



# 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. © 2001 Elsevier Science Inc. All rights reserved.

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## 1. 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 world-wide for food safety—especially for red meat. The red meat system in the European Union (EU) has evolved as a result of these food scares in an atmosphere of distrust for public sector and science to fully address the nature of some food problems (Baines & Davies, 1998). The result is a system in the EU that demands accountability encompassing production, processing and end products within the red meat system. Accountability is ensured in the EU by incorporating the concepts of traceability, transparency, and assurance (TTA) into the red meat system (Baines & Davies, 1998). Other countries are following the lead of the EU in incorporating TTA as their own red meat

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systems evolve. The result is a contrast between the U.S. red meat system and its trading partners and competitors in terms of TTA.

The purpose of this paper is to compare the TTA systems for pork between the U.S., some of its major trading partners, and competitors in world pork markets. This comparison is important because TTA has the potential to become the basis for product differentiation between countries, not just between firms. We take a macro approach (i.e., the country-level) to complete the analysis. We highlight the general level of development of TTA in specific countries and, hence, the relative position of industries within countries rather than firms within countries. We make our comparisons by examining the presence or absence of TTA at each level of the pork marketing chain in the U.S., the EU, Canada, Australia/New Zealand, and Japan. Our results suggest the U.S. pork system is lagging other countries in the development of TTA in terms of providing traceability, transparency, and extrinsic quality assurances. If pork products from other countries are preemptively differentiated from U.S. products based on TTA, then the U.S. pork sector could potentially be damaged in international markets and possibly even domestic markets.

## **2. Definitions**

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 public availability of information on all of the rule, procedures, and practices used to produce a food product at each level of the marketing chain (Baines & Davies, 1998; Early, 1998).<sup>1</sup>

Quality assurance has three key elements including managing hygiene to ensure food safety, ensuring quality through grading and other measurements, and providing mechanisms for product recalls (Early, 1998; Baines, 2001). The processes for ensuring hygiene in the EU have focused on hazard analysis critical control point (HACCP) systems<sup>2</sup> at each point in the pork value chain.

Ensuring quality in the EU pork system includes measurements of the intrinsic quality of a pork carcass or product (back fat, curing, etc.). Intrinsic quality measurements are common to most government grading systems including the U.S., its trading partners, and competitors. However, the EU system also provides measures of the extrinsic qualities of pork. Extrinsic qualities do not affect either food safety or the intrinsic qualities of the meat product but may still affect the value of the product.

Extrinsic qualities could include assurances about animal welfare, environmental preservation, or other inputs or absence of inputs used to produce the meat product<sup>3</sup> (Liddell & Bailey, 2001; Baines, 2001). Part of the focus of our analysis is on extrinsic quality assurances because they are beyond the typical assurances (food safety and intrinsic qualities) provided by public sector inspection and grading in the U.S. As a result, extrinsic quality assurances have the potential, along with traceability and transparency, to provide a basis for differentiate pork or other red meat in international trade (Baines & Davies, 2000). Table 1 provides a synopsis of the definitions of TTA used in this study for each level of the marketing chain.

Table 1  
 Definitions of TTA classifications used in the analysis of the pork industries in selected countries

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	

### **3. Development of TTA systems in different countries**

Other countries such as Canada and Australia/New Zealand have begun to develop TTA systems similar to the EU using public and private sector partnerships. However, the U.S. has not generally participated in this trend by implementing TTA systems for red meat. The uneven development of TTA systems world-wide raises questions about the threats and opportunities TTA poses to different countries within the international red meat industry. For example, it raises questions about the strategic positioning of the U.S. red meat industry in international markets in terms of TTA since no plan exists for implementing industry-wide TTA systems in the U.S.<sup>4</sup> (Frazao & Allshouse, 1996; Bailey & Hayes, 2002).

There are at least three reasons why the U.S. pork industry should be concerned that it 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 emerging consumer concerns are directly related to food safety issues, such as inputs used in animal feed in the case of BSE. Other consumer concerns are related to extrinsic quality assurances that relate to farm-level production practices and procedures such as concerns about genetically modified organisms (GMOs), the effect of consumption on environmental degradation, and animal welfare issues. 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, and consequently costs, 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.

