

**Market Opportunities and Threats to the U. S. Pork Industry
Posed by Traceability Systems**

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Abstract

This paper demonstrates that the U. S. pork industry is lagging its principal international competitors and major international customers in terms of developing programs for traceability, transparency, and assurance (TTA). The primary areas of weakness in U. S. TTA programs are at the producer level and in the area of providing consumers quality assurance regarding inputs used in producing pork products. We conclude that the U. S. pork industry may diminish its competitive advantage in world pork markets if it fails to enhance its TTA programs.

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Introduction

The appearance of “mad-cow” disease (*bovine spongiform encephalopathy*, or *BSE*) in Europe and widely publicized outbreaks of *e. coli* and other bacterial scares in the food industry have sparked a rising public concern worldwide for food safety—especially in red meat. Concerns about *BSE* have led to the development of complex systems of accountability encompassing production, processing and end product within the red meat system in the European Union (EU). The EU system is built on the concepts of traceability, transparency, and assurance (TTA). Traceability is defined as the ability to track the inputs used to make food products backward to their source at different levels of the marketing chain. Transparency refers to the availability of information on all of the procedures and practices used to produce a food product at each level of the marketing chain. Assurance means creating safety and quality standards at each level of the marketing chain and verifying these standards through a system of testing and auditing (Liddell (2001)).

Other countries such as Canada and Australia have begun to develop TTA systems similar to the EU. However, the United States has not participated in this trend by developing its own TTA system for red meat. The uneven development of TTA systems worldwide raises questions about the threats and opportunities TTA poses to the international red meat industry. It especially draws into question the future positioning of the United States red meat industry in international markets since the U. S. is lagging competitors in the development of TTA systems (Frazao and Allshouse (1996); Bailey and Hayes (2001)).

There are at least three reasons why the U. S. pork industry should be concerned that the United States is lagging its competitors in terms of TTA. First, consumers are becoming more concerned about the inputs used to produce food. In the past, consumers viewed their primary food safety risk as being food-borne pathogen contamination at the processing and preparation levels. As a result, current U. S. food inspection, food safety laws, and enforcement are aimed principally at food processors and food preparers. Food-borne pathogens remain an important concern but emerging consumer interests center on the inputs used to produce food. Some of these concerns are directly related to health issues, such as inputs used in animal feed in the case of *BSE*, while some are not directly food safety related such as concerns about genetically modified organisms (GMOs), environmental degradation, and animal welfare. For example, Wade and Conley (1999) report that interest has turned toward food safety systems that focus on controlling chemical additives, microorganisms, and viruses that are dangerous to humans when they are introduced into the food chain through production and processing practices. The current U. S. inspection system was not designed to track farm-level inputs in food production and significant changes would be required to modify the U. S. system to do so. Second, competitors may be able to successfully differentiate their pork products based on TTA. This could conceivably relegate U. S. pork products to second-

class status in the eyes of some consumers. Third, domestic and foreign pork consumers may be willing to pay for TTA and a potential market opportunity may be lost if the U. S. pork industry fails to develop credible TTA systems.

The purpose of this paper is to analyze from a strategic perspective the possible impact on U. S. pork export markets that might result from U. S. competitors increasing their TTA standards. The approach taken is to compare and contrast TTA systems in different countries, provide an initial country ranking based on each country's level of TTA, and finally to discuss potential implications for the U. S. pork marketing system.

Past Work

Scientific research on issues relating to TTA is quite limited since these systems have been evolving only within the past five years. The economic literature that exists dealing with TTA focuses primarily on the aftermath of the *BSE* crisis in the United Kingdom (UK) (e.g., Palmer (1996); Loader and Hobbs (1996)). Hobbs used transaction costs economics to examine the perceived value of tracing beef cattle from the farm to the packer level (1996a) and between beef suppliers and retail outlets in the UK (1996b). Her findings indicated that traceability was the most important characteristic desired by large beef processors when purchasing cattle from farmers (1996a). Hobbs (1996b) also found that the ease of traceability ranked ahead of prices paid to processors as an important characteristic to consider when supermarkets purchased meat.¹ Latouch, Rainelli, and Vermersch (1998) reported that consumers in the Rennes area of France were willing to pay for traceability, but their study focused on only one issue, *BSE*, and did not deal with more general issues relating to TTA. Verbeke et al. (1999) examined the attitudes of Belgian meat consumers about pork and argued that traceability systems would work best when coupled with efforts to improve intrinsic qualities such as leanness, healthiness, taste, and tenderness.

