CHOICES
The magazine of food, farm, and resource issues
1st Quarter 2007 • 22(1)
A publication of the American Agricultural Economics Association

Overview: Globalizing Food Chains: Producer, Company, and Policy Responses

By Bruce A. Babcock and Helen H. Jensen, Guest Editors

The rapid emergence of global food chains has changed how food companies and farmers think about strategic investment, marketing, and production decisions as well as food and agricultural policy. But trade negotiators for developed countries continue to spend most of their time protecting the interests of domestic commodity producers, whereas the top priority of developing country negotiators is to shield their agricultural sectors behind import tariffs while fighting for lower tariffs in developed countries. Even as these efforts continue to bog down any progress in the Doha round of negotiations in the World Trade Organization, the realities of increased urbanization in developing countries, continued income growth in most countries, economies of scale, and comparative advantage are working together to transform the food choices of consumers in both developed and developing countries. The case studies included in this issue of *Choices* highlight some of the key issues facing companies, farmers, and governments as supply chains globalize.

Increased demand by rich-country consumers for a wide variety of high-quality and unique food products has opened up opportunities for food companies and producers around the world. The decreased cost of providing consumers information about product attributes has greatly increased the feasibility of meeting these demands with specialized products. The article by Stricker, Mueller, and Sumner illustrates how this decreased cost of information transmission through an Internet presence can be used by producers of boutique products to greatly expand the geographic range of their customer base, thus allowing them to achieve greater scale than they would be able to if they were limited to local sales only.

The increased demand for quality by consumers is often accompanied by demands for increased assurance that the products meet strict sanitary and phytosanitary (SPS) guidelines. Both developed and developing countries are finding that new investments in upgraded food production and processing systems are needed to meet these international guidelines. Pork production systems provide a good example of the trends. Batres-Marquez, Clemens, and Jensen show how these investments are slowly transforming how pork is produced and processed in Mexico, with perhaps unintended impacts on the types of pork products that are being offered domestically. Lence shows how these investments have transformed Spain's pork industry and speculates about whether Spain's producers will choose to make the next set of investments needed to meet ever-stricter requirements.

The technical upgrades and investments required to meet rich-country SPS guidelines put developing countries at a distinct disadvantage internationally, according to many observers. Dong and Jensen review the difficulties that China is experiencing as it tries to upgrade its regulatory system in order to meet international standards. The

Articles in this Theme:

authors argue that, ironically, perhaps the biggest hurdle for China to overcome is a lack of central control over SPS systems being used to produce food. The study by Boland, Perez, and Fox shows that developing countries occasionally have an inherent advantage over rich countries in meeting new demands of international consumers. In their study of the Uruguayan beef industry, the authors show how reliance on a traditional grass-fed production system has given the country's producers an advantage at meeting the growing demand for natural beef. After all, it is easier to adopt a certification system for natural beef when all cattle in the country are grass fed. In this case, country-of-origin labeling of U.S. beef could work in favor of Uruguayan beef producers. The Uruguayans could then differentiate their beef, raised in pastures, without the use of antibiotics and growth-promotants, from U.S. beef, finished with 50,000 other animals in large feedlots. This is yet another example of the complexity of decisions and their effects, both intended and unintended, in global supply networks.

The guest editors would like to acknowledge the suggestions of the anonymous reviewers and the assistance of Roxanne Clemens and Sandra Clarke in preparing the articles for this theme issue.

Bruce A. Babcock (babcock @iastate.edu) is Professor of Economics and Director of the Center for Agricultural and Rural Development, and Helen H. Jensen (hhjensen @iastate.edu) is Professor of Economics and Head of the Food and Nutrition Policy Division, Center for Agricultural and Rural Development, Iowa State University, Ames, IA.

CHOICES
The magazine of food, farm, and resource issues
1st Quarter 2007 • 22(1)
A publication of the American Agricultural Economics Association

Mexico's Changing Pork Industry: The Forces of Domestic and International Market Demand

By S. Patricia Batres-Marquez, Roxanne L. Clemens, and Helen H. Jensen

JEL Classifications: Q13, Q18

Once dominated by traditional and small-scale production systems with little regulation, Mexico's pork industry now includes modern, vertically integrated production systems and federal inspection of packing and processing plants. Recent structural changes have resulted in three distinct segments within the production and processing sectors as the industry works to adjust to international and domestic demand for better product quality, stricter sanitary practices, and increased supplies yet continue to meet the needs of low-income consumers. As the structural changes continue, the industry faces several challenges that will affect its ability to become both internationally and domestically competitive. To meet these challenges, the Mexican government is faced with decisions about implementing and enforcing regulations and providing incentives to encourage continued development and best serve domestic consumers.

Background

The structure of Mexico's pork industry has changed significantly in response to the implementation of the North American Free Trade Agreement (NAFTA), changes in consumer demographics, and the industry's desire to increase pork exports. The trade liberalization allowed under NAFTA has played a major role in spurring the rapid expansion of pork imports into Mexico to help keep pace with steadily growing demand (see Figure 1). Many of the structural changes to Mexico's pork production and processing sector have taken place since the phase-in period of NAFTA began in 1994. During this period, Mexican pork producers have worked to meet increasing domestic demand for pork and better pork quality and to meet competition from imported pork and the poultry meat products that substitute for pork in many processed products. Processed products are popular in Mexico because of flavor; convenience; the range in quality and price that makes them affordable to many consumers; and the perception of many consumers that cooked, processed products are safe. Imports of live U.S. slaughter hogs have also been an important component of Mexico's pork industry trade, although numbers have been highly variable. Between 1996 and 2005, exports of U.S. slaughter hogs to Mexico ranged between a low of 14,700 head (1997) and a high of 201,500 head (1998); in 2005, exports totaled 130,100 head.

Pork has always been an important part of the Mexican diet, but a growing middle-income class, greater urbanization, overall population growth, and the greater availability of imported pork due to NAFTA have helped drive the sharp increase in pork demand. In 2005, per capita pork consumption reached 33.1 pounds, a 30.4% increase since 1995 (SAGARPA, 2006). Between 1990 and 2005, domestic pork production increased by 50%, but total consumption increased even more rapidly (see Figure 1). Along with the increase in pork demand, a growing number of Mexican consumers are demanding higher quality and greater safety in pork products. At the same time, a significant portion of Mexico's population does not have access to retail outlets that sell pork produced under sanitary conditions and can afford only the lowest-quality, lowest-priced pork.

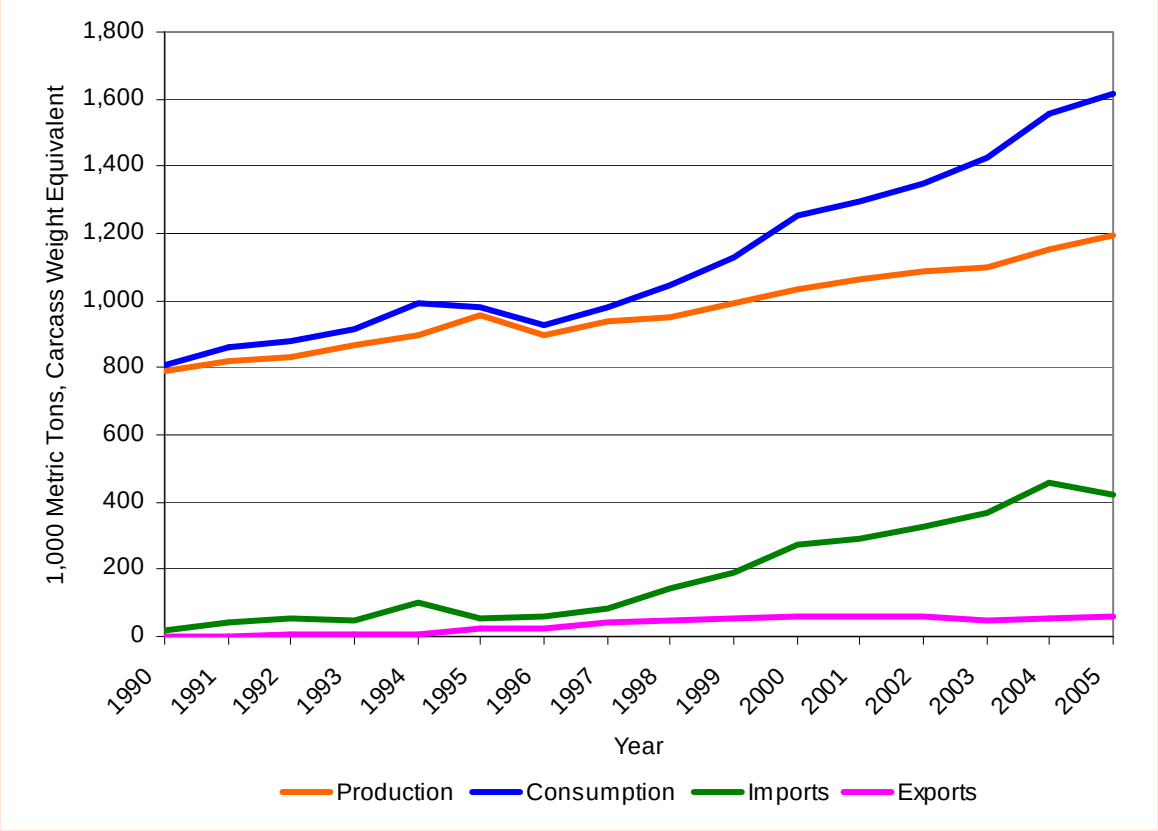

Figure 1. Pork production, consumption, imports, and exports in Mexico, 1990-2005.
Source: USDA Production, Supply and Distribution Online: http://www.fas.usda.gov/psdonline/psdHome.aspx.

During this period, the Mexican pork industry has worked to increase exports, although this trade is relatively small compared with import volumes (Figure 1). Although Mexico is a net pork importer, the Mexican pork industry is competitive in providing some labor-intensive cuts that require trained labor to produce and some high-value-added cuts to export markets. Japan and Mexico signed a free-trade agreement in 2004, and exports under this agreement began in April 2005. During 2005, Mexico exported 46,906 metric tons (carcass weight) of pork to Japan, the largest export market for Mexican pork (USDA, 2006). In contrast, Mexico exported a mere 11,663 metric tons (carcass weight) of pork to the United States.

Meeting international standards for the product quality and sanitary practices required to export pork has further encouraged greater integration and efficiencies in the production and processing sectors. But, as a large net importer of pork, Mexico must increase production and/or imports to replace any exported pork if domestic demand is to be met. To increase domestic production and compete with imported pork, the industry will need to continue to expand production from its vertically integrated systems.

The desire to export has also required that the Mexican industry improve sanitation practices in the segments of the production and processing sectors involved in exporting. Sanitary and phytosanitary (SPS) standards in the United States and elsewhere have limited live hog and pork exports from Mexico. For example, U.S. food safety import regulations require that pork and pork products imported from Mexico meet all the same food safety standards applied to similar products produced in the United States. The efforts to upgrade slaughter and processing facilities to meet these standards are discussed in the following section. Another important effort has been the attempt to eradicate export-limiting swine diseases.