### **4. Past work**

Economic research on issues relating to TTA is quite limited since these systems have been evolving only within the past 5 years. The economic literature that exists dealing with TTA focuses primarily on the aftermath of the BSE crisis in the U.K. (e.g., Palmer, 1996; Loader & Hobbs, 1996). Hobbs used transaction costs economics to examine the perceived value of tracing beef cattle from the farm- to the packer-level and between beef suppliers and retail outlets in the U.K. Her findings indicated that traceability was the most important

characteristic desired by large beef processors when purchasing cattle from farmers (Hobbs, 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.<sup>5</sup> Latouche, 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, van Oeckel, Warnants, Viaene, and Boucque (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.

## **5. Private and public sector involvement in developing TTA systems**

The development of TTA systems in the EU signals a marketing system in need of fixing to meet consumer concerns about food safety and other issues. The need for additional assurances such as provided by TTA suggest an informational failure in the market between regulators, consumers, and producers. Pinpointing the location(s) of this breakdown in communication seems like a vital first step in determining who should develop and regulate TTA systems. If the only motivation for developing TTA systems is to address food safety then the development of such systems might not be justified where the system appears to be addressing consumer needs adequately. This could possibly explain the relatively slow development of TTA systems in the U.S. compared to other countries. However, TTA can also be viewed as a method to ensure high quality products. This appears to be at least one of the motivations for countries outside the EU to develop TTA systems (Baines & Davies, 2000).

TTA programs have developed at different speeds in different countries and with different levels of public and private sector involvement. The private sector has provided significant 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 that under emphasized the dangers of BSE. As a result, consumer confidence in the ability of EU governments to deal effectively with the crisis was badly shaken (Baines & Davies, 1998).

Private companies and private associations<sup>6</sup> in some of the EU countries met the challenge of diminished consumer confidence in government assurances by developing brand name meat products that gave private certifications regarding food safety and quality assurance, including TTA. Examples of branding include Assured British Meat (ABM) (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 & Bailey, 2001). Countries where consumer confidence in government regarding food safety issues has remained relatively high, such as in the U.S., have generally had less private participation in developing food safety and quality assurance programs than the in EU.

Baines and Davies (1997, 2000) argue that both the public and private sectors have a role in developing TTA systems. They state that the initial efforts to alter the red meat system in the U.K. to incorporate TTA resulted in various assurances, especially about food safety, being offered by retailers, producers, and suppliers. The result was confusion at all levels of the marketing chain about what was being assured and by whom. ABM<sup>7</sup> was created jointly by the British government and the British meat industry to counter this confusion. ABM consolidated assurance programs and established minimum standards for food safety, environmental preservation, animal welfare, and traceability (Fearne, 1998; Baines & Davies, 2000; Early, 1998). As a result, these standards were eliminated as a basis for competition in the marketing chain and confusion about various claims was reduced. The same joint public/private approach has been used to develop Canadian traceability systems and on-farm quality assurance programs so that food safety is not used as a basis for competition (Abbatemario, 2001).<sup>8</sup>

Table 2 presents a synopsis describing the level of public and private sector involvement in food safety and extrinsic quality assurance certifications in the U.S., its major competitors in international pork markets (U.K., Denmark, Canada, and Australia/New Zealand) and the world's largest pork importer (Japan). Table 2 illustrates that the private sector in the EU is participating more aggressively in certifying food safety and extrinsic quality assurance than the private sector in the U.S., Canada, Australia/New Zealand, and Japan. The result has been a more market-oriented food safety and extrinsic quality assurance system in the EU than in other countries.

Another reason the EU system is more market-oriented rather than producer-oriented is that the EU is much more export dependent for pork than other countries. For example, Denmark exports most of the pork it produces while the U.S. exports only about 7.1% of the pork it produces (USDA, FAS, 2001; U.S. Meat Export Federation, 2001a). This makes EU producers willing to develop systems that address the concerns of foreign customers, such as TTA, and may explain why TTA systems are slower to develop in the U.S.

