Traceability for Food Marketing & Food Safety: What's the Next Step?

When information about a particular attribute of a food product is systematically recorded from creation through marketing, traceability for that attribute is established. Recording and transmitting information about food products at specific points along the marketing chain can have a number of practical purposes, including product quality control and supply-side management. However, the area where traceability seems to be getting the most attention lately—mandatory tracking of genetically engineered crops and food—is *not* among the practical or efficient uses of traceability.

Information on any number of the attributes of a food product can be recorded and passed along the food marketing chain. A coffee producer, for example, may maintain records on bean variety, location of cultivation, labor conditions on the farm, whether the bean was grown organically or in the shade, and on the shipping firm. Records such as these might later prove useful to the coffee producer in tracking quality or in replicating a top-selling shipment. These records could be used to distinguish one type of coffee from another. Recently, the European Union (EU) proposed government-mandated traceability for genetically engineered crops and foods to help distinguish them from their conventional counterparts.

Traceability systems are recordkeeping systems. In practice, traceability systems are used primarily to help keep foods with different attributes separate from one another. There are two primary approaches for separating attributes:

- A segregation system separates one crop or batch of food ingredients from others. Though segregation implies that specific crops and products are kept apart, segregation systems do not typically entail a high level of precision and do not necessarily require traceability. In the U.S., though white corn is channeled through the bulk commodity infrastructure, it is segregated from other types of corn.
- An identity preservation (IP) system identifies the source and/or nature of the crop or batch of food ingredients. IP systems are stricter than segregation systems and tend to require documentation, that is, traceability, to guarantee that certain traits or qualities are maintained throughout the food supply chain. Tofu-quality soybeans are put into containers to preserve their identity.

Food suppliers and government have several motives for documenting the flow of food and food products through production and distribution channels—and a number of reasons for differentiating types of foods by characteristics and source. In some cases, the benefits of establishing detailed traceability may not warrant the costs. For example, consumers may not be willing to pay for information on specific government-approved pesticides used on each apple in a bin of apples.

In other cases, the benefits of IP and traceability may exceed the costs. For example, if a large-scale canned fruit manufacturer could profitably produce both a line of organic applesauce and conventionally produced apple sauce, the firm would want to separate organic and conventionally produced apples and document the source of each. Traceability systems will vary widely depending on the motivations driving their development and the degree of assurance desired (increasing reliability usually increases costs).

Private-Sector Motivations For Traceability

Food suppliers who operate in the private sector have three distinct motives for establishing traceability systems: to differentiate and market foods with subtle or undetectable quality attributes; to facilitate traceback for food safety and quality; and to improve supply-side management. A firm may establish a traceability system to achieve any number of these objectives, and as a result, the private sector has a significant capacity for tracing.

Differentiate and market foods with undetectable or subtle quality attributes. While the U.S. food market successfully mass-produces homogenous commodities such as grains and meats, it also offers goods and services tailored to the tastes and preferences of narrow segments of the consumer population. The growth in micromarkets reflects an increased ability to satisfy variations in consumer food preferences as well as rivalry among food manufacturers.

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Food producers differentiate products for micromarkets over a wide variety of quality attributes including taste, texture, nutritional content, cultivation techniques, and origin. Consumers easily detect some quality innovations—green ketchup is hard to miss. However, other differences involve credence attributes—characteristics that consumers cannot discern even after consumption of the product. The claim that a product contains no genetically engineered ingredients asserts a credence attribute: consumers cannot taste or otherwise sense a difference between food products containing genetically engineered ingredients and those made with non-genetically engineered ingredients.

Credence attributes can be content attributes or process attributes:

- *Content attributes* affect the actual physical properties of a product, although they can be difficult for consumers to perceive. For example, consumers are unable to determine the amount of isoflavones in a glass of soymilk or the amount of calcium in a glass of enriched orange juice by drinking the beverages.
- *Process attributes* do not affect final product content but refer to characteristics of the production process. These reflect consumer concerns about the production process, including environmental stewardship, animal welfare, and labor conditions. Process attributes include organic, free-range, dolphin-safe, shade-grown, earth-friendly, and fair trade. In general, neither consumers nor specialized testing equipment can discern process attributes. No test conducted on the contents of a can of tuna, for example, could ascertain that the tuna had been caught using dolphin-safe technologies.

The task of producing credence attributes may prompt some firms to segregate or establish IP and traceability systems—in fact, where attribute testing is not possible, IP and traceability may be the only way to differentiate these attributes. Some firms may differentiate production by establishing separate product lines within the same plant or by sequencing production and thoroughly cleaning production facilities between differentiated product batches. Other firms may dedicate a whole plant to the production of one specific product line.

