Biotech Food Labeling (Elise Golan, ERS)

The biotech labeling example illustrates three observations made in the theory section of this report. First, to establish successful mandatory labeling requirements, the government must provide or arrange for standards, testing, certification, and enforcement. Second, labeling of complex, unclear information will not reduce information and search costs. Third, labeling is not the best policy tool for redressing externalities (even theoretical externalities).

Background

Extensive cultivation of biotech crops began in the United States in the mid-1990's with the introduction of biotech varieties of corn, soybeans, and cotton.[10] Introduction of these major biotech varieties did not mark the first use of biotechnology in agriculture, but it, along with the use of rbGH in milk production, did herald the widespread introduction of biotech ingredients into a broad variety of food products. Whether through direct consumption, or by consumption of processed foods or meat, consumers are exposed to a wide variety of food items containing or, in the case of meat, fed with corn, soybeans, or cottonseed meal or oil. The use of biotechnology in flavoring and enzyme production further increases the potential for widespread consumption of food products containing biotech ingredients.

Labeling requirements are established by USDA for meat and poultry and by FDA for all other food products. Both agencies require labeling of a biotech food if the food's composition differs significantly from that of its conventional counterpart.[11] Most biotech foods on the market have been found to be essentially equivalent to their conventional counterparts, hence, most biotech foods are unlabeled. Despite assurances from the government (and many other organizations) about the safety of biotech foods on the market, some consumers have expressed a desire to be able to distinguish between foods and food products containing biotech ingredients and those that are biotech free. In this chapter, we examine the costs and benefits of meeting this demand.

The Firm's Decision

When deciding whether or not to advertise the non-biotech or biotech characteristics of their products, the question for food producers, including farmers, processors, and manufacturers,[12] is whether someone will eventually compensate them for their trouble. Producers will have the incentive to label and safeguard the integrity of biotech products with positive consumption attributes like better flavor or nutritional content. These characteristics are of value to consumers and advertising their presence may boost demand. For example, Calgene voluntarily labeled its Flav'r Sav'r tomatoes to distinguish them from conventional varieties. However, most biotech foods currently on the market are "first-generation" varieties, varieties with positive producer attributes (cost reducing or yield enhancing) but no obvious consumer attributes. Producers do not have an incentive to label these products.

Currently, the decision confronting most firms is whether to pursue a non-biotech strategy. Such a strategy entails eliminating biotech ingredients from a product, labeling the product as non-biotech, and then marketing the product to consumers who place a value on knowing that their food does not contain biotech ingredients. The costs and benefits of this strategy for private firms are outlined below.

Costs to the Firm of Non-Biotech Labeling

Numerous private costs could be incurred in the process of establishing a credible non-biotech product label. First, a producer must consider the opportunity costs associated with the non-biotech labeling decision. The opportunity costs of adopting a non-biotech strategy are the forgone benefits of biotech cultivation and utilization. For first-generation biotech crops, these potentially include reduced chemical use, less harmful chemical use, reduced tilling, reduced labor time, less production and financial risk, and in some cases,

[10] Agricultural biotechnology is a collection of scientific techniques, including conventional hybridization, that are used to modify or improve plants, animals, and microorganisms. Recently, the term biotechnology has been used to refer more specifically to products that have been genetically engineered (biochemical manipulation of genes or DNA). This is the meaning adopted here.

[11] The FDA, EPA, and USDA all have responsibilities in regulating the safety of agricultural biotechnology. A good overview of U.S. federal regulation of agricultural biotechnology is at http://www.aphis.usda.gov/biotech/OECD/usregs.htm.

[12] In the remainder of the biotech example we use the terms "producers" and "firms" to mean farmers, food processors, and food manufacturers.

increased yields. To date, the evidence on whether or not biotechnology has actually delivered these benefits is positive, although results vary by variety, region, and year (Heimlich et al., 2000a and b). The economic surplus created by cultivation of biotech varieties is then distributed among farmers (increased profits), seed producers and biotech firms (higher seed prices, technology fees, and increased profits), and manufacturers and consumers (through lower input prices and food prices) (Falck-Zepeda et al., 2000; Moschini et al., 2000).