Current private and public sector efforts in the U.S. 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 system during the next 2 years. Global Animal Management (GAM), a company operating in the U.S. as a subsidiary

Table 2

The level of private and public involvement in certification programs for food safety and extrinsic quality assurance in selected countries

Food characteristic	Private certification <sup>a</sup>	Public certification <sup>b</sup>
Food safety	U.S.: low	U.S.: high
	U.K.: high	U.K.: high
	Denmark: high	Denmark: high
	Canada: moderate	Canada: high
	A/NZ <sup>c</sup> : high	A/NZ: high
	Japan: low	Japan: high
Extrinsic quality assurance	U.S.: low	U.S.: moderate
	U.K.: high	U.K.: moderate
	Denmark: moderate	Denmark: high
	Canada: low	Canada: moderate
	A/NZ: low	A/NZ: moderate
	Japan: low	Japan: moderate

<sup>a</sup> The levels for private certification are basically as follows: high: aggressive private company and private association brand naming and certifications for food safety and quality assurance; moderate: private associations (e.g., the National Pork Producers Council) actively involved in implementing systems to certify food safety and/or extrinsic quality assurance; low: limited private involvement in certifying food safety and/or quality assurance.

<sup>b</sup> 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 of violations.

<sup>c</sup> A/NZ: Australia/New Zealand.

of 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 GAMs 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.

Although private sector involvement in developing TTA programs has been limited in the U.S., this could change rapidly if major food companies decided to require TTA. An example is McDonald's recent concerns and plant audits dealing with food safety and animal welfare issues. Grandin (2001) reports that the "McDonald's Effect" resulted in more improvements in packing plant programs in food safety and animal welfare than she had seen previously during her 25-year career. The sensitivity of consumers and the reaction of food companies to that sensitivity cannot be underestimated in its potential to change the

meat marketing system in a relatively short period of time. TTA provides methods to assure food companies and consumers about food characteristics not currently tracked by standard grading and inspection procedures.

The purpose of this paper is not to argue strongly for or against joint public and private sector involvement in establishing TTA systems. Individual marketing chains can provide TTA products.<sup>9</sup> However, providing clear signals to consumers about the pork products they are purchasing should be a principal consideration if TTA systems are implemented. The TTA systems being developed in the EU, Canada, and Australia/New Zealand are using both the private and public sector to develop the system and its standards. Private sector solutions may exist but also pose potential risks to consumer confidence if individual firms compete based on food safety.

### 6. 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, & Bailey, 2000). Fig. 1 illustrates how highly concentrated these markets are. Three exporters, the EU, Canada, and the U.S. export 85% of the pork traded in international markets and Japan, the world’s largest food importer, buys approximately one-third of all

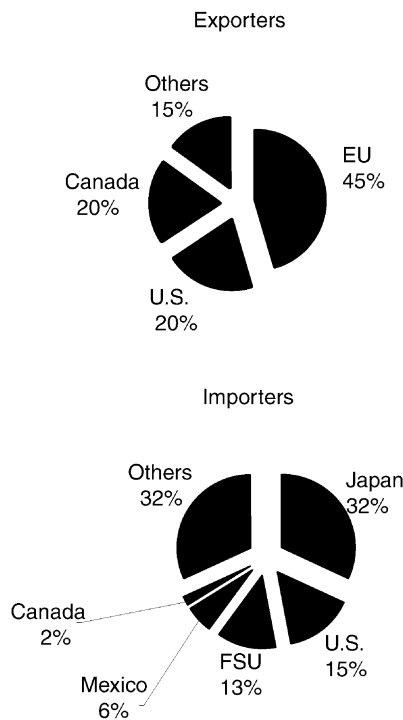


Fig. 1. Market shares for the world’s major pork exporters and importers. Source: USDA, FAS (2000).



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.<sup>10</sup> Japan has traditionally focused its food quality standards on consumer quality issues such as color and water content. Also 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). Recent activities within the Japanese Ministry of Health are beginning to lean toward requiring more extrinsic quality characteristics in imported products, particularly related to GMO concerns (JETRO, 1998). The sensitivity displayed by the Japanese regarding GMO corn and the recent discovery of a case of BSE in Japan (U.S. Meat Export Federation, 2001b) suggest risks exist relating to farm-level food safety issues for U.S. pork exported to the Japanese market.