Firms that produce foods with process attributes by contracting with ingredient suppliers for commodities with particular attributes have, de facto, established traceability and IP systems. For example, firms that market dolphin-safe tuna segregate (sometimes exclusively buying dolphin-safe tuna) and keep records of their transactions.

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Likewise, because no test can now distinguish between highly processed oils derived from genetically engineered commodities and those derived from conventional commodities, these products are usually differentiated through tracking. The incentives to develop segregation or IP systems and to document transactions are the same for process and content attributes in cases where testing for content attributes would be costly, inaccurate, or difficult.

Once a firm has produced a product differentiated by a credence attribute, it then faces the difficult task of establishing market credibility. Consumers are often skeptical about the existence of credence attributes. In response, a firm can acquire credibility like it acquires other inputs—by making or buying it. Some firms build credibility by establishing a reputation for delivering the attributes they advertise. Other firms purchase the services of third party entities (neither the buyer nor the seller) to provide objective validation of quality attributes. Third parties offer four primary services to help verify quality claims: establish product quality standards and/or traceability standards; test products, and/or review traceability documentation to verify that traceability and/or technical standards have been met; provide certification that standards have been met; and report violations of standards.

Third-party services can be provided by a wide variety of entities, including consumer groups, producer associations, private third-party entities, and international organizations. The following are examples of third parties:

- The Good Housekeeping Institute, founded for the purpose of consumer education and product evaluation, sets product standards and provides consumer guarantees for a wide range of goods, including foods.
- The American National Standards Institute (ANSI), a nonprofit membership organization, facilitates development of voluntary private-sector standards for a wide range of products.
- Underwriters Laboratories (UL), a private nonprofit entity, provides standards and certification, primarily for electrical appliances.
- The Council of Better Business Bureaus works with the National Advertising Review Board to investigate questions of truth and accuracy in national commercial advertising.
- ISO, a worldwide federation of national standards bodies, promotes the development of standardization and international standards for a wide range of products.

Governments can also provide voluntary third-party verification services. For example, to facilitate marketing, producers may voluntarily abide by government established and monitored commodity grading systems.

Facilitate traceback for food safety and quality. Many firms use traceability systems to minimize potential damage from deficiencies in their food safety systems. Food suppliers have a strong economic interest in quickly isolating the source of food safety or quality problems, before the food item reaches consumers; all firms want to avoid the association of their brands with safety hazards or compromised quality. A traceability system can help producers reduce the time required to identify and remove contaminated foods from production lines and from the market.

Most food producers put coded information on food packaging to facilitate prod-

European Union Proposes Mandatory Traceability Standard For Genetically Engineered Foods & Feeds

The European Union's (EU) proposed regulations for mandatory traceability and labeling of genetically engineered foods and feeds, unveiled in July 2001, could take effect by the end of 2003.

The EU mandatory traceability proposal contains the following requirements.

- ***EU handlers*** of genetically engineered foods or feeds must document from whom they received those items and must retain and transmit information related to genetic engineering. Handlers would be required to keep records for 5 years.
- ***EU farmers*** must indicate that the commodity was grown using genetic engineering methods and further delineate each type of biotech transformation event that may be present in each delivery. For imported commodities, this information must be provided by the importer. For imported processed products, the importer must indicate which ingredients are genetically engineered.
- ***Each genetically engineered transformation event*** must have a specific unique identifier.
- ***Retail-level foods*** must be labeled as containing genetically engineered ingredients on an ingredient-by-ingredient basis.

A traceability system may add to the costs to growing, handling, storage, transport, processing, and administering the sale of genetically engineered food products. Estimating the magnitude of the costs of identity preserving, tracing, and labeling is complex and subject to varying assumptions. Some key determinants of the costs include the stringency of the tolerance level, the ease of cross-pollination at the farm level, and the volume of the product transported, stored, and processed.

uct identification. For example, most voluntary recalls listed on the USDA's Food Safety and Inspection Service website refer consumers to coded information on products' packaging. Some firms use detailed coded information. For example, one milk processor uniquely codes each item to identify time of production, line of production, place of production, and sequence. With such specific information, the processor can identify faulty product to the minute of production. If a food safety or quality problem were encountered, the information could help contain the costs of damage control.

The struggle to control BSE in cattle in the United Kingdom has warranted the development of various traceability systems to document the distribution of beef products. One example is the traceback system adopted by an Irish supermarket which uses DNA testing capable of tracing meat to animal of origin rather than to farm or herd.