Classical swine fever (CSF) prevented live animal and pork exports until Mexico was able to regionalize CSF-free states. Under regionalization, the Mexican government recognizes 13 Mexican states as CSF-free. In addition to CSF-free areas, Mexico has two other CSF zoo-sanitary

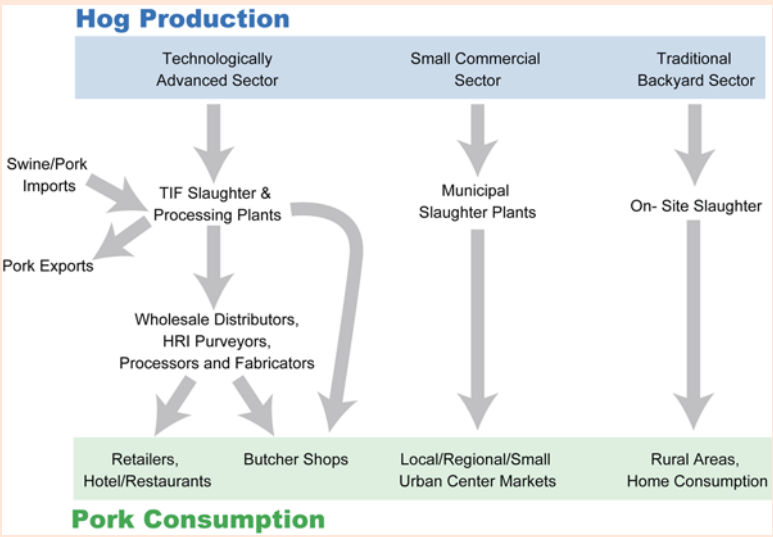

Figure 2. Structure of the pork industry in Mexico.
Note: The technologically advanced sector serves markets in metropolitan areas and international markets.

areas: eradication areas and control areas. In the eradication areas, located in Central Mexico, vaccination for CSF is prohibited; producers rely instead on depopulation and restrictions on movement of live animals should an outbreak occur. In contrast, CSF is considered endemic in the control area of Mexico, located in southern Mexico. Here, vaccination is used continuously to reduce pig production losses. Movement of live hogs and meat between zones is regulated or restricted, which has influenced industry development and limited export potential for producers and processors in some states.

The need to meet international sanitary standards and competition from imported pork has helped shape government policies that are resulting in improved pork quality and safety. However, government and industry resources are limited and modernization has not reached all segments of pork production and processing. As the production and processing sectors continue to modernize, the Mexican pork industry faces significant challenges because of differences in the product quality required by a more modern pork distribution system and export markets, in contrast to that accepted and preferred by many domestic consumers.

Production and Processing Systems

Production and processing of hogs and pork products in Mexico are undergoing important structural changes, driven by adjustments in the domestic market and international rules of trade. Modern, technologically advanced production and processing systems have emerged, and rapid urbanization has shifted opportunities toward more integrated marketing channels. However, the modern sector coexists with a more traditional domestic sector, and today three distinct sectors exist in the Mexican pork industry. Technology, resources, and location differentiate the three live animal production systems and the unique pork product distribution and marketing channels supplied by each (see Figure 2).

Live Hog Production

Hog production systems in Mexico can be separated into three types: technologically advanced, small commercial (semi-technically advanced), and traditional backyard. These systems are differentiated by the level of technology employed, degree of vertical integration, and quality of hogs produced (see USDA, 1999, for more details; see Batres-Marquez et al., 2006, for full references on all data).

Firms that operate technologically advanced production systems raise hogs at specialized sites, use advanced breeding methods, and implement strict animal health regimes, such as vaccination against disease and multi-site production systems. Most of these vertically integrated firms control the entire process, from hog production through pork distribution. The hogs are fed milled feeds and balanced rations, and this production system consistently produces the highest quality hogs of the three systems. These operations have shown the greatest expansion in response to increased pork demand in Mexico, and this expansion is expected to continue in response to an overall increase in demand, as well as demand for better quality and greater safety.

Small commercial operations produce fewer pigs per unit than do the technologically advanced producers. The small commercial producers may use breeding stock similar to that of the technologically advanced firms but lack the animal health controls and marketing systems used by the technologically advanced producers. These producers are less likely to feed balanced rations and cannot consistently produce hogs of uni-

formly higher quality. In response to the need for increased efficiencies to increase pork supplies and to compete with the increase in inexpensive imports allowed under NAFTA, many of these small commercial producers have exited the industry because of their inability to produce animals more efficiently and to meet increased quality standards, such as weight ranges, that are required by many live hog buyers. As a result, the scale of production has increased and the industry has become more highly concentrated and integrated, and this trend is expected to continue.

The reduction in small commercial production and the expansion of technologically advanced production have taken place alongside continued production using traditional backyard methods. Traditional backyard production is still quite common and found throughout the rural and semi-urban regions of the country. These traditional hog production systems are used in areas where there are few or no formal commercial channels. The hogs normally are fed low-quality feedstuffs and are of the lowest quality among the production systems. This production segment has declined, but economic and geographic limitations that prevent a large number of domestic consumers from obtaining pork from the other segments mean that this segment will remain part of the pork industry for the foreseeable future.

Pork Slaughter and Processing

As with live hog production facilities, slaughter and processing systems can be separated into three types: federally inspected, or "Tipo Inspección Federal" (TIF), plants; municipal plants; and traditional on-site slaughter. The facilities differ mainly by the degree of technology used, the size of capital investment, and the services the plants offer.

The TIF slaughter and processing plants use state-of-the-art technologies and have the highest sanitary standards and most advanced technological processing levels in Mexico. These plants are certified and federally inspected by the National Service of Health, Innocuity, and Agro-alimentary Quality (SENASICA) of the Agricultural, Livestock, Rural Development, Fishery, and Food Secretariat (SAGARPA). In addition, some of Mexico's TIF plants are HACCP-certified by the USDA Food Safety and Inspection Service, and some are individually approved by the Japanese government to export pork to Japan. TIF plant services include slaughtering, carcass handling, packaging, refrigerated storage, and fabrication of processed products (for example, hams and salamis) for both domestic and imported pigs and pork. An individual TIF plant may provide slaughter services only, slaughter and fabrication/processing services, or fabrication/processing services only.

TIF slaughter plants generally obtain hogs from technologically advanced, vertically integrated production systems that produce animals raised to meet high quality standards for the higher-end domestic market and for international markets. Also, the slaughter of imported hogs is restricted to TIF plants. TIF fabrication/processing plants use raw materials from TIF slaughter plants and imported products. The products from TIF slaughter and fabrication plants are mainly sold in large urban areas, and a small percentage is exported. Only pork slaughtered in TIF plants can be exported, once the importing country has accredited that the TIF plant complies with its sanitary controls.

TIF plants have existed in Mexico since 1947, but use of these plants has been increasing. A 1994 law on animal health requires that all new slaughter and meat plants built in Mexico be TIF plants. In addition, many companies are renovating existing plants in order to obtain TIF certification. In 2005, there were 95 TIF slaughter plants in Mexico. TIF pork plants processed 5.1 million pigs, a 25.9% increase over the number of hogs processed in 1998. TIF pork slaughter operations are concentrated in four states. In 2004, 43% of all hogs slaughtered in TIF plants were slaughtered in the state of Sonora, 21% in the state of Mexico, 14% in Guanajuato, and 11% in Yucatan. Eight other states accounted for the remaining 12% of TIF slaughter (Conferacion Nacional de Organizaciones Ganaderas, 2005).

As the number of TIF plants has increased, so has the share of hogs slaughtered in these plants with respect to total hogs slaughtered in Mexico. In 1991, only 11% of all slaughtered hogs were slaughtered in TIF plants, whereas in 2005, about 36% of all hogs were slaughtered in these plants. However, despite the general shift of production to the more modern processing sector, many TIF plants are working below their capacity levels—about 55% to 60% capacity according to one estimate. Because imported live hogs must be slaughtered in TIF plants, the underutilization of slaughter and processing capacity in Mexico encourages more live hog imports when market conditions such as U.S. hog prices and currency exchange rates are favorable.

Despite the incentives to use TIF facilities, several factors limit their use and segregate the market between the TIF plants and municipal slaughter plants, especially with regard to

small commercial producers. First, shipping of meat in refrigerated containers makes meat transported from TIF plants to retail and consumer markets relatively more expensive than meat produced, processed, and marketed through local market channels. A second factor that limits the use of TIF plants is their geographical location. Even though TIF plants are located near major hog production areas, they are inaccessible to many producers dispersed throughout the country because of high transportation costs and other logistical problems. Third, many small producers do not meet the animal quality standards of the federally inspected slaughter plants.

In contrast to TIF plants, municipal slaughter plants offer limited services, namely, slaughtering and carcass handling (cutting). These plants do not follow strict sanitary controls such as appropriate refrigeration, yet they are the main processors of hogs in nonmetropolitan areas of the country. According to some estimates, there are 866 municipal slaughter plants located throughout Mexico. Most of these plants are old and have not received proper maintenance. They lack the equipment and resources necessary to dispose of byproducts properly and therefore are a source of contamination, particularly groundwater contamination (Lastra Marin and Peralta Arias, 2000). This segment of the slaughter industry is expected to decline as more producers use TIF plants for slaughter and processing, but the decline likely will be slow. Mexico's small commercial operators have traditionally sent their animals to municipal and/or private slaughterhouses where slaughter costs are about 30% to 40% lower than those of the TIF slaughter plants. These lower costs are passed on to consumers, at least in part, through lower prices of meats sold in local, regional, and small urban center markets.

A sizeable proportion of producers in Mexico still use traditional on-site slaughter. These slaughter practices correspond to a traditional/ancestral slaughtering system practiced even before the Spanish colonization of Mexico. Although the share of hogs slaughtered under this system has fallen, about 36.1% of hogs were slaughtered on site in 1997, mainly in rural areas. The pork harvested under this system is used mainly for family (subsistence) consumption, although some is sold fresh for local domestic consumption. This system remains an important source of pork for many consumers because of its low production cost, low price, and the preference by some consumers for freshly slaughtered meat.

Government Incentives for TIF Production

As noted, slaughter and fabrication in TIF plants are more expensive than in municipal plants or on-site slaughter. To support the modernization of the meat industry, the Mexican government has provided subsidies to producers to encourage slaughter and processing at TIF plants and at registered plants in the process of becoming certified as TIF plants. In 2003, for example, producers received approximately $7 per head (on average) for hogs slaughtered in TIF plants to cover the higher cost of meeting hog quality standards of TIF plants. In 2004, producers received about $4.63 per animal to cover the cost differential. Hogs slaughtered under the subsidy program must be five to six months of age, weigh 85 to 120 kilograms, and be produced in Mexico. Programs like this are designed to promote the use of TIF plants, a key component to expanding Mexico's export of pork and to improving the quality and safety of fresh pork in the domestic market.

Challenges to the Industry

Both expanded domestic production and imports have been used to meet the rapid increase in Mexico's consumer demand for pork. Rising consumer incomes, more consumer information about food safety, and more efficient distribution will help drive demand for pork produced in TIF plants and increase consumer willingness to buy packaged (rather than freshly butchered) meats. These changes will, in turn, continue to drive ongoing structural changes in the domestic pork production, slaughter, and processing sectors.

Key to the continued development of a more modern and integrated production and processing sector is the increased domestic movement of live pigs (brought about through improved animal health and disease control), as well as channeling more pigs and pork through the modern sector. Such changes will require improvements in infrastructure (for example, new and improved roads and cold chains) to expand the use of TIF plants and to encourage the development of marketing channels that support high-quality products. Such changes will also require continued government regulatory and financial support.

The Mexican government's scarcity of financial resources relative to the country's needs will force the government to make choices about the most effective use of scarce resources for future development of the pork sector. The three levels in the industry's production and processing systems are likely to remain a part of

Mexico's pork industry, although the proportion of hogs produced and slaughtered in each will gradually change. In the near term, Mexico's industry can take advantage of different consumer markets through exports of high-valued cuts. However, given that Mexico's export market for pork is small and importing countries certify only a portion of TIF plants for export, policies that encourage increased exports may limit the overall industry's potential to increase quality and safety in the domestic market. Government policies that encourage industry-wide improvements in quality and safety could reasonably be expected to help bring about the long-term changes necessary to support a pork industry that benefits all consumers.

Acknowledgment

The authors thank all the reviewers for helpful comments, and are especially grateful to one reviewer for suggestions on the organization of material.

For More Information

Batres-Marquez, S.P., Clemens, R., & Jensen, H.H. (2006). *The changing structure of pork trade, production, and processing in Mexico.* MATRIC Briefing Paper 06-MBP 10, Midwest Agribusiness Trade Research and Information Center, Iowa State University. Available online: http://www.card.iastate.edu/publications/DBS/PDFFiles/06mbp10.pdf (Accessed 11/29/06).