The EU and Canada have proven to be effective competitors with the U.S. 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).<sup>11</sup> 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.

## **7. Ranking TTA systems**

Comparing TTA levels across countries is useful in determining the stage of TTA development among pork market competitors and customers and pinpointing any potential weaknesses in these systems. 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.<sup>12</sup> 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.<sup>13</sup>

In our scoring system, to receive one point for traceability for a particular level (Table 1) in the marketing chain required that level to have the following components:

1. A documenting agency<sup>14</sup> responsible for researching and developing the practices and procedures for traceability at that level of the marketing chain.

2. An agency that monitors compliance for traceability at that level of the marketing chain. The documenting and monitoring agency may or may not be the same entity.
3. Verification of traceability by a third-party either through direct inspection, audit, or other means.
4. Labeling of final products to provide traceability to that particular level of the marketing channel.

Requirements to receive one point for transparency at each level of the marketing chain required the following:

1. A documenting agency that develops written practices and procedures for transparency at that level of the marketing chain.
2. Public access to the written and accepted practices and procedures for producing the product at that level of the marketing chain. A method must also be in place for incorporating public input into the development of these procedures.
3. That at least 50% of market participants at that level of the marketing chain participate in the same or closely associated program.
4. That there be a disclosure about chemicals used to produce the product at that level of the marketing chain.

Quality assurance was scored for both food safety and extrinsic quality assurance. Ranking each country's assurance system for both food safety and extrinsic quality was important since traditionally countries have focused their efforts on food safety. Quality assurance, especially for extrinsic quality, 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.

The requirements to receive one point for food safety assurance at each level of the marketing chain required the following:

1. A documenting system that develops the practices and procedures that assure food safety at that level of the marketing chain be provided (e.g., HACCP).
2. An agency designated to monitor compliance with the rules and procedures designated in the documenting system.
3. That third-party verifications be made for compliance.

The requirement to receive one point for extrinsic quality assurance at each level of the marketing chain required the following:

1. That documented standards for extrinsic quality assurance be required at that particular level of the marketing chain (e.g., standards for animal welfare, absence of hormones, absence of GMOs, etc.)
2. An agency (either public or private) be assigned to monitor compliance with these standards.<sup>15</sup>
3. That third-party verification be made for compliance.

A “perfect” total score was 17. This included five possible points for traceability (complete traceability, national,<sup>16</sup> producer, processor, distributor), four points possible for transparency (national, producer, processor, and distributor), and eight points possible for assurance including four points for food safety (producer, processor, distributor, and retailer)

Table 3  
Scoring example for the U.K. TTA system<sup>a</sup>

Item	Documenting agency	Monitoring agency	Type of verification	Label availability	Score
<b>Traceability<sup>b</sup></b>					
Complete	None	None	None	No	0
Producer	ABP	ABP	Audit	Yes	1
Processor	ABM	ABM	HACCP audit	Yes	1
Distributor	ABM	ABM	Audit	Yes	1
National	MAFF	MAFF	Inspection	Yes	1
Item	Documenting agency	Location for public access	% Participation	Chemical disclosure	
<b>Transparency<sup>c</sup></b>					
Producer	ABP	Internet	80	Yes	1
Processor	ABM/MAFF	Internet	80	Yes	1
Distributor	ABM/MAFF	Internet	80	Yes	1
National <sup>d</sup>	MAFF	MAFF	80	Yes	0
Item	Documented system	Monitoring agency	Type of verification		
<b>Safety assurance<sup>e</sup></b>					
Producer	HACCP based	ABP	Veterinary visit		1
Processor	HACCP	ABM	HACCP audit		1
Distributor	HACCP	ABM	HACCP audit		1
Retail	HACCP	Tesco, M&S, safeway	Inspection		1
Complete	Documented standards	Monitoring agency	Type of verification		
<b>Quality assurance<sup>f</sup></b>					
Producer	Yes	ABP	Veterinary visit		1
Processor	Yes	ABM	HACCP audit		1
Distributor	Yes	ABM	HACCP audit		1
Retail	Yes	Tesco, M&S, safeway	Inspection		1
Total score for the U.K.					15

<sup>a</sup> ABP: Assured British Pigs; ABM: Assured British Meat; MAFF: Ministry of Agriculture, Fisheries, and Food, and M&S: Marks and Spencer.