Improve supply-side management. For many firms, traceability systems have already proven their value in managing production flows and tracking retail activity. In the U.S., the vast majority of packaged food products, as well as a growing number of bulk foods like bagged apples and oranges, bear codes that enable stores and manufacturers to collect data on retail trade patterns. These codes, known as bar codes, are composed of a series of numbers detailing standard information on type of product and manufacturer (the UPC code), and a series of numbers assigned by the manufacturer to nonstandard production or distribution details. While the original purpose of bar codes was to facilitate tracking of retail sales by item and to generate information on food consumption trends and patterns, their use is not restricted to that purpose. The bar code technology is also used to manage inventory flow.

Manufacturers have developed other high-tech tracing systems for managing input and output flows. For example, ranchers have been using electronic identification eartags and corresponding data collection cards to track information on animals' lineage, vaccination records, and other health data. The advantage of electronic tags is that producers and packers can use transponder readers to track individual animal characteristics. This allows for efficiency gains by sorting individual cattle in feed yards, recording preconditioning and other health regimes, and conducting disease surveillance and monitoring. Additionally, the resulting chain of documentation enables producers to sell their cattle at a price that reflects quality.

Motives for Government-Mandated Traceability

A government may have three reasons for considering making some traceability systems mandatory: to facilitate and monitor traceback to enhance food safety; to address consumer information about food safety and quality; and to protect consumers from fraud and producers from unfair competition.

Monitor and enhance food safety. To help protect the public's health, the Federal government, along with State and local public health departments, plays an active role in tracing foodborne illness outbreaks. Both USDA and the U.S. Food and Drug Administration (FDA) rely ultimately on documentation maintained by private firms.

In a traceback investigation, public health officials attempt to identify the source of a foodborne illness outbreak and then trace the flow of the contaminated food throughout the food supply system. When investigation units trace diseases to their origin and contaminated foods are removed from the food supply, illnesses can be prevented and lives saved. In the cases of some types of foodborne illnesses, such as those caused by *E. coli* 0157:H7, no cure is known; identifying and removing the source of illness is the only means of preventing the spread of disease. The faster the disease-causing bacteria can be detected, the faster investigators can respond to outbreaks and the more lives that can be saved.

Federal government and other public health officials have taken strides in building the infrastructure for tracking the incidence and sources of foodborne illness. The Foodborne Diseases Active Surveil-

lance Network (*FoodNet*) combines active surveillance for foodborne diseases with related epidemiologic studies to help public health officials better respond to new and emerging foodborne diseases. *FoodNet* is a collaborative project of the Centers for Disease Control and Prevention (CDC), nine states, USDA, and the FDA.

Another network, *PulseNet*, based at CDC, connects public health laboratories in 26 states, Los Angeles County, New York City, the FDA, and USDA to a system of standardized testing and information sharing. *PulseNet* helps reduce the time it takes disease investigators to find and respond to foodborne outbreaks.

Both *Foodnet* and *Pulsenet* differ from passive surveillance systems that rely on reporting of foodborne diseases by clinical laboratories to state health departments, which in turn report to CDC. Under passive information gathering, only a fraction of foodborne illnesses are routinely reported to CDC.

Once investigators have identified a contaminated food source, the Federal government works with food manufacturers to isolate the cause of contamination and to remove the contaminated food from the market. Two Federal agencies may take action: USDA and FDA. USDA, which regulates the safety of meat and poultry, does not have authority to require that manufacturers recall contaminated foods; recalls handled by USDA are voluntary—although USDA can detain or seize adulterated or misbranded products. USDA may also remove inspectors from federally inspected plants that are recalcitrant about addressing safety problems, effectively halting plant operations. Recalls handled by FDA, which regulates all domestic and imported food except meat and poultry, are conducted voluntarily, sometimes by FDA request.

Both USDA and FDA rely ultimately on documentation maintained by private firms to trace the flow of inputs into the final food product and to track the distribution of final food products throughout the retail sector. A firm's traceback documentation is constructed from its traceability system: the documentation used to trace a food from farm (or point of production) to plate (or retail or eating establishment) is used to trace a food product back from plate to farm. The Federal government does not monitor private firms' traceback ability, and such systems are not mandatory. Mandatory, government-monitored traceability of private industry production would be needed only if private firms fail to supply enough traceback capacity.

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Private firms provide the optimal amount of traceback capability if markets function properly. If all benefits as well as the costs of traceability are borne by private firms, then the market supply of traceback will be optimal: the net benefits of traceability systems for food safety will be maximized. However, when markets fail, as when the benefits firms actually reap are not equal to social benefits, the amount of traceback capacity may not be optimal. Where the market fails to give food suppliers incentives to maintain traceback or other food safety systems, and consumers are willing to pay for more safety, there could be a need for intervention to increase traceability.