The Verbeke et al. (1999) study indicated that production improvements are needed in pork marketing systems as well as TTA. TTA not only provides valuable marketing information but can also provide production information to all points in the marketing chain. For example, TTA makes it possible for production information gathered at slaughter and information about consumer acceptance at retail to be provided to farmers and information about inputs and processes used at the farm level to be provided to consumers or anyone else along the marketing chain. Expanded information and the shared accountability provided by TTA have the capability of offering a method of communicating with information and data among the levels of the marketing chain in ways not possible before. Economic incentives should entice firms to take advantage of TTA to improve consumer acceptance of their products. TTA may be able to provide the information each link in the marketing chain needs to accomplish this task. Strengthening the links between the levels of the marketing chain may possibly be the most important potential contribution of TTA systems. This can only be done effectively if the private and public sectors work in tandem to create these information flows.

¹ However, Hobbs (1996b) found supermarkets' most important consideration to be consistent quality.

Private and Public Sector Involvement in Developing TTA Systems

TTA programs have developed at different speeds in different countries and with varying levels of public and private sector involvement. The private sector has provided leadership in developing TTA programs in the EU, especially during the time since the *BSE* crisis. At the start of the *BSE* crisis a few government officials in the EU disseminated what was considered misinformed or even misleading information to the public about the dangers of *BSE*. As a result consumer confidence in the ability of EU governments to deal effectively with the crisis was badly shaken. Private companies and private associations in some of the EU countries met this challenge by developing brand name meat products that gave private certifications regarding food safety and quality assurance,² including TTA. Examples of branding include Assured British Meat (2000) and Swedish Farm Assured (2001). In some cases in the EU the private and public sectors have worked very closely together (e.g., Denmark) to develop TTA programs (Liddell (2001)). Countries where consumer confidence in government regarding food safety issues has remained relatively high, compared to the EU, have generally had less private participation in developing food safety and quality assurance programs³ than the EU.

Table 1 presents a synopsis describing the level of public and private sector involvement in food safety and quality assurance certifications in the United States, its major competitors in international pork markets (UK, Denmark, Canada, and Australia/New Zealand) and the world's largest pork importer (Japan). Table 1 illustrates that the private sector in the EU is participating more aggressively in certifying food safety and quality assurance than the private sector in the United States, Canada, Australia/New Zealand, and Japan. The result has been a more market-oriented food safety and quality assurance system in the EU than in other countries. TTA is an essential part of the EU system since it makes the certification of food safety and quality assurance characteristic feasible. In other countries governments and trade associations have been the principal designers of TTA systems, mostly in reaction to the events in the EU. As a result, the non-EU systems tend to be somewhat more producer-oriented than in the EU. This places the EU in a position of potential competitive advantage since their TTA systems have been developed to meet specific consumer concerns regarding food safety and quality assurance.

Current private and public sector efforts in the United States and Canada have focused on electronic tracking systems. These include a system called AgSpan, which is a company associated with Metropolitan Life Insurance Company. AgSpan is developing protocols for certifying veterinarians to document farm-level health programs. Canada has an official database for tracing cattle called the Canadian Cattle Identifying Agency. Canada is also in the process of implementing mandatory traceability in its red meat

² In this study, quality assurance refers to building characteristics into pork products that have no value in terms of safety or nutrition but which are still valued by some consumers. Examples of quality assurance characteristics might include animal welfare, absence of GMOs, and environmentally friendly production processes.

³ TTA is basically the tool that makes certifying food safety and quality assurance programs possible.

system during the next two years. Global Animal Management (GAM), a company associated with Schering Plough Animal Health Corporation, is in the process of installing tracking systems in meat packing plants (both hogs and cattle) that would allow individual animals to be electronically tracked from birth at least through the carcass stage and eventually to individual meat cuts (Coe (2000)). One of the primary features these companies use when marketing these different systems is the ability of the system to provide production information (birth date, weight, slaughter date, grades, back fat, etc.) to producers (Coe (2000)). As the North American systems evolve, the lessons learned in the EU about developing consumer oriented TTA systems need to be remembered. Systems such as GAM's could easily include information that may be valuable to consumer on the processes and inputs used to produce pork. Research could identify how consumers want these systems to evolve and determine what information consumers are willing to pay for. The potential result would be a system that addresses consumer needs and provides a large enough financial return to justify the investment.