The second set of costs that arises in pursuing a non-biotech marketing strategy are the costs of keeping non-biotech commodities and food products free of biotech material. This segregation could be achieved by either specializing in biotech or non-biotech, establishing separate facilities for biotech and non-biotech, or taking precautions to sequence or separate biotech and non-biotech production (including a thorough cleaning of equipment and storage facilities after each biotech variety). As an alternative to segregation, processors could choose to reformulate their products to use ingredients from crops that are exclusively non-biotech, thus minimizing the risk of inadvertently using a biotech variety. For example, corn emulsifiers could be replaced with rice emulsifiers. The cost of any of these options varies greatly depending on the flexibility of the production and marketing systems, the tolerance level for biotech content, the volume of biotech and non-biotech commodities and products processed by the system, and the likelihood of achieving economies of scale.

Another set of costs arises in convincing manufacturers and consumers that the product is truly non-biotech. One way to achieve this is to test for biotech content, and a number of private firms have begun to market biotech-testing products. Another method of monitoring the integrity of the non-biotech label is to establish a system of identity preservation (IP) in which producers at each stage of the marketing chain attest to the integrity of their non-biotech products. Such a system relies on strict segregation and product tracking more than on continual testing. Whether they use testing, or IP, or both, it may be difficult for individual firms and farmers to establish a credible non-biotech label. As with other credence goods, consumers may be skeptical of producers' claims. Such skepticism could be fueled by the observation that biotech tests are not completely reliable or consistent, and that it is difficult to ensure the integrity of an IP system.

Benefits to the Firm of Non-Biotech Labeling

Benefits to the firm of non-biotech labeling arise to the extent that labeling increases profitability. Labeling could increase a firm's profitability for a number of reasons. First, for firms selling biotech food products or commodities that have not been approved for sale in the EU or other foreign markets, pursuing a non-biotech strategy is the only way to gain access to these markets. For some firms, the benefits of access to these markets could be high, while for others they could be inconsequential. Second, firms could profit from a non-biotech label to the extent that such a label enhances the firm's reputation for safety or environmental leadership, thereby strengthening the firm's marketing position. This could be the reason that many baby food manufacturers have adopted a non-biotech strategy. Third, the market for biotech foods and commodities is still very unstable and market signals are difficult to decipher. For example in August 1999, ADM recommended that producers segregate biotech from non-biotech varieties and EU-unapproved from EU-approved varieties, but in February 2000 they withdrew this recommendation. Producers could choose a non-biotech strategy to avoid risk of uncertain biotech markets and to be in a position to gain sales if demand for non-biotech grows.

The fourth reason farmers may consider a non-biotech strategy is that some grain elevators have begun to offer price premiums for non-biotech crops. Evidence suggests that for 1999, premiums ranged from 10-15 cents (roughly a 2-3 percent premium) for soybeans and from 5-10 cents (roughly a 2-6 percent premium) for corn, though only a small number of elevators offered premiums (USDA, ERS, 2000). The February 2000 survey commissioned by Pioneer Hi-Bred and conducted by Farm Progress Companies estimated that slightly more than 1 out of 10 elevators were planning to offer a price premium for non-biotech products in the fall of 2000.

Private Benefits Outweigh Private Costs for Some Firms but Not for Others

For some firms, the benefits of creating a non-biotech label outweigh the costs. These firms are tailoring their production to benefit from the emerging markets and potential price premiums for non-biotech products. This is particularly true in the EU where even before labeling was required, many grocery stores and food chains had developed non-biotech product lines. Even in the United States, a number of manufacturers and handlers have moved to create non-biotech product lines, and

non-biotech labels can be found in most health food stores. For other firms, the costs of non-biotech labeling outweigh the benefits. For these firms, the benefits arising from the lower production costs associated with first-generation biotech varieties and a bulk production and marketing system outweigh the benefits of the non-biotech label.