Conferacion Nacional de Organizaciones Ganaderas. (2005). *Informacion economica pecuaria.* Numero 14, Mexico. Available online: www.cnog.com.mx/Estudios/Indicadores/INFOPECO14.pdf.

Lastra Marin, I. de J., & Peralta Arias, M. de los A., eds. (2000). *La producción de carnes en Mexico y sus perspectivas 1990-2000.* Available online: http://www.sagarpa.gob.mx/Dgg/estudio/carne.pdf (Accessed 8/31/06).

Secretaria de Agricultura, Ganaderia, y Desarrollo Rural Pesca y Alimentación (SAGARPA). (2006). *Situación actual y perspectiva de la producción de carne de porcino en Mexico 2006*. Available online: http://www.sagarpa.gob.mx/Dgg/estudio/sitpor06.pdf (Accessed 9/26/06).

United States Department of Agriculture (USDA). (1999). Mexico's pork industry structure shifting to large operations in the 1990s. *Agricultural Outlook.* Washington, DC: Economic Research Service.

USDA. (2006). *Mexico Livestock Annual.* MX6068. Washington, DC: Foreign Agricultural Service. Available online: http://www.fas.usda.gov/gainfiles/200608/146208819.pdf. (Accessed 11/29/06).

S. Patricia Batres-Marquez (sbatres@iastate.edu) is Assistant Scientist, Food and Nutrition Policy Division at the Center for Agricultural and Rural Development (CARD), Roxanne Clemens (rclemens@iastate.edu) is Managing Director of the Midwest Agribusiness Trade Research and Information Center, and Helen Jensen (hhjensen@iastate.edu) is Professor of Economics and Head of the Food and Nutrition Policy Division at CARD, Iowa State University, Ames, IA.

CHOICES
The magazine of food, farm, and resource issues
1st Quarter 2007 • 22(1)
A publication of the American Agricultural Economics Association

Grass-Fed Certification: The Case of the Uruguayan Beef Industry

By Michael A. Boland, Lautaro Perez, and John (Sean) A. Fox

JEL Classifications: Q13, Q17

Uruguay is a small beef-exporting country. It is located between Argentina and Brazil, both of which rank among the world's largest beef producers and exporters. Uruguay has approximately 57,000 agricultural/livestock operations, of which 29,000 (52%) are pasture-based beef and sheep ranches. Of these, about 19,000 specialize in breeding (cow-calf operations), 6,000 are calf-to-beef type operations, and 4,000 specialize in finishing. Over half the ranches are classified as family farms with less than 200 acres, while another quarter are considered transitional farms with less than 900 but more than 200 acres. About 5% are farms of over 3,500 acres (MGAP-DIEA, 2005).

In 1995, the World Organization for Animal Health declared Uruguay free of foot-and-mouth disease (FMD). This status was lost temporarily in December 2000 but was regained in May 2003. The country prohibits the import of live animals and/or genetic material from countries affected by FMD or other exotic diseases. Uruguay is also classified in the lowest possible risk category for bovine spongiform encephalopathy.

Uruguay's new sanitary status opened its access to several important markets, which until then had been closed to the country's noncooked beef exports. Fueled by improved market access, exports became even more important to the economy. In 2005, meat exports accounted for about 26% of the total value of Uruguayan exports, with beef accounting for 22%.

Uruguay beef serves as an example of one industry's effort to obtain international certification for its grass-fed beef production system. Certification, in conjunction with Uruguay's already highly developed cattle identification and tracking system (the DICOSE system), is viewed as central in the development of a national brand image for Uruguayan beef, analogous to that associated with New Zealand lamb.

Industry Expansion

Uruguayan beef production expanded following the achievement of FMD-free status in 1995. Expansion was facilitated by a significant decline in sheep numbers due to falling wool prices. Sheep numbers declined from 26 million in 1991 to 10.8 million in 2005. As of June 30, 2005, the cattle inventory was at a record high of 11.95 million head. Slaughter rose to a record 2.39 million head in 2005, almost triple the levels registered in 1990.

Beef exports grew because of improved market access, productivity gains, and small and decreasing domestic consumption. Exports averaged 138,000 metric tons, carcass weight, from 1990 to 1994—about 40% of total production. Between 1995 and 2000, exports jumped to an average of 232,000 metric tons, accounting for about 60% of production in 2000. In 2005, exports reached a record 478,699 metric tons carcass weight (equivalent to 292,248 metric tons shipped weight), accounting for 80% of beef production, and only 15% was exported chilled. Chilled exports have increased in the last three years, as most organic and natural beef is shipped as chilled. Normally, frozen beef is mixed with U.S. beef to increase its leanness. There is no difference in quality between frozen and chilled beef.

Notwithstanding the dramatic growth in exports, Uruguay still supplies only around 5% of the approximately 6 million metric tons of beef traded internationally, although beef represents 75% of total Uruguayan production. In recent years, the United States has become the largest export market for Uruguayan beef, accounting for

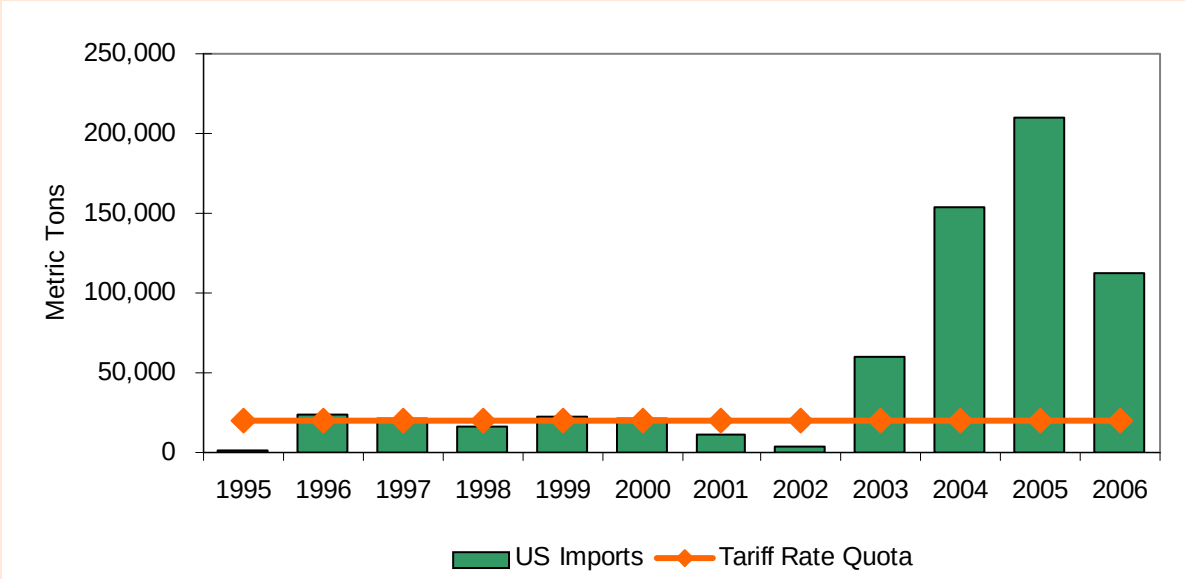

Figure 1. Uruguayan beef exports to the United States, 1995 to 2005.

52% and 76% of total tonnage of beef exports in 2004 and 2005, respectively. The market share decreased in 2006 due to increased demand from Russia in the first six months of 2006. Other major markets include Canada, European Union (EU) countries (United Kingdom, Germany, Spain, and Portugal), Israel, Russia, and Mercosur members (Argentina, Brazil, and Chile).

Beef exports to the United States are regulated by a World Trade Organization (WTO) negotiated tariff rate quota (TRQ) currently set at 20,000 metric tons per annum for chilled and frozen beef, as shown in Figure 1. Exports within the quota are subject to a nominal fixed tariff of 4.4¢ per kilogram (approximately 2¢ per pound), while above-quota exports are subject to an ad valorem tariff of 26.4%. Between 1995 and 2002, exports to the United States were generally limited by the quota. However, between 2003 and 2005, tight beef supplies and higher prices in the United States led to a significant increase in U.S. imports from Uruguay (nearly 210,000 metric tons in 2005). The above-quota imports, on which the 26.4% tariff was paid, consisted primarily of lower-quality beef destined for the hamburger market. The structure of the U.S. market for Uruguayan beef has also changed in recent years. Between 2001 and 2004, the number of U.S. importers handling Uruguayan beef increased from 29 to 67, while the share for the top five importers fell from 86% to 56%.

The DICOSE Traceability System

In 1973, the Uruguayan government created the División de Controlar de Semovientes, today known as DICOSE, within the Ministry of Livestock, Agriculture, and Fisheries, to account for domestic animal stocks and movements (Marshall, Boland, & Conforte, 2002). The objective was to curtail smuggling and help with the eradication of FMD. Under the DICOSE system, farmers are given a code consisting of a region number, a police station number, and a farm number. Every time an animal is moved, bought, or sold, the movement must be recorded and the animal accompanied by its paperwork. The system is similar to having a passport. Police sign all sales documentation, with copies going to the seller, the buyer, the Ministry, and the police. Ministry inspectors check all trucks and documentation at each slaughter plant before unloading. Farmers are audited at random every year, and they must present an annual animal stock balance.

With DICOSE, Uruguay was one of the first countries in the world to be able to trace animals back to their origins, and the Ministry could use the system to ensure that farmers and slaughter plants were complying with sanitary requirements. Once animals reach the carcass disassembly stage, however, it is virtually impossible to track each cut because of multiple cutting lines in most plants. Thus, while an individual cut cannot be traced back to an individual animal, it can be traced to a specific lot number. A system that would maintain individual identity for each animal as it moves through the car-

Figure 2. Uruguay's USDA Process Verified Certified Natural Beef label.

cass disassembly stage would be costly to implement, and there are currently no economic incentives for such a system. However, processors are now projecting plant layouts capable of tracing each individual cut in the deboning line. Some plants already provide this service for specific European consumers.

In September of 2006, Uruguay began a mandatory individual cattle traceability program. All animals born in September 2006 or later must be ear tagged (one visual tag and one radio frequency identification tag) for traceability purposes. The basic components of the Sistema de Indentificacíon y Registro Animal (Animal Identification and Record System) are

- individual animal identification,
- farm identification (for example, geographic identification; unique identification; and the DICOSE for farms, plants, and auction yards),
- recorded information, and
- ownership and cattle movement records.

Thus, Uruguay currently is able to track individual animals until they reach the plant and by animal lot in and after they leave the plant. In 2010, Uruguay will implement post-plant meat traceability. Individual animal traceability has been mandated by Japan, South Korea, Canada, Australia, New Zealand (after October 2007), and the EU (only France, the United Kingdom, and Ireland are in compliance).

In the United States, 90% of cattle go through a feedlot system in which growth hormones are used to enhance feed efficiency and lower production cost. In contrast, Uruguayan cattle are fed primarily on pasture alone, and while some supplemental grain-based feed may be used, the use of growth hormones is strictly prohibited. Thus, Uruguay is also in compliance with EU rules on hormone use. In addition, antibiotics in feed are not used in pasture-based systems.

Product Differentiation and Certification

Product differentiation is recognized as a key factor in enhancing demand for Uruguayan beef in export markets (Perez, Boland, & Schroeder, 2003). In 2001, the National Meat Institute (INAC— Instituto Nacional de Carnes) of Uruguay developed the "Certified Natural Meat Program of Uruguay," with the dual objectives of differentiating and increasing consumer confidence in Uruguayan meat products. The program involves international certification of compliance with various protocols in both the animal production and industrial phases of meat production. In August 2004, USDA announced that Uruguay's Certified Natural Beef is "Process Verified." In other words, the beef is verified according to this process of compliance (see Figure 2). The main components of the Certified Natural Meat Program of Uruguay are food safety, traceability, animal welfare, and environmental sustainability. These are expressed in the following claims made for animals marketed under the program:

- Source verified—All cattle can be fully traced from ranch to harvest, fabrication, and packaging. Identification of animals is by means of individual plastic ear tags.
- No added hormones—No growth hormones of any kind or equivalent growth promotants have ever been administered to the animals.
- Not fed antibiotics—No subtherapeutic antibiotics have been fed or administered as a supple-

ment in feed or water for the purpose of growth promotion.
- No animal proteins in feed—The animals have never been fed proteins of animal origin except maternal milk.
- Grass fed—All animals in the program have been grown, raised, and fattened on a grass diet. Restricted supplementation levels are accepted to support grazing.
- Open range—Animals have never been confined to yards or feedlots at any time in their lives, and are raised in open pastures year round.

