knutson and Assoc.
- Knutson, Ronald, J.B. Penn, and William T. Boehm. 1983. *Agricultural and Food Policy*. Englewood Cliffs, NJ: Prentice-Hall.
- Lichtenberg, E., D. Parker, and D. Zilberman. November 1988. “Marginal Analysis of Welfare Costs

of Environmental Policies: A Case of Pesticide Regulation.” *American Journal of Agricultural Economics* 70:867-874.

Miceli, T. and K. Segerson. 1994. “Regulatory Takings: When Should Compensation Be Paid?” *Journal of Legal Studies* 23:749-76.

Nelson, G., T Josling, D. Bullock, L. Unnevehr, M. Rosegrant, and L. Hill. 1999. *The Economics and Politics of Genetically Modified Organisms in Agriculture: Implications for WTO 2000*. Bulletin 809. Urbana, IL: Office of Research, University of Illinois.

SCI. September 20, 1999, and other issues. *SCI Policy Report*. Washington, DC: Sparks Commodities, Inc. <http://www.scipubs.com/process.cfm>.

Shogren, Jason F. and John Tschirhart. Third Quarter, 1999. “The Endangered Species Act at Twenty-five.” *Choices*, pp. 4-9.

Simpson, R.D., R.A. Sedjo, and J.W. Reid. 1996. “Valuing Biodiversity for Use in Pharmaceutical Research.” *Journal of Political Economy* 104:163-185.

Solow, Andrew R. and Stephen Polasky. Third Quarter, 1999. “The Endangered Species Act as a Tool to Conserve Biological Diversity.” *Choices*, pp.17-21.

Tweeten, Luther. 1984. *Causes and Consequences of Structural Change in the Farming Industry*. NPA Report No. 207. Washington, DC: National Planning Association.

Tweeten, Luther. 1993. “Government Commodity Programs Impacts on Farm Number.” Chapter 13 in Arne Hallam, ed., *Size, Structure, and the Changing Face of American Agriculture*. Boulder, CO: Westview Press.

Tweeten, Luther. 1992. “The Economics of an Environmentally Sound Agriculture (ESA).” Pp. 39-83 in Ray Goldberg, ed., *Research in Domestic and International Agribusiness Management*. Vol 10. Greenwich, CN: JAI Press

Tweeten, Luther and Glenn Helmers. 1990. “Comment on Alternative Agriculture Systems.” In *Alternative Agriculture, Scientists’ Review*. Special Publication No. 16. Ames, IA: Council for Agricultural Science and Technology.

Tweeten, Luther and Daryll Ray. 1975. “Impact of Public Compensation Policies.” Chapter 5 in Earl Heady and Larry Whiting, eds., *Externalities in Agriculture: Benefits and Costs*. Ames: Iowa State University Press.

US Department of Agriculture. September 1999. *Agricultural Income and Finance*. AIS-72. Washington, DC: Economic Research Service, USDA.

Vogt, Donna and Mickey Parish. 1999. *Food Biotechnology in the United States: Science, Regulation, and Issues*. RL370198. CRS Report for Congress. Washington, DC: Congressional Research Service, Library of Congress.

World Resources Institute. 1994. “Biodiversity.” Chapter 8 in *World Resources 1994-95*. New York: Oxford University Press.