Competition in International Pork Trade

International pork markets are characterized by high concentration on both the import and export sides of the market. These markets are also well integrated and are highly competitive (Barrett, Li, and Bailey (2000)). Figure 1 illustrates how highly concentrated these markets are. Three exporters, the EU, Canada, and the United States export 85% of the pork traded in international markets and Japan, the world's largest food importer, buys approximately one-third of all pork that is exported (USDA, FAS (2000)). While the U. S. market share of pork trade is large enough to offer some ability to counter preemptive strategic moves by competitors, the international pork market remains dominated by the EU. This suggests that a move by the EU to differentiate their pork based on TTA has the potential to hurt U. S. pork exports.

Japan is by far the most important market for U. S. pork exports. The United States has an advantage over the EU in providing chilled pork to Japan (Liddell (2001)). However, because food imports are so important in Japan, Japanese food and labeling laws are designed primarily to regulate imports. In Japan food ingredients must be disclosed in detail on labels. Information providing traceability to the processing plant is also required to be included in labeling (Japan External Trade Organization (JETRO) (1998)). The recent sensitivity displayed by the Japanese regarding GMO corn suggests some risk exists for U. S. pork exports if concerns about *BSE* or other input-based food safety issues continue to surface.

The EU and Canada have proven to be effective competitors with the United States for the Japanese pork market, especially for frozen pork. Both have increased their share of the Japanese frozen, imported pork market in recent years (Liddell (2001)). Aggressive competitors with developed or developing TTA systems can be expected to attempt to differentiate their products in ways that will add value or competitive advantage. Consequently, a lagging U. S. system for TTA may eventually provide a threat to U. S. pork exports to Japan and other countries.

Ranking TTA Systems

Comparing TTA levels across countries is useful in determining the stage of TTA development among pork market competitors and customers. The country score calculated in this study was ordinal, i.e., did not give an absolute ranking, but was only intended to rank by order the treatment each country gives to food safety and quality assurance programs certified through TTA. Results of the scoring procedure provide an understanding of the degree of effort each country is putting into developing a more traceable, transparent, and assured system than has existed in the past.

This study examined the different levels of TTA that existed in each selected country at the end of 2000 and compared each country's TTA programs against a theoretically "perfect" TTA score. Points were assigned based on if a country "qualified" under each level of TTA. That is, each country received one point for each TTA category it qualified under. A perfect score was obtained if the country had complete TTA. The different levels or categories of TTA used to do the scoring are presented in Table 2. Assurance was scored for both food safety and quality assurance. Ranking each country's assurance system for both food safety and quality was important since traditionally countries have focused their efforts on food safety. Quality assurance, as defined in this study, is a more recent market development. Quality assurance scores identified countries that are making efforts to provide consumers explicit assurances about the inputs used to produce and manufacture pork products at each stage of the marketing chain. A "perfect" total score was 17 (five points possible for traceability, four points possible for transparency and eight points possible for assurance).

Table 3 reports the composite TTA scores for each country considered in the analysis. Denmark received the highest total score (16) followed by the UK (15), Australia/New Zealand (13), Japan (11), Canada (8), and the United States (7). The results supported the notion that the U. S. pork system is lagging its principal competitors (EU, Canada, and Australia/New Zealand) and some of its major customers (Japan and Canada) in terms of developing TTA systems. The results presented in Table 3 also help to identify specific areas in which the U. S. pork industry appears to be falling behind other countries in terms of TTA.

None of the six countries offers complete traceability to consumers (i.e., traceability to genetic lines and specific initial farm level production inputs). The reason for this is not precisely clear but probably relates to the costs associated with achieving complete traceability. Electronic tracking systems, such as the one being developed by GAM, may reduce the cost of tracking this information and might make complete traceability less costly. More traceability exists in systems outside North America than within North America, although Canada will soon have mandatory traceability to the producer level. The principal U. S. competitors in pork export markets are all moving at a faster rate than the United States in establishing traceable systems, including an emerging competitor, Australia/New Zealand.