The program is voluntary; members (farmers and slaughter plants) join with the objective of adding value to their product. Independent certification firms verify that members are in compliance with protocol claims, and thus certification involves the entire production chain from animal production to meat cutting, packing, and labeling. The country brand is "Uruguay Certified Natural Beef" and the label, shown in Figure 2, is the intellectual property of INAC. Its use is granted subject to endorsement of the accredited certifying firm.

Certification under this program links the product with its country of origin and essentially attempts to establish Uruguayan beef as a brand identity similar to that of New Zealand lamb as described by Clemens and Babcock (2004). However, there is one important difference. Uruguay is attempting to use a broad certification program based on USDA standards, whereas New Zealand is marketing the country without a formal certification program. Ultimately, the intent is a quality assurance program to certify that the whole country conforms to a process of producing high-quality grass-fed beef. Table 1 shows the progress of the certification program.

Benefits of Certification

The objective of certification is to differentiate Uruguayan beef from that of competitors and thereby enhance demand. To illustrate the potential benefits, consider the impact on exports to the United States. As noted, the majority of Uruguayan beef shipments to the United States in 2004 and 2005 were out of quota, as the country has only 2.8% of the quota compared with 54% for Australia and 30.6% for New Zealand, and these shipments were subject to the 26.4% tariff. Given the differential treatment of in- and out-of-quota exports, exporters minimize tariff exposure by reserving the quota for higher-value chilled beef exports and shipping lower-priced manufacturing beef out of quota. Thus, demand for its beef outside the quota has changed Uruguay from a small to a major exporter of beef to the United States, and since 2003, the United States has been Uruguay's principal market.

In general, it is not economical to ship high-quality beef out of quota because the tariff would not allow the product to compete with U.S. domestic producers, with other exporters to the U.S. with more quota, or eventually with the alternatives for those cuts that Uruguayan exporters have in other international markets. However, because chilled beef still comprises only a small fraction of Uruguayan beef exports, the 20,000 ton quota is not yet a limiting factor. For example, in 2004, only 7,562 metric tons of high-quality chilled beef were shipped to the United States, and the remainder of the quota was filled with lower-quality frozen beef.

Table 1. Progress of the Uruguayan certification program, 2004 to June 2006.

	2004	2005	Jan. to June 2006
Certified farms	56	186	277
Animals in certified farms	90,000	300,000	550,000
Certified slaughterhouses	1	3	10
Exports (metric tons)	0	17	482

Lessons for the Future

Since eradicating FMD in 1995, Uruguay has been expanding its beef exports, particularly to the United States. In addition, acceptance of the DICOSE traceability system and the Uruguayan ban on growth hormones provide access to the EU market. Exports to the United States are constrained by a TRQ, and exports to the European Union are constrained by a WTO-negotiated Hilton quota. Uruguay has 6,300 carcass tons in the quota, which must be boneless. Eligible animals must have been exclusively pasture raised since their weaning. The beef is produced from animals kept on registered and approved farms that comply with conditions of production of animals eligible for the European Union as determined and verified by Uruguayan authorities.

To date, Uruguay has filled its U.S. TRQ with a combination of high- and low-quality beef. Certification of Uruguayan natural grass-fed beef would differentiate and enhance demand for high-quality Uruguayan beef and would be expected to lead to a situation in which the entire TRQ is filled with high-quality beef. Additional enhancements in demand as a result of certification would benefit the holders of the TRQ permits, but because overall demand for Uru-

guayan beef would not increase, there would be no price benefit for Uruguayan producers. Producers would, however, benefit from a negotiated increase in the TRQ.

What lessons does the Uruguayan example hold for domestic and international producers responding to opportunities in the United States? In the past few years, almost a dozen producer alliances in the United States have become process verified, and a number of other initiatives are underway. In March 2005, the state of South Dakota implemented the first state-certified beef program in the United States. Under that program, consumers will be able to trace a product back through the meatpacking plant, to the feedlot where the animal was fed, and to the ranch where the animal was born. A similar initiative in Iowa would create a label for "Iowa-80" beef. The success of such programs hinges on their ability to market a brand name tied to a distinct set of desirable attributes. Given the range of attributes that some consumers appear to value (for example, traceability, hormone free, grass fed, no antibiotics, no genetically modified grain), there appears to be room in the market for several such differentiated products.

However, as programs proliferate and face competition from foreign programs such as Uruguay's, the initial benefits are likely to diminish. Similarly, domestic efforts such as the Iowa-80 certification program might prevent loss of market to Uruguayan imports. Regional programs such as this would not exclude imports or impede other countries in developing their own brand identities, with the possible exception of EU products developed under *terroir* labels, which are only applicable for EU countries. But that is a regional label using legislation and not a private effort for differentiation. Alternatively, U.S. producers could seek alliances with producers in other countries such as Uruguay to provide beef of this type, or U.S. producers could invest in processing facilities in other countries, as they have done in Uruguay. Clearly, some countries such as Uruguay may have highly differentiated products that will become more competitive with U.S. beef. Producers involved in alliances seeking to differentiate their beef by geographic origin or by the process with which the beef was produced must realize that producers in other countries can develop similar products and that in a global beef market domestic certification programs are not likely to present significant barriers to market entry.

For More Information

Clemens, R., & Babcock, B. (November 2004). Country of origin as a brand: The case of New Zealand lamb. Briefing Paper 04-MBP 9, Midwest Agribusiness Trade Research and Information Center, Iowa State University.

Marshall, M., Boland, M.A., & Conforte, D. (2002). Exporting U.S. and Uruguayan beef to the European Union. In J. Caswell (Ed.), *Consumer Demand for Quality Conference*. Boulder, CO: Westview Press.

MGAP-DIEA. (March 3, 2005). Censo General Agropecuario 2000. Ministerio de Ganadería Agricultura Y Pesca. Available online: www.mgap.gub.uy/Diea/ (Accessed 11/4/06).

Perez, L., Boland, M.A., & Schroeder, T. (2003). Country of origin labeling in Uruguay. *International Food and Agribusiness Management Review 6*(4), 1-13.

Note: A complete set of references is available from the authors upon request.

Michael Boland (mboland@ksu.edu) and Sean Fox (seanfox@ ksu.edu) are Professors, Department of Agricultural Economics, Kansas State University, Manhattan, KS. Lautaro Perez (lautaro@adinet.com.uy) is Lecturer, ORT University, Montevideo,Uruguay.

This research was funded, in part, by the Agricultural Marketing Resource Center.

CHOICES
The magazine of food, farm, and resource issues
1st Quarter 2007 • 22(1)
A publication of the American Agricultural Economics Association

Challenges for China's Agricultural Exports: Compliance with Sanitary and Phytosanitary Measures

By Fengxia Dong and Helen H. Jensen

JEL Classifications: Q13, Q18

In the food safety arena, a clear role for government is to adopt sanitary and phytosanitary (SPS) measures to protect human, animal, and plant life or health. Relative to developing countries, developed countries tend to adopt more stringent food safety standards and regulations with a broader scope and to rely increasingly on certification and traceability. The additional costs of compliance for meeting international SPS requirements are higher for firms operating in developing countries because they must take additional steps to meet international food safety regulations and standards. Therefore, their comparative advantage, achieved through lower production costs, will tend to be reduced because of high incremental compliance costs. Given that a high proportion of developing countries' exports are agricultural and food products and that export destinations are mainly developed countries, concerns have arisen that SPS measures are affecting developing countries' access to export markets.

China provides a good example of the potential and problems of compliance with SPS requirements and other private standards required by foreign retailers because many of the problems China is facing in agricultural production and in exports are common to other developing countries. Developed countries, including Japan, account for a major share of China's agricultural exports. Thus, examining China's SPS conditions in agricultural production, efforts to overcome SPS problems, and ability to adjust SPS controls to demand in the markets of developed countries provides lessons on approaches that might be used by other developing countries faced with similar problems. Given the major challenges found in China, we focus the SPS issues on food safety and quality control.

Sanitary and Phytosanitary Issues for Agricultural Exports

After 15 years of negotiations, China became the 143rd full member of the World Trade Organization (WTO) on December 11, 2001. Since then, with eliminated or lowered tariffs, China's bilateral trade has grown significantly. In 2004, the value of Chinese exports of agricultural products exceeded $17.3 billion (see Figure 1). As shown, fruits and vegetables represent a growing share of agricultural exports.

Despite prospects for economic rewards from expanded trade, several problems have emerged. Chinese farmers and exporters had anticipated a large, positive impact on domestic production with accession to the WTO, especially for labor-intensive agricultural products such as vegetables, fruits, livestock and poultry products, and seafood. However, these products have been hardest hit by the need to meet significant SPS standards, and this has dampened substantial growth in these agricultural exports. According to a recent investigation by China's Ministry of Commerce, about 90% of China's exporters of foodstuffs and agricultural products were affected by foreign technical trade barriers; exporters suffered losses totaling US$9 billion a year.

China's recent experiences with SPS barriers have been mainly with the European Union, Japan, and the United States. They are the leading importers of China's agricultural products, accounting for about 68% of total Chinese

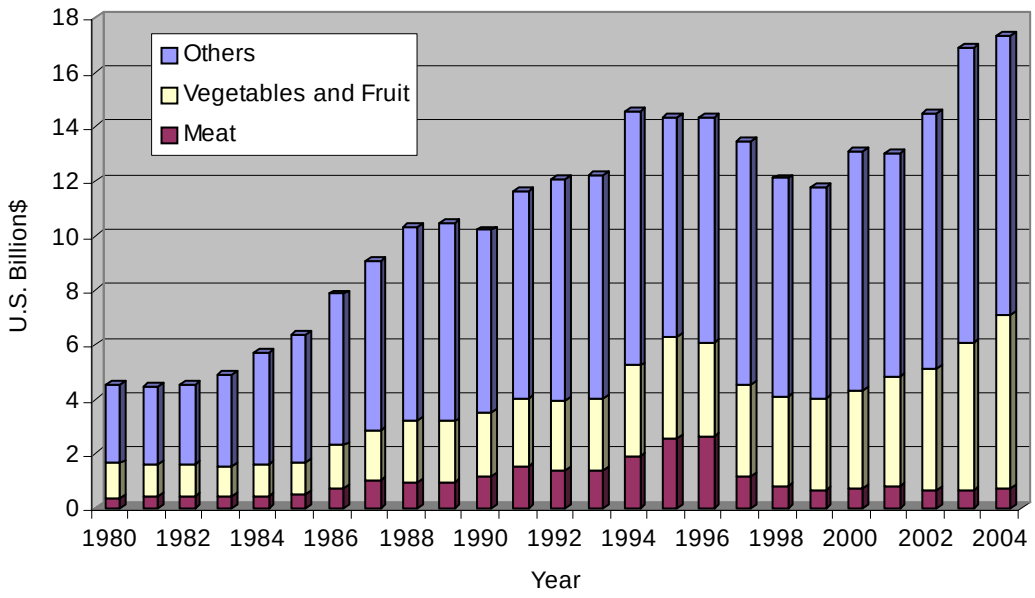

Figure 1. Chinese agricultural product exports.
Source: FAOSTAT (http://faostat.fao.org)

vegetable and fruit exports over the 1998-2000 period. But, at the same time, these three markets accounted for 41%, 30%, and 24%, respectively, of the trade losses attributable to SPS measures in 2002. An illustrative example is Japan's ban on China's frozen spinach in July 2002 after pesticides called chlorpyrifos were found in the product. Prior to the ban, imports from China accounted for 99% of Japan's annual imports of 40,000 to 50,000 metric tons of spinach. Because failure to pass SPS inspections often leads to closer inspection of future exports, China's agricultural products have confronted much stricter inspection in these markets following several of the SPS-related problems. Currently, Chinese exports of seafood, vegetables and fruits, tea, honey, poultry meats, and red meats are creating the most frequently encountered SPS problems. Excessive pesticide residues, low food hygiene, unsafe additives, contamination with heavy metals and other contaminants, and misuse of veterinary drugs have been major issues.