But, even assuming that the operations of the marketplace do not provide sufficient food safety, is a government-mandated traceability system the best or least-cost solution? Usually, performance standards—rather than process standards—ensure the most efficient compliance systems. With performance safety standards, such as standards for pathogen contamination or recall speed, the individual firm can choose the most efficient process to achieve a particular standard. For some firms, plant closure and total product recall may be the most efficient method for isolating production problems and removing contaminated food from the market. For other firms, detailed traceback, allowing the firm to pinpoint the production problem and minimize the extent of recall may be the most efficient solution. Other firms may be able to maintain safety at less expense by adopting new technologies, such as irradiation, and dispensing with recordkeeping.

Process standards such as mandatory traceability require that firms adhere to a common set of production or management systems, regardless of the size or technological characteristics of the firm. As a result, process standards tend to be less efficient than performance standards. Likewise, mandatory government monitored traceability is likely to be a less efficient mechanism for building food safety than enforcement of food safety performance standards.

Address consumer knowledge about food safety and quality. Where markets produce all the information that consumers are willing to pay for, mandatory traceability systems would be superfluous and introduce unwarranted costs. However, sometimes consumers would like more information about the safety and quality standards maintained by food manufacturers. It is possible that mandatory, publicized traceability systems could help reduce such asymmetry by providing additional safety and quality information so that consumers could more readily choose food products to match their preferences. For example, various government agencies mandate that oyster producers document the time and place of oyster harvest. However, a general mandatory traceability system may not be the most efficient way to enhance food safety—enforcement of food safety performance standards is generally a better option.

Protect consumers from fraud and producers from unfair competition. To protect consumers from fraud, and producers from unfair competition, the government may require that firms producing foods with credence attributes substantiate their claims through traceability systems. If firms are not required to establish proof that credence attributes exist, some may try to pass off standard products as those having credence attributes, in order to gain price premiums. In these cases, the government may require that firms producing valuable credence attributes verify their claims. For example, the government may require that firms producing organic foods verify the claim. No such verification would be necessary, of course, for conventional foods because consumers

typically are not willing to pay more for these foods.

Similar but Distinct Concerns For Private, Public Sectors

In the private sector, the goals for traceability of food supplies are mainly to assure buyers of the existence of quality attributes, to facilitate traceback for food safety and quality, and to improve supply chain management.

The main goal of the public sector for traceability is to ensure that recordkeeping is sufficient for traceback, with the objective of mitigating foodborne public health problems. Additionally, when markets fail, the public sector may have an interest in providing consumers with access to information about safety or quality standards maintained by private firms, and in protecting consumers and producers from fraudulent claims.

Proponents of the EU proposal for mandatory traceability of genetically engineered food and feed argue that such a system is necessary

- to ensure the government's ability to recall genetically engineered products in case of unforeseen food safety or environmental problems;
- to enhance consumer choice; and
- to control and verify labeling claims.

However, it is doubtful that mandatory traceability will prove to be the most efficient mechanism for achieving any of these objectives.

Performance standards, which allow firms to determine the most efficient mechanism for compliance, are usually more efficient than process standards for ensuring food safety or environmental quality. With government-mandated food safety performance standards, all food, including genetically engineered food, that did not meet the standards could be subject to recall and/or seizure. A strictly enforced performance standard would enhance firms' incentive to maintain efficient food safety systems.

When there are process attributes that are valued by consumers—like non-genetically engineered foods—then food suppliers may have the incentive to market those attributes. Consumer surveys have indicated that many EU consumers are opposed to the purchase of genetically engineered foods. Manufacturers and retailers can opt to market non-genetically engineered foods. Consumers' choice of products would then be enhanced without imposing government-mandated traceability. Many retailers and food establishments are doing this—both in the U. S. and in Europe.

Mandatory traceability for all foods is also unlikely to be the most efficient mechanism for verifying quality claims for the subset of foods with credence quality attributes valued by some consumers, such as non-biotech foods. A government may indeed have an incentive to require that producers of non-genetically engineered foods verify that these foods are actually not genetically engineered, if the non-genetically engineered attribute is of value to some consumers. However, no such verification would be necessary for the genetically engineered foods currently on the market, because this attribute is not of value to consumers (most biotech products currently on the market boast producer, not consumer attributes).

A mandatory traceability system for both genetically engineered and non-genetically engineered foods is unnecessary to protect consumers from fraud. Such a system could raise costs without generating compensating benefits. AO

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February Releases—National Agricultural Statistics Service

The following reports are issued electronically at 3 p.m. (ET) unless otherwise indicated.
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Milkfat Prices (8:30 a.m.)
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5 Weather - Crop Summary (noon)
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