Canada and the United States have less transparency than the EU systems. The weakest transparency link in the North American systems is at the producer level. Inspection and certification procedures in most of the countries are well established and publicized for the processor and distributor levels (processor and distributor transparency). This reflects the traditional orientation of food systems to protect against food-borne pathogens at the processor and preparer levels. The European systems have been modified to include farm-level certifications and the EU makes information about the procedures and processes for obtaining farm-level certification available to the public (producer transparency).

All six countries take similar approaches to food safety with each offering food safety assurance from at least the processor to the consumer. The EU countries (Denmark and the UK) have developed food safety programs at the farm level while the other four countries have not. This reflects the heightened consumer concerns in the EU about farm-level inputs used in pork production. Neither the United States nor Canada has focused efforts on quality assurance. However, the EU and Australia/New Zealand have made quality assurance a priority and their systems match the Japanese quality assurance system more closely than the U. S. system does. This suggests the United States may be becoming somewhat unbalanced in its food safety and quality assurance systems relative to the EU and other competitors (i.e., less emphasis is placed on quality assurance in the U. S. system than in other countries). As a result, U. S. pork exports may be somewhat vulnerable if major concerns about food safety and quality assurance arise in our major export customers.

Conclusions

World pork markets are evolving steadily toward more traceability, transparency, and assurance. TTA systems are evolving at different rates in different countries and the uneven development of these systems presents potential opportunities and threats to pork market participants. The U. S. pork industry is lagging its principal competitors and some of its largest customers in terms of developing TTA programs. This places the United States at a potential competitive disadvantage relative to some of its competitors in terms of TTA.

As a result of low consumer confidence in government's ability to deal with food safety and quality assurance issues, TTA systems in the EU have been designed with a high degree of both private and public involvement. This has resulted in systems that are market driven. International pork markets are highly integrated, competitive, and concentrated. Any successful effort to differentiate pork products based on TTA is a potential threat to U. S. export markets. The magnitude of this threat is not yet fully known and could only be ascertained through additional research.

The United States received the lowest score of the six countries considered in the analysis in terms of its TTA program for pork. Based on the analysis, the principal weaknesses in the U. S. system exist at the producer level and in quality assurance where less effort has been expended to develop TTA programs than in other countries. The EU

has stressed developing TTA programs that involve each level of the marketing chain beginning with producers. Systems in the United States, Canada, and Australia/New Zealand continue to place emphasis on the marketing chain from the processor level forward. The U. S. pork industry has made little effort, compared to the pork industries in other countries, in developing systems to assure consumers about the inputs used in pork production, processing, distribution, and retailing (quality assurance). As a result, the U. S. pork industry may face additional threats to its markets in the future as consumer awareness and concerns about the processes and inputs used to produce food continue to increase. It is also possible a market opportunity is not being addressed by the U. S. pork industry if domestic and foreign consumers are willing to pay more for pork with food safety and quality assurance characteristics certified through TTA.

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Table 1. The Level of Private and Public Involvement in Certification Programs for Food Safety and Quality Assurance in Selected Countries.

Food Characteristic	Private Certification^a	Public Certification^b
Food Safety	U. S. - Low UK – High Denmark – High Canada – Moderate ANZ ^c – High Japan – Low	U. S. – High UK – High Denmark – High Canada - High ANZ – High Japan – High
Quality Assurance	U. S. – Low UK – High Denmark – Moderate Canada – Low ANZ – Low Japan – Low	U. S. – Moderate UK – Moderate Denmark – High Canada – Moderate ANZ – Moderate Japan – Moderate

^a The levels for Private Certification are basically as follows:

High = aggressive private company and private association band naming and certifications for food safety and quality assurance

Moderate = Private associations actively involved in implementing systems to certify food safety and/or quality assurance

Low = Little private involvement in certifying food safety and/or quality assurance

^b The levels for Public Certification are basically as follows:

High = Aggressive inspections relating to food safety and/or inputs in food production not directly related to food safety, HACCP implementation, ban on potentially unhealthy substances

Moderate = Adherence to animal protection laws with investigations usually generated following complaints

^c ANZ = Australia/New Zealand

Table 2: TTA Classifications to Score TTA in the Pork Industries in Selected Countries.^a