Current Sanitary and Phytosanitary Conditions

China's SPS problems can be attributed to many factors, most of which are common to developing countries. Although there is a dual system of production, with some export-oriented enterprises co-existing with primarily domestically oriented production, it is hard to keep the two separate in the national supply chain, and the overall level of food safety in domestic production will inevitably affect the expansion of China's agricultural exports.

Regulatory and Oversight Systems

Because the Chinese government is still working to perfect its SPS regulatory and oversight systems, regulation and supervision of food product quality do not yet provide the necessary guidance for agricultural and food production. Some industries and commodities have no technical standards, and there is no sound food safety law to support and upgrade inspections. With respect to restrictions on pesticide residues, Codex has over 2,500 maximum residue levels, the European Union has over 22,000, the United States has over 8,600, and Japan has over 9,000. By comparison, China has only 484, and fewer than 20% of these conform to Codex levels.

Many technical standards and regulations in China are outdated, duplicative, or inconsistent with international standards. Moreover, the establishment of agricultural standards involves 10 government ministries, with little coordination from the central government down to the county level. As a result, each level of government has developed its

own standards. This dispersed structure neither facilitates coordination nor supports effective implementation of food safety regulations. In addition, the lack of technical, institutional, and managerial capacity to control and ensure compliance makes the regulations and standards less effective.

The Production Environment

The lack of effective regulation of quality, coupled with widespread noncompliance with existing regulations, has resulted in Chinese producers often misusing or abusing chemicals and drug inputs (for example, chemical fertilizers, pesticides, and antibiotics). Antiquated production techniques and technology, environment pollution, and a low-quality input supply make production conditions worse. According to inspection reports of agricultural produce sampled by China's Ministry of Agriculture in July 2005, over 10% of vegetables in farmers markets and supermarkets contained excessive pesticide residues based on Codex food standards.

In animal production, there are persistent violations of regulations on drug additives and quality standards. In 2005, China's Ministry of Agriculture conducted sample inspections nationally on feed and feed additives and veterinary medicine. About 9% of samples drawn from feed and feed additives production, marketing, and utilization firms or households were substandard. Besides prohibited drug additives, lead, aflatoxin B1, and *Salmonella* were the most common adulterants or types of contamination found. In addition, 25% of veterinary medicine samples were substandard in terms of quality.

The small scale of fresh produce and livestock operations in China and the fact that they are relatively scattered across producing areas contribute to the abuse of agricultural chemicals and noncompliance with regulations. For example, 66% of swine producers had an annual production of less than 50 pigs in 2005. Controlling the use of chemicals and veterinary drugs in such a vast country—with more than 700 million farmers and many more household farming operations—is extremely difficult.

Poor machinery and low management levels in household operations also contribute to SPS problems. Small-scale farmers have little or no motivation to comply with SPS regulations if they do not face penalties for noncompliance as they face increased production risks. Even when large-scale, standardized production might develop, compliance with SPS standards can lead to significant increases in production costs, and, in the short term, the potential loss of revenue can be a significant barrier to change. With such an unfavorable situation, meeting higher food safety and quality standards leads to higher costs, which constrain expansion of China's agricultural product exports.

Inspection Technology and Information Transfer

Lack of up-to-date inspection equipment limits China's ability to conform to internationally accepted assessment procedures. Much of China's current inspection and testing technologies and instruments are antiquated and unable to meet the demand for services in terms of quality and scale of operation, especially when pesticides and veterinary drug residue tolerances are set at very low doses (for example, parts per billion and parts per trillion).

In addition, inefficient information systems and isolated domestic markets mean that market information and other technical requirements may not be communicated in an efficient manner. The lack of effective information channels across governments, industries, and regions means that even if some firms or industries confront SPS problems in export markets, other firms or industries are not likely to be informed on a timely basis. Many farmers do not have access to information about SPS standards, let alone to the resources required to comply with these standards, such as appropriate technologies and scientific and technical expertise. Most producers have only a limited awareness of SPS measures in general and lack an understanding of their importance.

China's Progress on Resolving Problems

With increasing interaction with world markets, China's government and traders have recognized SPS problems and are taking actions to improve the production and marketing environment. Recent investment in state-of-the-art processing facilities, transportation and distribution infrastructure, and improved testing and product control have improved quality and supported increased development of food markets (in particular, dairy, meat, fruits, and vegetables). These improvements contribute to the expansion of exports by increasing the overall supply available to both domestic and export markets. In the dairy sector, for example, companies are beginning to invest in technologies to increase milk quality, and emerging national brands are establishing credible reputations for quality and safety (Fuller et al., 2005). Some of this product is available for export. In addition to efforts to update agricultural and food stan-

dards and regulations and to educate producers on requirements for production methods in international markets, the Chinese government is trying to attract foreign investment, support large enterprises, and promote good agricultural and manufacturing practices. In the meantime, the private sector is working to coordinate international standards and thus increase access to world markets.

Foreign Direct Investment, Dragon-Head Enterprises, and Industry Associations

With relatively scarce capital internally, the government has encouraged foreign direct investment (FDI) in agriculture. Such investment can introduce capital, advanced technology, and management and marketing skills to improve product quality, increase exports, and assist in the transition from traditional to modern agricultural operations. Currently, agricultural production and food processing sectors each account for only about 2% of total FDI. Except for a few inland provinces, FDI in general has been concentrated in the southeast coastal areas. The Chinese government has further opened its agricultural sector to the outside world and has provided favorable polices and terms to attract FDI through preferential taxes and improved infrastructure.

China's government has supported the development of leading, large-scale enterprises, or "dragon-head" enterprises, as these targeted enterprises can bring along many enterprises and farmers by involving them in their supply chains and providing them guidance on production practices that improve food safety and quality. Currently, about 500 key dragon-head enterprises have formed at the national level, and over 2,000 have formed at the province level. Approximately 30% of all farm-households sold products to these industrial enterprises. The national- and provincial-level key dragon-head enterprises are mainstays of the move toward a more industrialized agricultural system. Because it is difficult for an enterprise to deal directly with thousands of dispersed farm-households or for a farmer to directly contact or negotiate with these enterprises, more and more industry associations have been formed voluntarily by producers and processors. These national or local industry associations are acting as a bridge and link between the government, enterprises, and farmers. And they are effective in working out strategies for industry development, safeguarding members' rights, improving cooperation and experience exchange among members, and conveying information on food safety standards and requirements.

Additional FDI, key dragon-head enterprises, and industry associations also offer some hope to small-scale farmers with low management skills and poor production techniques that they might benefit from expanded export markets. Small-scale farmers organizing to operate as single large-scale entities allows them not only to gain economies of scale but also to more easily standardize production and comply with SPS measures at lower costs. This improved organization and investment may allow small-scale producers to remain competitive in the stricter food safety environment required in international markets.

Hazard Analysis and Critical Control Point Systems and Good Practices

Following the lead (and requirements) of the United States and other countries, China has turned to implementation of Hazard Analysis and Critical Control Point (HACCP) systems as another approach for reducing SPS and food safety problems and improving access to world markets. In 2002, China's General Administration of Quality Supervision, Inspection, and Quarantine introduced regulations requiring export-oriented enterprises producing six kinds of food (canned food, aquatic products [excluding fresh, frozen, air-cured, and pickled/salted products], meat and meat products, frozen vegetables, fruit/vegetable juice, and frozen convenience food containing meat or aquatic products) to pass a HACCP system examination for hygiene certification before producing, processing, or storing exported food. As expected, firms wanting to enter export markets have rapidly embraced the use of HACCP systems. As microbial contamination is the number one food safety issue (43% of illnesses caused by food poisonings were linked to microbial contamination in 2005), improved risk-based control systems, such as HACCP, along with frequent inspections by government agencies, can reduce the risks of microbial contamination on the supply side. To the extent that HACCP is successful in improving the quality of the manufacturing process, the use of HACCP systems is expected to greatly improve the sanitary condition of those exported foods.

However, because producers of most exported products and production services at various stages of the supply chain are not required to adopt HACCP or to use good manufacturing practices in processing or good agricultural practices in the fields, the responsibility for improving SPS conditions comes through self- or market-oriented discipline. Producer efforts toward good practices are motivated primarily through

incentives to earn more revenues by way of foreign exchange in export markets, and through the threat of lost payments and business from foreign customers should problems occur.

Opportunities and Challenges for China

Although SPS conditions as a whole in China are low, a number of enterprises, especially those that are export-oriented in the coastal and open provinces and regions, have reached SPS levels consistent with international levels. The improvements in food quality and product safety are a result of their operating in relatively open markets and exporting to developed countries, as well as their investment in modern food production, processing, and distribution industries. These markets are now mostly controlled by the "invisible hand" of international market forces, and producers can quickly adjust production to market signals. Their good practices can have spillover effects on domestic production and potentially expand supply sources available to export markets. This provides an optimistic prospect for China's food quality and safety. Recent estimates show that China has an opportunity to compete successfully because of low production costs that offset relatively high internal marketing costs (USDA, 2006). However, large regional differences limit prospects for broad participation in international markets, and it will take a long time for China to make the necessary adjustments to improve the overall SPS conditions in the country. During the transition, the potential for exports of China's agricultural products will vary, depending on the destination countries (which have different levels of SPS requirements), product varieties, and the capacity of producers to conform to SPS standards.

Although the WTO SPS Agreement requires members to ensure that SPS measures are based on sufficient scientific evidence, there are some well-founded concerns that countries may abuse SPS measures by using them as trade barriers. As China works to respond to the SPS regulations of other countries, concerns have risen that some countries will use SPS barriers to keep out lower-cost Chinese products, which are very competitive in world markets. Consequently, importing countries may look to restrict imports from China by setting relatively high standards or strict inspections in order to protect domestic markets. As China faces continuing SPS conflicts, the government has looked to bilateral negotiations to resist unfair trade restrictions and discrimination and is likely to call upon the WTO to coordinate and resolve trade disputes. As a member of the WTO, China can participate in the negotiation and establishment of international regulations and standards. What remains to be seen is whether China will improve its market opportunities under its new access to scientific review processes.

Asia has been the dominant destination for China's seafood, meat, vegetable, and fruit exports, accounting for over 50% of China's total exports in each category. Since U.S. exports have been of a different type, or seeking different destinations or market niches, China's exports of processed fruits and vegetables, which account for 60% of its total value of fruit and vegetable exports, generally had not posed challenges to U.S. exports. However, notable competition to U.S. exports brought about by China's increasing exports has been seen in the U.S. apple juice market and in Asian fresh fruit and vegetable markets, especially apples, onions, and edible brassicas (mainly broccoli and cabbages).

The value of China's apple juice exports to the United States increased from $1 million in the early 1990s to $108 million during the 2002-2004 period, and China has replaced the United States as the leading exporter of apple juice to Japan and Canada (USDA, 2006). And, due to low production costs and proximity to Japan, China's fresh vegetables are more price competitive than are U.S. vegetables. Declining U.S. market share in other Asian markets is also coinciding with increased vegetable exports from China.

At the same time, growth in China's domestic market, fueled by increased consumer income, modernization in the retail food system, and better transportation and distribution networks, has begun to compete with export outlets for the country's high-quality and processed food products, and this may dampen the expansion of products destined for international markets.