<sup>b</sup> Subtotal: 4.

<sup>c</sup> Subtotal: 3.

<sup>d</sup> A zero score is assigned since no specific method for receiving external input in formulating procedures is present.

<sup>e</sup> Subtotal: 4.

<sup>f</sup> Subtotal: 4.

and four points for extrinsic quality assurance (producer, processor, distributor, and retailer) (Table 1). Table 3 provides an example of how this scoring was done for the United Kingdom's pork system including the agencies, methods, and verifications used to ensure TTA.<sup>17</sup>

Table 4 reports the composite TTA scores for each country considered in the analysis. Denmark received the highest total score (16) followed by the U.K. (15), Australia/New Zealand (13), Japan (11), Canada (9), and the U.S. (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 4 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

Table 4  
Composite pork market TTA scores for selected countries

Category	U.K.	Denmark	Canada	U.S.	Japan	Australia/New Zealand
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	1	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	9	7	11	13

the U.S. in establishing traceable systems, including an emerging competitor, Australia/New Zealand.

Canada and the U.S. have less transparency than the EU systems. The weakest transparency link in the North American systems is at the producer-level.<sup>18</sup> 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 U.K.) 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 U.S. 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 U.S. 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 extrinsic 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 extrinsic quality assurance arise with our major export customers.

## **8. Conclusions**

World pork markets are evolving steadily toward more TTA. 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 U.S. 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 U.S. 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.

The U.S. system continues 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 (extrinsic 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.

## Notes

1. Transparency requires published procedures that are publicly available and can be influenced by input from stakeholder groups.
2. Codex standards emphasize hygiene and fit well into the HACCP approach for ensuring food safety. ISO 9000 standards are private labeling schemes that certify practices and procedures for a wide range of products. Capmany, Hooker, Ozuna, and van Tilburg (2000) indicate that the U.S. is also lagging other countries in the adopting ISO 9000 standards.
3. An example would be the assuring the absence of genetically modified organisms (GMOs) in a product.
4. Some individual marketing chains in the U.S. are developing TTA products.
5. However, Hobbs (1996b) found supermarkets' most important consideration to be consistent quality.
6. The term "private associations" refers primarily to producer organizations.
7. Assured British Pigs (2000) is a label for pork operating under the umbrella of ABM.
8. In both the U.K. and Canada, the private sector (producers) approached the public sector for support in developing TTA programs.
9. For example, Farmland Industries (2001) has developed TTA products. The fact that a large firm like Farmland is developing TTA products provides additional evidence that TTA systems and products are becoming more important.
10. The Japanese market represents approximately 58% of the value of pork exported from the U.S.
11. Liddell (2001) based on USDA, FAS information that Canada and Denmark exports of frozen pork to Japan increased between 1999 and 2000 by 50% and 37%, respectively.
12. The criteria for scoring were determined by Liddell (2001) but were based on the requirements placed on TTA systems in the EU, especially the U.K. The requirements are used in actual "on-the-ground" systems in the EU. Consequently, they are based on what has generally been accepted in EU systems.
13. Some programs for TTA at particular levels of the marketing chain have been instituted in some countries but were not scored as "1s" because not all of the necessary criteria have been met even though the country might qualify for a "1" in

the near future. For example, Canada will soon qualify as a “1” for producer-level transparency.

14. No distinction is made between public or private agencies.
15. In the case where a private agency is responsible for monitoring, the public role is to monitor claims made through labeling. Therefore, the public sector will always have a role in assuring that extrinsic claims are actual.
16. National traceability provides for country or origin information to be provided for the final product(s).
17. Similar detail for each of the countries analyzed is available in Liddell (2001).
18. As stated earlier, Canada will soon have farm-level transparency.

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