Potential Third-Party Role in Non-Biotech Labeling

Third-party services could change the labeling decision of many firms by either reducing the costs of biotech labeling or increasing the benefits associated with the non-biotech label. Standards, testing, certification, and enforcement could all facilitate the development of a market for non-biotech foods. Despite the value of third-party services, few are currently available in the United States. This observation reflects both the small size and youth of the non-biotech market in the United States. It also reflects the difficulty of establishing these services for biotechnology.

Third-party entities may have a particularly difficult time establishing well-recognized, achievable standards. Biotech standards or tolerance levels would determine the maximum amount of biotech ingredients allowable in a "non-biotech" commodity or food. To achieve such standards, the risks of biotech foods would need to be both small and measurable. Like regulation of dietary intake of pesticides, third-party entities could establish biotech tolerances under these conditions. For example, if rodent test results indicated a possibility of harm from biotech foods, analysts could estimate the theoretical risk to humans and use these estimates to guide the setting of tolerance levels.

Currently, opinions about biotech risks do not lend themselves to tolerance assessment. The FDA and many consumers believe that, from a risk perspective, biotech foods and their non-biotech counterparts are identical. That is, there is no additional risk from biotech foods and therefore no reason to set tolerance levels. Some consumer groups, however, characterize the possible outcomes from consuming biotech food as undefinable but catastrophic. On this reasoning, even the smallest amount of biotech food in the food supply should be avoided and therefore, no tolerance granted. No one is suggesting that there are small risks that might be managed through tolerances. Some national governments are imposing tolerances. In the absence of a consensus on risks, tolerance levels for biotech content are being guided by consumer demand, the feasibility of the system to segregate biotech from non-biotech, and the feasibility of testing technologies to test for biotech content.

The fact that biotech tolerances are currently being determined by rather arbitrary considerations may make it more difficult for government policymakers to participate in setting standards. Policymakers may have particular difficulty reaching consensus on "consumer preferences." In addition, if the government does set standards (particularly if they are mandatory), there is a danger that these standards could outlive the topical considerations upon which they were based. As previously discussed, it may be difficult for government to change standards in response to changes in consumer preferences and technological advances.

Testing for biotech content is another important third-party service, and third-party entities have begun to provide testing services. Two types of tests have been developed to detect use of biotechnology: PCR (polymerase chain reaction) tests and ELISA (enzyme-linked immunosorbent assay) tests. To certify the validity (and limitations) of these tests, private, third-party entities and government both have taken steps to accredit and standardize testing procedures. The Joint Research Council in the EU has validated both the ELISA and PCR methods. In the United States, the Grain Inspection, Packers and Stockyards Administration (GIPSA) has established a reference laboratory to evaluate and verify the validity of analytical techniques applied to the detection of genetically enhanced traits in grains and grain products.

The third major service that could be supplied by third-party entities is certification. The ultimate viability of a market for non-biotech commodities hinges on the ability of producers to provide credible assurances to consumers that the products they purchase are truly non-biotech. Some third-party certifiers are emerging, many of whom have already established credible identity preservation systems for other types of high-valued commodities and food products such as organic foods. However, inconsistent standards and variable testing results make certification a risky endeavor.

Consistent enforcement of standards, testing, and certification would also decrease transaction costs and increase market efficiency. Again, as with certification, because standards are inconsistent and testing results variable, enforcement may be difficult.