For More Information

Dong, F., & Jensen, H.H. (2004). The challenge of conforming to sanitary and phytosanitary measures for China's agricultural exports. MATRIC Working Paper 04-MWP 8, Midwest Agribusiness Trade Research and Information Center, Iowa State University. Available online: http://www.card.iastate.edu/publications/synopsis.aspx?id=514.

Fuller, F.H., Huang, J., Ma, H., & Rozelle, S. (2005). The rapid rise of China's dairy sector: Factors behind the growth in demand and supply. CARD Working

Paper 05-WP 394, Center for Agricultural and Rural Development, Iowa State University. Available online: http://www.card.iastate.edu/publications/synopsis.aspx?id=760.

United States Department of Agriculture (USDA). (February 2006). China's rising fruit and vegetable exports challenge U.S. industries. *Outlook Report No. (FTS32001). Washington, DC: Economic Research Service. Available online:* http://www.ers.usda.gov/Publications/FTS/2006/02Feb/FTS32001/fts32001.pdf.

Fengxia Dong (fdong@iastate.edu) is Associate Scientist and Helen H. Jensen (hhjensen@iastate.edu) is Professor of Economics and Head of the Food and Nutrition Policy Division, Center for Agricultural and Rural Development, Iowa State University, Ames, IA.

CHOICES
The magazine of food, farm, and resource issues
1st Quarter 2007 • 22(1)
A publication of the American Agricultural Economics Association

The Transformation of Spain's Pork Sector: Can It Continue?

By Sergio H. Lence

JEL Classifications: Q13, Q18

Compared with the other major players in the world pork market, Spain has experienced profound growth and transformation within its pork sector over the past 20 years. Between 1985 and 2003, pork production in Spain increased by 139%, reaching 3.3 million metric tons per year, and Spain became the second-largest pork producer in the European Union (EU).[1]

The substantial increase in pig production in Spain was largely propelled by EU membership in 1986, which induced a relocation of EU pig operations that favored Spain's lower labor and feed costs, lower population density, and looser environmental regulations. At the same time, Spain's pig producers were forced to become more competitive with other EU producers or risk being put out of business. This situation became even more pronounced with the creation of the EU single market in 1992, which increased both regulations and competition but also created new opportunities for marketing higher-quality products that meet stricter safety standards and are capable of commanding price premiums. The producers who succeeded were the ones who adopted state-of-the-art technologies, became highly efficient, and implemented innovative approaches to organization and management.

In the late 1980s, Spain was a net importer of pigmeat, producing slightly over 95% of its consumption. However, as a result of the substantial transformation experienced by its pork sector, Spain has become a large net exporter, shipping about 450,000 metric tons of pork (2001-2003 average) and 1.1 million live slaughter pigs (2002 total) per year. Spain's pigmeat production exceeded consumption by more than 15% in 2002. Although most of this trade occurs among EU member countries and total exports are small relative to those of Denmark and the Netherlands, Spain has attained an increasingly significant role in EU pork trade (see Figure 1).

The transformation in pig production in Spain was led by the feed industry, which consolidated into fewer, larger firms and became organized into private corporations or cooperatives. The greater resources of these larger firms allowed them to become integrators by entering into contracts with pig producers. Under most such contracts, the integrator owns the animals and provides feed, technical assistance, veterinary services, and other inputs, and the producer provides facilities and labor. These arrangements gave integrators the required scale to reduce costs by negotiating better terms with input providers.

Spain's pork sector faced several other challenges along the path to its current success. Spain's pork producers and processors now face new challenges in the form of a more regulated production environment. Will Spain be able to maintain its competitiveness within the EU? The following discussion addresses this question by looking at the results of earlier challenges, how new policies and regulations are changing the EU industry, and implications for the future success of Spain's pork sector.

Drivers of Change

Domestic Demand

A major driver of the significant expansion of Spain's pork sector has been domestic demand. Meat consumption, of pigmeat in particular, has grown at a remarkable rate in Spain over the last two decades. Between 1985 and 2002,

1. *Unless otherwise stated, the term EU refers to the 15 member countries prior to the 2004 enlargement.*

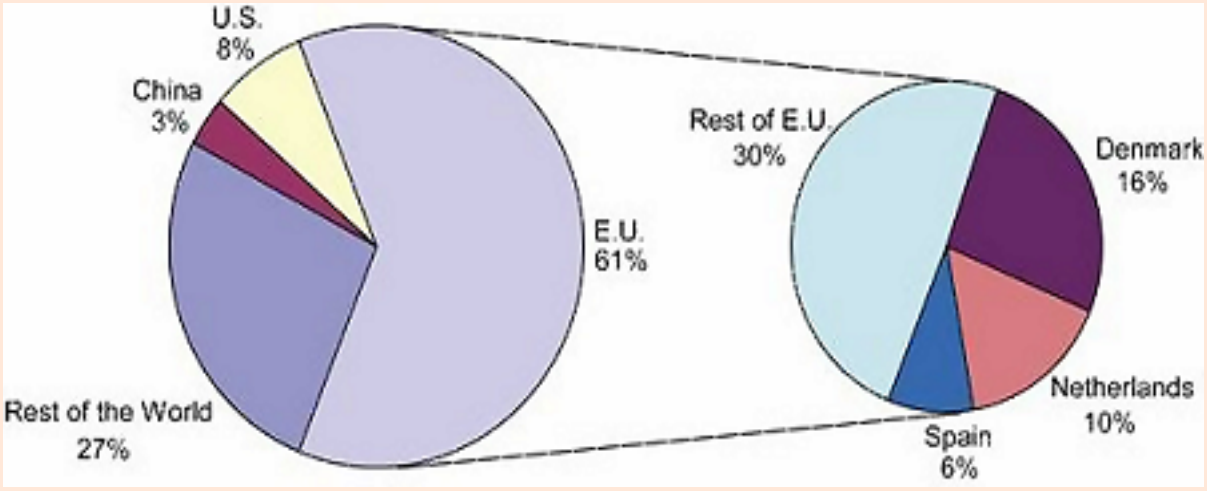

Figure 1. World pigmeat exports, average 2000-2002.
Source: FAOSTAT (http://apps.fao.org/default.jsp).
Note: Annual world pigmeat exports averaged 8.0 million metric tons in the 2000-2002 period.

annual per capita meat consumption in Spain increased by more than 50%, from 77.9 kg to 118.5 kg, and annual per capita pork consumption almost doubled, from 36.5 kg to 66.6 kg, over the same period. As a result, in 2003 Spaniards ranked as the world's second-largest consumers of pigmeat on a per capita basis, behind Austrians.

The noticeable increase in the domestic demand for pigmeat can be largely attributed to the substantial growth in per capita income experienced by Spain after it joined the EU. Spaniards have a strong preference for cured meat products. On a per capita basis, Spaniards are the world's largest consumers of cured ham, and cured products in general account for about half of the consumption of processed pigmeat. In turn, processed meat makes up 80% of total pigmeat consumption in Spain. Cured products are relatively expensive items and tend to be more responsive to increases in income than are more economical meat products. Thus, increasing income levels in Spain translated into higher demand for cured products such as "Serrano ham."

Spain's significant income growth is likely attributable, at least in part, to its accession into the EU. Given this, it is reasonable to expect Spain's income growth rate to fall to more normal levels, implying that domestic demand is unlikely to drive growth as prominently in Spain's pork industry.

Animal Disease

Outbreaks of classical swine fever (CSF) in 1997 and 1998 and the discovery of bovine spongiform encephalopathy (BSE) in the United Kingdom in 1997 had a noticeable impact on the rapid pace of transformation in Spain's pork sector. While more than 800,000 pigs were being culled in an attempt to eradicate CSF, many consumers were responding to the news of BSE by substituting pork for beef. The simultaneous drop in pork supplies and increase in pork demand led to a sizeable jump in pig prices, triggering a flurry of investment in new state-of-the-art production facilities.

Then, as output from the new facilities entered the market and the pork supply increased, prices fell to record lows, prompting the least profitable pig operations to exit the business. The outcome of this process was a swine sector consisting mostly of new operations with modern facilities and extremely efficient production practices. Small operations virtually disappeared; most medium-sized operations became associated with either cooperatives or corporations; and two or three large producers came to control more than 80% of pig production in Spain.

The CSF outbreaks also triggered vertical integration in the meatpacking industry. Reduced capacity utilization due to culling, together with the high pig prices, led the largest meatpacking firms to integrate with pig producers to ensure a steadier stream of animals for their operations. Some of these companies integrated vertically downstream as well, establishing their own chains of retail shops. Much of the integration took the form of cooperatives, associations, and corporations, although some meatpackers opted to establish

their own pig production facilities to secure supplies.

Technological Change

Increased vertical integration and construction of new facilities allowed Spain's swine sector to become a technology leader within the EU. Prior to these changes, Spain's pig producers lagged other major EU producers in the use of technology. Now, more than half of Spain's pigs are produced in state-of-the-art facilities, some of which can house more than 10,000 sows.

This technological advancement has been accompanied by increased specialization, both in type and geographic location of production operations. Specialized farrowing and finishing operations are now far more common than are farrow-to-finish operations, and production has tended to concentrate in the regions of Catalonia (finishing), Castilla-Leon (farrowing), and Aragon (finishing). One likely driver of Castilla-Leon's farrowing specialization is its greater distance to ports, resulting in a higher relative cost of imported feed.

As noted, most of Spain's large-scale meatpacking operations became vertically integrated after the CSF outbreak. However, the processing industry remains very atomistic.[2] As of 2000, there were about 900 slaughterhouses, 2,300 cold warehouses, 2,100 meatpacking plants, and 4,700 processing plants for the red meat sector as a whole. Pork makes up about 60% of all meat supplies, and the industry tends to be somewhat more concentrated for pork than for other meats. In 2003, the top 10 slaughterhouses accounted for 30% of pig slaughter, and the top 36 slaughterhouses accounted for 60%.

The large number of processing plants stems in part from the substantially larger share of processed pork (80%) sold relative to sales of unprocessed pork (20%). Still, there is evidence of inefficient use of processing plants, with capacity utilization estimated at less than 30%, although Catalonia's meat plants appear to be substantially larger and/or more efficiently utilized than is the average meat plant in Spain.

Product Differentiation

Spaniards have a strong preference for cured pork products and are the world's largest consumers of cured ham on a per capita basis. In recent years, the processed pork market has experienced a major shift toward quality differentiation. To target demand for high-quality products, the industry has begun to implement traceability systems throughout the pork market channel, and producers of cured pork products have been highly proactive in seizing opportunities and offering products with greater appeal to consumers. Among other initiatives, Spanish producers have taken advantage of EU legislation on geographical indications and traditional foods. As of January 2007, for example, Spain was one of only nine EU countries with protected designations of origin (PDOs), and one of only two with designations of traditional specialty guaranteed (TSGs) for pork products.[3] Spain had the only ham TSG (Serrano ham) and held four PDOs for ham alone (surpassed only by Italy).

These efforts to promote high-quality cured products are exemplified by Serrano ham, a typical ham consumed by Spaniards. Historically, Serrano ham was not strictly standardized in terms of quality. Recognition of Serrano ham as a TSG changed this situation by providing legal protection to the Serrano ham designation and requiring stringent, standardized production processes and quality norms. The aggregate value of all hams marketed as PDOs increased by over 200% between 1991 and 2002, and the market for Serrano ham increased at a significantly higher rate than did markets for other pork products.

Government Support Programs

The EU Common Agricultural Policy (CAP) stipulates provisions to stabilize pork markets, mainly by setting up a price system and regulating trade with non-EU countries. To cushion large price declines, the CAP price system allows the EU Commission to issue aid for private storage and/or export refunds for pork products when prices drop below 103% of the basic price established by the EU. The price system also allows the EU Commission to authorize intervention purchases of pork when prices fall substantially below the basic price. Although intervention purchases have not been used for at least two decades, aid to private storage and export refunds have often been used. Also, pork imports from non–EU countries are subject to licenses and taxes, and additional import duties can be levied when there is a risk that imports could destabilize the EU market.