Completely Traceable	Producer Traceable	Processor Traceable	Distributor Traceable	National Origin Traceable
Definition: The ability to track the identification of a pork product backwards to the initial input of production, i.e., genetic line and feed ingredients.	Definition: Identification of an individual product back to the producer but not to the initial production ingredients.	Definition: Identification of an individual product back to the processor but not to the producer.	Definition: Identification of an individual product back to the distributor but not the processor.	Definition: Identification of an individual product back to the nation of origin but not the distributor.
Producer Transparency	Processor Transparency	Distributor Transparency	National Transparency	
Definition: The availability of information on the entire production process is available from the producer to the consumer.	Definition: The availability of information on the entire production process is available from the processor to the consumer.	Definition: The availability of information on the entire production process is available from the distributor to consumer.	Definition: National standards are publicly available. Decisions regarding national standards are open for both industry and public input.	
Farm Assurance	Processor Assurance	Distributor Assurance	Retail Assurance	
Definition: The process of creating safety and quality standards at the farm level, which involve regular internal and external verification through testing or auditing.	Definition: The process of testing and auditing specific requirements at the abattoir and processor level to ensure safety and quality standards are met.	Definition: The process of testing and auditing live animal and product transportation techniques to ensure specific standard of safety and quality are met.	Definition: The process of auditing retail handling procedures to ensure that safety and quality standards are met.	

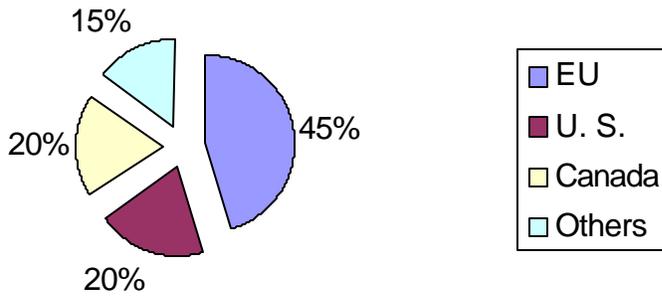
^a Each country’s system received one point for qualifying for each level of TTA in each category. For example, if a country has producer-level transparency it received one point and zero points for that category, otherwise. Assurance is scored for safety assurance and quality assurance (8 points possible in the assurance category). A “perfect” composite score would be 17 (i.e., five points for traceability, four points for transparency, and eight points for assurance).

Table 3. Composite Pork Market TTA Scores for Selected Countries.

Category	UK	Denmark	Canada	U. S.	Japan	ANZ
Traceability:						
Completely Traceable	0	0	0	0	0	0
Producer Traceable	1	1	0	0	0	1
Processor Traceable	1	1	0	0	1	1
Distributor Traceable	1	1	1	1	1	1
National Origin Traceable	1	1	1	1	1	1
Transparency:						
Producer Transparency	1	1	0	0	0	0
Processor Transparency	1	1	0	1	1	1
Distributor Transparency	1	1	1	1	1	1
National Transparency	0	1	1	0	0	1
Assurance – Food Safety:						
Farm Assurance	1	1	0	0	0	0
Processor Assurance	1	1	1	1	1	1
Distributor Assurance	1	1	1	1	1	1
Retail Assurance	1	1	1	1	1	1
Assurance – Quality:						
Farm Assurance	1	1	0	0	0	0
Processor Assurance	1	1	1	0	1	1
Distributor Assurance	1	1	0	0	1	1
Retail Assurance	1	1	0	0	1	1
Total Score:	15	16	8	7	11	13

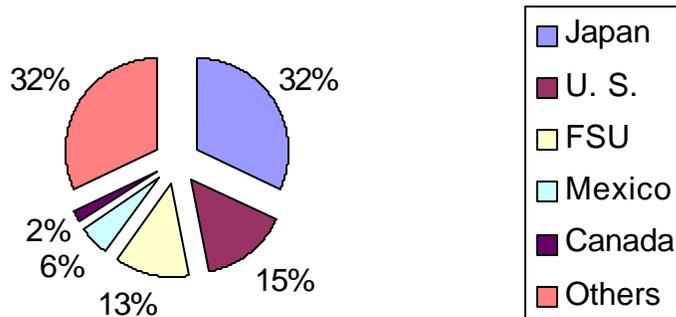
Figure 1. Market Shares for the World's Major Pork Importers and Exporters.

Importers



Posed by Traceability Systems

Exporters



Source: USDA, FAS (2000)