Mandatory Labeling: Weighing the Costs and Benefits

The first question that must be addressed when considering mandatory labeling is will it be effective? In other words, will it generate any benefits? Clearly, mandatory labeling will not be effective if it is not accompanied by consistent, achievable standards, testing services (or IP), certification services, and enforcement. In fact, labeling requirements in the absence of these services have more potential to disrupt the market than they do to reduce transaction costs. For example the inconsistent manner in which EU tolerance levels have been applied has increased uncertainty and information and search costs. In many cases, food manufacturers are uncertain how best to comply with EU standards and ensure access to the European market.

Even if the government is able to establish standards, testing (or IP), certification, and enforcement, the effectiveness of biotech labeling for addressing problems of missing or asymmetric information and externality problems is questionable. A simple label proclaiming "this product contains biotech ingredients" does not convey any information about potential costs and benefits or probabilities. Though such labeling may be informative to some consumers, it may also lead to greater confusion on the part of others and reduce, rather than enhance, economic efficiency. Even if information on theoretical consequences and probabilities were included on the label, it would be unreasonable to expect consumers to be able or willing to evaluate such information.

Labeling is also not the policy tool best suited for reducing any of the potential externalities associated with this technology. Labeling may lead to a better matching of individual consumer preferences, but when preferences differ, some consumers will necessarily be unsatisfied by the social outcome. For example, if consumers perceived biotech foods as posing potential health and environmental risks, then presumably, risk-averse consumers would choose to consume more conventional foods, while the risk-neutral would choose either biotech or conventional foods. For individual health risks, labels would lead to a better market outcome, allowing consumers to better match their individual health-risk preferences. However, as long as any consumers choose to consume biotech foods, the potential risks to the environment and to public health remain, and the social outcome preferred by biotech-averse consumers is not attained.

For agricultural biotechnology, labeling may be even less successful in correcting for externality problems if the objective is to "internalize" the externality. An externality is internalized when the firm or farmer creating the externality is made to bear the costs of the externality. The cultivation of biotech has the potential to impose externality costs on non-producers, because these producers may need to take precautions to assure that their products are not mixed with biotech products. For example, non-biotech farmers may need to take precautions to ensure that their crops are not cross-pollinated by biotech crops. Mandatory biotech labeling has been suggested as one means of passing some of these costs back to biotech producers. However, mandatory labeling will probably be unsuccessful in transferring the costs of segregation from non-biotech to biotech producers and consumers (Golan and Kuchler, 2000). Even if biotech producers label their products with "may contain biotech" or "does contain biotech," non-biotech producers will still need to certify that their products are indeed non-biotech. As a result, even with mandatory biotech labeling, non-biotech producers and consumers will bear the costs of segregation, and labeling will be unsuccessful at internalizing externality costs.

Regulation targeted directly at potential externalities is probably a better policy option than labeling. Biotech cultivation regulations (for example, boundaries and refuges) and well-defined property rights may be better suited to controlling the potential environmental externalities of biotech production.

Once the efficacy of mandatory labeling is established, policy analysts still must determine whether the benefits outweigh the costs. This is a difficult task because most of the social benefits and costs of mandatory labeling are largely theoretical. Labeling advocates cite social benefits ranging from informed consumers to reduced risk of ecological disaster. Labeling opponents claim that the cost of labeling (and segregation) would be so high that food manufacturers would be forced to stop using biotech crops, thereby reducing the demand for biotech crops to the point that the technology would be abandoned. In this extreme scenario, many of the environmental or social benefits of agricultural biotechnology would be lost. Policy analysts will be hard pressed to calculate the costs and benefits of such theoretical and extreme predictions.

The wide variety of theoretical social costs and benefits, all with varying and unknown probabilities of

occurrence, may argue for labeling as one of the best political options for dealing with concerns about biotech consumption and production (and may explain why labeling continues to be debated). As discussed in Part 1, where political or regulatory consensus is not possible, labeling may represent the best compromise solution and the path of least resistance. Nevertheless, any decision to require labeling must consider whether labeling will have an impact on the social objectives, whether labeling is the least-cost government tool, and of course, whether market forces and individual incentives have already responded to address the policy concern.