2. *It is worth pointing out, however, that in general the pigmeat processing sector in the EU is much less concentrated than in the United States. One notable exception is in Ireland, where the sector is dominated by two firms.*

3. *Interestingly, none of the new EU members had PDOs or TSGs for pork products.*

The EU also provides special financial assistance for animal disease emergencies. To prevent the spread of diseases such as CSF, the CAP forbids animal movement in affected areas and stipulates the purchase and destruction of animals in these areas. These operations are co-financed by the EU Commission and the member states. This type of financial assistance proved to be very important for Spain during the 1997 CSF outbreak.

Historically, EU producers of many commodities received government support in the form of direct payments, but this has not been the case for swine producers in Spain. In 2003, the EU announced a major reform of the CAP, including provisions designed to shift producer support from direct payments to decoupled payments (that is, from output-dependent payments to payments not linked to production volume). In the case of pigs, the impact of the CAP reform is estimated to be minimal because swine producers have not received direct payments.

Some sources predict that EU swine producers will benefit indirectly because the CAP reform will reduce the price of feed grains. However, others argue that cheaper feed grains will likely enhance the competitiveness of pig producers in countries that joined the EU in 2004. Thus, the overall impact on Spain's pig producers will most likely be very small, with any minor indirect benefit from lower feed prices being offset by stronger competition from some of the newly merged states.

Environmental and Animal Welfare Regulations

Concurrent with the development of Spain's swine sector, high population density and increased environmental concerns over intensive production systems have triggered tighter EU environmental regulations. Given the higher compliance costs associated with these regulations, many EU producers either reduced herd sizes or exited the business. In relative terms, Spain's lower population density and less-demanding regulations provided a more nurturing background for new investments in pig production than did other EU countries. Now, however, the increasing geographic concentration of pig production and limited availability of land on which to dispose of manure have heightened environmental concerns.

In response, EU and national legislation have imposed ever stricter environmental regulations. These regulations limit inventories and output in some of the most affected EU regions and provide incentives to induce pig producers to exit the industry. For example, new regulations for Catalonia restrict the maximum size of individual production facilities and require producers either to have a minimum amount of land available per animal for waste disposal or to invest in advanced manure-handling technologies. Some producers are forming cooperatives and using EU subsidies for alternative sources of energy to build waste disposal plants that transform livestock waste into electricity and fertilizer.

In addition, recent legislation at both the EU and national levels reflects public concern over animal welfare (see ECDGA, 2004). In 2001, the EU Council adopted two directives establishing new minimum animal welfare standards for pig production. Among other measures, the directives ban the use of tethers and individual stalls for pregnant sows and gilts, establish minimum light requirements and maximum noise levels, require that pigs have permanent access to materials for rooting and playing, and establish a minimum weaning age of four weeks. Such controls will be applied to producers in third countries exporting pork to the EU as well.

In 2004, the EU Council approved new regulations for the welfare of pigs during transport. The regulations include rules for trips lasting more than eight hours, significantly higher standards for vehicles used to transport live animals, and checks on vehicles using satellite navigation systems. Significantly for Spain, the EU Commission has agreed to propose new regulations before 2011 regarding maximum travel times and animal densities during transport.

The stricter transportation regulations will increase the cost of moving pigs, reduce the feasibility of transporting live animals, and will likely have a noticeable impact on Spain's swine industry because the geographic specialization of its production operations requires substantial movement of animals within the country. In addition, even though Spain is neither the EU's largest exporter nor the EU's largest importer of pigmeat, Spain is a major trader of live animals.[4] In 2002, Spain imported 1.5 million pigs (mostly piglets from the Netherlands

4. *The largest exporters of pigmeat in the EU are Denmark and the Netherlands, whereas the largest importers are Germany and Italy. In 2002, pigmeat exports by Denmark and the Netherlands were almost three and two times larger, respectively, than Spain's pigmeat exports, and pigmeat imports by Italy and Germany were about ten and eight times greater, respectively, than Spain's pigmeat imports.*

and France) and exported 1.1 million pigs for slaughter (mostly to France and Portugal).

Overall, this more demanding regulatory environment can be expected to limit the rate of growth of pig production in Spain, and in the EU in general. Further, the new rules will likely be easier to implement in new facilities, which may provide countries joining the EU in 2004 or later a relative advantage over traditional EU production regions as the former develop their pork sectors.

EU Enlargement

In May 2004, the EU enlarged to 25 member countries. The 10 new member countries immediately added 30.8 million pigs to the EU herd, an increase of about 25.4% from the previous inventory. In the near term, EU enlargement does not seem to pose a threat to Spain's pork production industry. Of the new members, Poland has by far the largest number of pigs, but production is highly fragmented, and only 10 of Poland's 3,000 pig slaughterhouses are authorized to export to the EU-15 (the 15 EU countries before expansion). Hungary added the second-largest number of pigs, but about 20% of these stocks are held on small family farms with aging facilities. Significant investment will be required to upgrade the pork sector in either country.

In the longer run, some of the same forces that promoted pork production in Spain (such as lower labor costs and more lenient environmental regulations) may favor relocation of production to new member countries. And, as noted, the competitiveness of producers in the newly merged countries will likely be enhanced if the CAP reform leads to cheaper feed grains. Competitive feed costs, lower environmental standards, and the proximity of large import markets (for example, in Russia and the Ukraine) should attract foreign investment to Poland, Hungary, and the Czech Republic. For example, U.S.-based Smithfield Foods, the world's largest pork processor and hog producer, has recently made significant investments in Poland (and in Romania, as well). According to its Web site (http://www.smithfield-foods.com/home.asp), Smithfield Foods has anticipated "... that through its adoption of a market economy, Poland will resume its place as a premier and dominant supplier of meat and other agricultural products to Europe and other parts of the world."

Counteracting the impact of the potential competition from the new member countries in world markets is the prospect for a substantial increase in their domestic pork consumption. The 10 countries that joined the EU had a combined population of 74 million, all with a long-standing tradition of consuming pork. Although income levels in the new member countries are lower than those in the former EU15, they are likely to increase at a relatively rapid rate for the foreseeable future, which should help drive increased pork consumption.

Future Implications

Spain has achieved enviable success in modernizing and expanding its pork sector, but its producers and processors will need to continue along the path of rapid transformation to remain competitive. It appears, for example, that Spain's processing sector is ripe for consolidation. The high volume of slaughter pig exports, the large number of small plants, and the high level of underutilized capacity suggest significant inefficiencies in this sector.

Additionally, the costs of implementing increasingly restrictive environmental and animal welfare regulations in Spain will likely hamper the trend toward greater geographic specialization and growth in live pig exports. The regulations may also give pork producers in the 10 new EU member states an advantage as they incorporate provisions of the regulations in newly constructed facilities. Similarly, rationalization of the processing sector in those countries will likely involve the construction of state-of-the-art plants that have lower costs and are able to meet more stringent food safety regulations required by export markets.

Although the CAP reform is not expected to have a major impact on Spain's pork sector, the recent addition of 10 new member states to the EU may have a big effect. The magnitude of this impact will depend on the extent to which producers and processors in the new member countries obtain capital to build or upgrade facilities to meet increased consumption within their own countries.

Sergio H. Lence is Professor, (shlence@iastate.edu), Department of Economics, Iowa State University, Ames, IA.

For More Information

European Commission, Directorate-General for Agriculture (ECDGA). (2004). *The meat sector in the European Union. Fact sheet, ECDGA, Brussels, Belgium*. Available online: http://ec.europa.eu/agriculture/publi/fact/meat/2004_en.pdf (Accessed 11/706).

Lence, S.H. (2005). *What can the United States learn from Spain's pork sector? Implications from a comparative economic analysis*. MATRIC Research Paper 05-MRP 12, Midwest Agribusiness Trade Research and Information Center, Iowa State University, Ames, IA. Available online: http://www.card.iastate.edu/publications/synopsis.aspx?id+864 (Accessed 11/7/06).

CHOICES
The magazine of food, farm, and resource issues
1st Quarter 2007 • 22(1)
A publication of the American Agricultural Economics Association

Marketing Wine on the Web

By Susanne Stricker, Rolf A.E. Mueller, and Daniel A. Sumner

JEL Classifications: Q13, Q17

Wine purveyed on the World Wide Web joined many similar ventures with a big splash in the late 1990s. And, as with such ventures, some swam, some just bobbled, while others simply sank.

Marketing wine is information-intensive. Information moves with the product in every marketing step: sellers must find buyers or vice versa, sellers must describe the wine (shielded from sampling in its tightly sealed bottle), a price and other conditions must be posted or negotiated, and the winery and its customers must have proof of having agreed on an enforceable, legal sales contract. Advances in the technical efficiency of providing and communicating information may therefore reduce transaction costs and change the composition of total marketing costs for wine. Cost reductions from increased information efficiencies translate into an extended relevant market for any one winery, and into richer and more intensive communication between the winery and its customers. Moreover, changes in the composition of marketing costs may affect the competitiveness of sales channels, and new sales channels may become economically viable.

The Web has revolutionized communication and it provides the platform for e-commerce, defined as the use of the Web for buying and selling goods and services (OECD, 2003). Winery Web sites that are listed on Google or on other search engines make it easy for buyers to find their favorite winery. If properly designed and programmed, the Web site may provide customers with rich information about the wines that are offered, although wine, unlike books, music CDs, and DVDs, cannot be sampled on the Web. Maintaining a wine shop on the Web, where customers may purchase wines online, reduces information costs for wineries and their customers, but because wine is a physical product, distribution costs per bottle of wine remain largely unaffected by e-commerce. Nevertheless, the changes in the composition of marketing costs brought about by the Web may be large enough to cause wine sales to increase, to shift a significant part of total wine sales from conventional sales channels to the Web, or to shift the composition of wine consumption.

California wineries were early adopters of e-commerce, providing an opportunity to study the adoption, use, and impact of the technology. Moreover, because e-commerce has not spread evenly through all branches of U.S. agriculture, lessons learned from the wine industry may provide useful insights for entrepreneurs and policymakers concerned with accelerating the uptake of e-commerce in the rest of agribusiness. We decided to conduct an empirical study of the practice of e-commerce by wineries in California. We also included in our study wineries from Australia and Germany so that we can compare e-commerce practices across wine industries. Here, we summarize the key results (see Stricker, 2004, for more information).

Online Winery Survey

We surveyed wineries in California, Australia, and Germany during the third quarter of 2003. We contacted by e-mail 1,690 wineries, asking them to fill out a questionnaire on the Web, and received 268 online responses: 89 from California, 70 from Australia, and 109 from Germany. In addition, we received 100 survey responses for German wineries through telephone interviews.

Wineries in California, Australia, and Germany

The wine industries of the three regions differ with respect to the size composition of their wineries and the significance of direct sales. California wineries (which number about 2,500) are predominantly family owned and operated businesses. A few large wineries, such as E. & J. Gallo Winery, Robert Mondavi Winery, Sebastiani Vineyards & Winery, and Bonny Doon Vineyard, have established

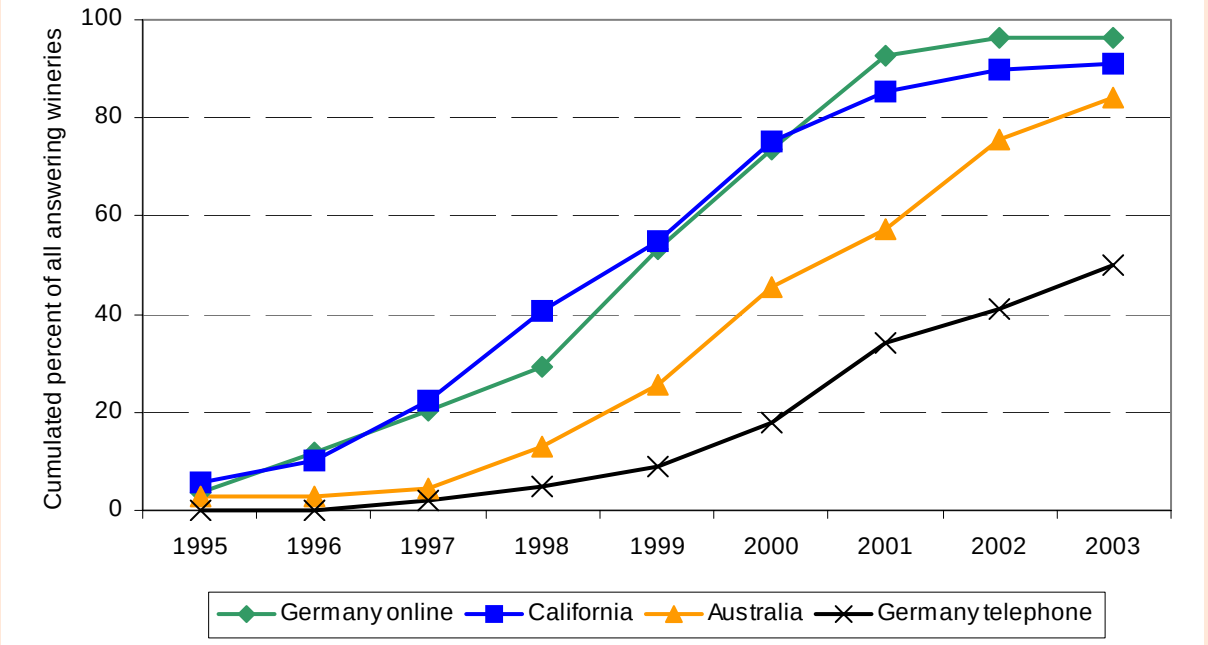

Figure 1. Cumulative share of wineries with Web sites by region, 1995–2003 (n=368).

brands that are well known, and they market most or all of their wine through established retail channels. Many of the smaller wineries produce insufficient quantities to supply large supermarket chains, and they sell much of their wine directly to consumers and restaurants.

The wine industry in Australia has been growing at a rapid pace, and it, like the wine industry in California, is characterized by a small number of larger wineries and a large number of smaller ones. As of 2003, there were 1,625 wine producers in Australia of which only 324 crushed 50 tons or more of grapes. Of the 324 wineries, the smallest 122 jointly crushed less than 1% of all grapes, and the largest 11 winemaking businesses accounted for more than two-thirds (68.6%) of the national grape crush in 2003. The size distribution of wineries in Germany is less skewed because there are hardly any large wineries with well-established brands while there are very many small wineries.

The wine industries in general are reflected in our sample. The respondent wineries from California are mostly family owned and operate large vineyard areas compared to the wineries in Australia and Germany. California wineries also employ the most full-time labor, on average. Median wineries in Australia and Germany are of comparable size – in total as well as in our sample, but the share of family-owned wineries is much smaller in Australia than in Germany.

Web Site Diffusion and Use for Wine Sales and Tourism Promotion

The diffusion of Web sites among wineries in California, as well as in Australia and Germany, has the typical sigmoid shape (Figure 1). Wineries in California created Web sites as soon as the Web began to expand into commerce in 1995. Diffusion was slow until 1997, when only about 20% of the respondent California wineries maintained a Web site of their own. After 1997, it took only four years until more than 80% of the California wineries had established a presence on the Web. After 2001, few additional California wineries joined the ranks of wineries with an online presence. In California, Web site diffusion is nearly complete, with 98% of the respondent wineries operating a Web site.

Most Web sites of California wineries (75%) are designed for online sales. The share of wineries that use their Web sites for selling wine is considerably lower in Australia (59%) and in Germany (42%). Web sites can also be used for promoting a winery's tourism activities, such as winery tours, restaurant and barbecue facilities, or accommodations. Given the low cost of Web space, we were surprised that California wineries made such limited use of the Web

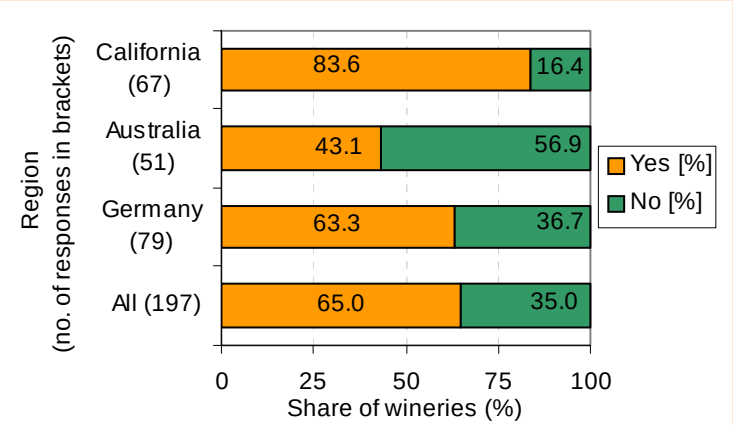

Figure 2. Share of wineries whose Web site has increased direct wine sales.

to promote tourist activities aligned with their wineries. Although nearly two-thirds (61.8%) of California wineries offer winery tours, only 40.4% advertise winery tours on their Web sites, and only about half of the wineries that offer accommodations or picnic facilities make visitors to their Web sites aware of what is available.

Lessons Learned

We can highlight five lessons from our survey on winery e-commerce.

1. Marketing wine on the Web works

More than 80% of California wineries claimed that their Web site had increased their direct wine sales (Figure 2). The percentage of wineries with increased direct wine sales from their Web site is particularly high in California. In Australia and Germany, Web sites boosted direct wine sales for only about half of the wineries surveyed.

The results in Figure 2 should be interpreted with care. If wineries that are particularly successful on the Web are more likely to participate in online surveys than those with indifferent or worse impacts of their Web sites on wine sales, our results put winery e-commerce in a better light than it actually deserves.

2. Winery Web sites stimulate tourism activities

Most wineries in California that promote tourism activities on their Web sites reported that tourism activities have increased (Figure 3). We do not know whether the increase can be fully attributed to the Web site. However, most wineries in Australia and Germany also reported increased tourism activities, and Web site promotion most likely increases tourism activities at a winery.

3. Web site usability and maintenance are key

Web sites must be both functional and easy to use, and visiting them should be a pleasant experience. The designs of winery Web sites varied widely, and we did not attempt to measure the impact of design characteristics on Web site impact. We found, however, a significant relationship between the frequency of Web site maintenance and direct wine sales and tourism activities. If the frequency of Web site maintenance is a reliable indicator of the effort and attention a winery gives to its Web site, this effort seems worthwhile.

4. Sales channel conflicts must be resolved

All wineries that sell wine on the Web also use conventional sales channels, and the Web channel overlaps with conventional channels with regard to the products and customers. Moreover, marketing wine on the Web may constrain pricing of wine in conventional channels because prices posted on a Web site can be so easily monitored. However, only about half (52%) of the California wineries offered the same collections online and offline, and California wines sold on the Web are, on average, $1.45 per bottle more expensive than all wines offered by our respondent wineries. We cannot say whether the higher prices, on average, are caused by the desire to avoid channel conflicts or whether they are the result of high shipping costs in direct wine sales in the United States.

5. Transport costs still limit the size of the market

When e-commerce was an infant industry, pundits foresaw the "death of distance." Direct marketing on the Web is, however, best suited for goods that can be digitized. For these goods, the Internet reduces both transaction and delivery costs. In contrast to words, music, video, and air tickets, wine cannot be digitized and must be shipped in its bulky form. Moreover, delivery of wine must comply with U.S. alcohol laws.

Delivery costs for wine are still high, and the costs of shipping small consignments of wine internationally are prohibitive. In 2003, it cost between $11 and $17 to ship a 12-bottle case of wine within California, and between $13.50 and $54.00 per

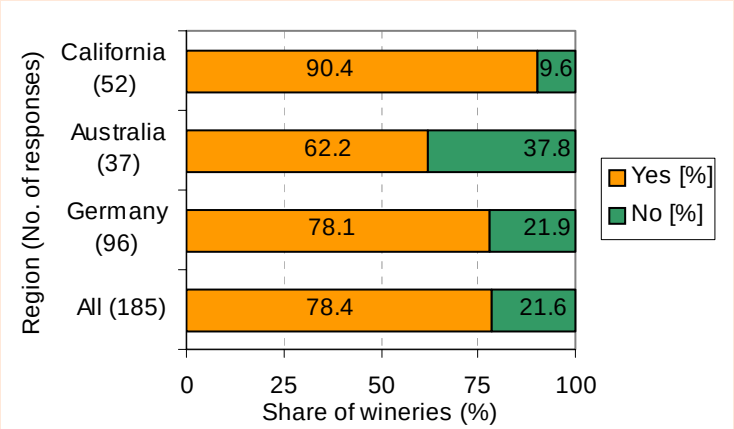

Figure 3. Share of wineries whose Web site has increased the use of tourism activities.

case outside of California. High international shipping costs keep most wineries from accepting orders from abroad. A California winery that once accepted an order from the United Kingdom reported shipping costs of $140 for eight bottles. Compared to bulk shipments, which cost less than $1 per bottle shipped from California to a re-seller in Europe, shipping costs for small consignments typical of direct marketing orders are grossly unattractive. Selling wine on the Web is therefore an activity that continues to be strictly conscribed by distance and is only feasible at the upper end of the price range.

Outlook: Long-tail Opportunities for Wineries

Information technology advances rapidly. The Web site technologies available in 2003, at the time the survey for this study was conducted, are now known as Web 1.0 technology, which is currently being superseded by Web 2.0 technologies. The new technologies enable users to interact with each other by means of blogs, wikis, public Web spaces, and allow monitoring of Web users' behavior in the Web-sphere. The new technologies further extend users' capacities to search for suitable products, and they allow users to share information about products and producers. Examples of the new technologies are book reviews not by editors but by normal readers on Amazon.com and ratings of sellers by buyers on eBay or on Amazon. Similarly, given the opportunity, we would expect wine connoisseurs to make public their opinions of wines that are sold on the Web, thereby complementing wine recommendations and ratings provided by wine gurus and vendors. Publicly accessible information of this kind allows buyers to venture into the long tail of markets that consists of highly diversified market niches that may not be provided by established middlemen (Anderson, 2006).

Since we conducted our survey, the U.S. Supreme Court has struck down state laws that prohibited California wineries from selling wine directly to out-of-state consumers, and many states have now liberated direct interstate wine sales. Whereas these new laws will benefit all California wineries, the new Web technologies will be mostly to the advantage of small boutique wineries.

For More Information

Anderson, C. (2006). *The long tail.* London: Random House Business Books.

Organisation for Economic Co-operation and Development (OECD). (2003). "Measuring the Information Economy 2002." Paris: OECD. Available online: http://www.oecd.org/dataoecd/16/14/1835738.pdf (Accessed 01/31/07).

Stricker, S. (2004). *Wine on the Web.* Kiel, Germany: doctoral dissertation. Available online: http://e-diss.uni-kiel.de/diss_1202/d1202.pdf (Accessed 01/31/07).

Sumner, D.A., Bombrun, H., Alston, J., & Heien, D. (2004). The wine and winegrape industry in North America. Chapter 10 in K. Anderson (Ed.), *Globalization of the world's wine markets.* London: Edward Elgar. Available online: http://aic.ucdavis.edu/research1/Winegrape.pdf (Accessed 01/31/07).

Susanne Stricker (susanne.stricker@googlemail.com) is with the Northern Germany Statistical Office, Kiel, Germany. Rolf Mueller (raem@agric-econ.uni-kiel.de) is Professor and Director, Department of Agricultural Economics, University at Kiel, Germany. Daniel Sumner (dasumner@ucdavis.edu) is Director, University of California Agricultural Issues Center, and Professor, Department of Agricultural and Resource Economics, University of California at Davis, Davis, CA, and a member of the Gianinni Foundation.