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Meat Science 71 (2005) 150–157
MEAT SCIENCE
www.elsevier.com/locate/meatsci

Review

The vital role of science in global policy decision-making: An analysis of past, current, and forecasted trends and issues in global red meat trade and policy

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Abstract

As global populations and economies change, the dynamics of global trade and policy change as well. In analyzing the past trends and projections for global populations, economic developments, animal product production and consumption, global trade policy, and current issues being faced, one can begin to make some predictions or projections as to how the global red meat and poultry infrastructure will change and, more importantly, point to areas where a proactive approach is necessary to shape these changes to meet the most globally beneficial end.

Many issues face the global red meat industry, from food safety to animal disease, and are becoming more and more complicated as consumer knowledge increases and as politics intervene. Internationalized science is key and vital in the future of global trade policy as science can address the more informed consumer in a manner, which reduces anxiety over unknowns.

The role of the industry is to provide the information and knowledge to the consumer necessary to convey the validity of globally accepted standards, which relate to ensuring consumer safety, animal welfare, and provide assurances that these standards are being met within the production sector.

Keywords: Meat; Trade; Global; BSE; Zoonoses

Contents

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0309-1740/$ - see front matter
doi:10.1016/j.meatsci.2005.04.007

1. Introduction

The Center for Strategic and International Studies (CSIS, 2005) has developed a model, which it believes identifies the seven primary factors needed to understand global changes in the next 25–50 years. These seven factors are: (a) population, (b) resource management, (c) technology, (d) knowledge, (e) economic integration, (f) conflict, and (g) governance. Perhaps with the exception of conflict, these factors can be directly related to agriculture and, more specifically, global meat production and dynamics. Populations and resource management deal directly with supply and demand functions for global food while increasing knowledge and technological advances influence governance in the form of global trade policies. Global economic integration has made trade more important than ever before. In analyzing the past trends and projections for global populations, economic developments, animal product production and consumption, global trade policy, and current issues faced, one can begin to make some predictions or projections as to how the global red meat and poultry infrastructure will change and, more importantly, point to areas where a proactive approach is necessary to shape these changes to meet the most globally beneficial end.

2. Global animal product trade: past, present, and future

2.1. Global population

The CSIS (2005) states, "About 8700 people every hour, 146 people every minute, and 2.5 people every second are being added to the global population." From 1950 to the year 2000, the world population roughly doubled from 3 billion to 6.3 billion; a growth of another 2 billion is expected by the year 2025 (Fig. 1; CSIS, 2005).

The important aspect of this growth is not just the fact that it is occurring, but where it is occurring now and is expected to occur in the future. In the vast majority of what are considered developed countries, the population has been decreasing since the 1960s, and this fall is expected to continue. Some 33 countries in the world are expected to have smaller populations in 2025 than now (CSIS, 2005). Some countries that were considered social and political powers have experienced drastic decreases; Russia for instance is estimated to be depopulating at a rate of 2225 people per day. If this decrease is occurring in developed countries, and the global population is expected to increase, then the rise in population is occurring primarily in countries, which are considered undeveloped or developing. It is estimated that Bangladesh, China, India, Nigeria, Pakistan, the United States, Ethiopia, and the Democratic Republic of Congo will account for one half of the world population growth in the next 50 years (Fig. 2; CSIS, 2005).

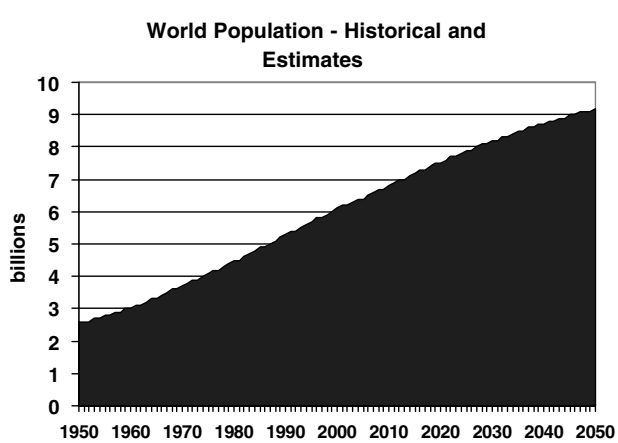

Fig. 1. Global population from 1950 to 2000 estimates of population from 2000 to 2050. CB (2005).

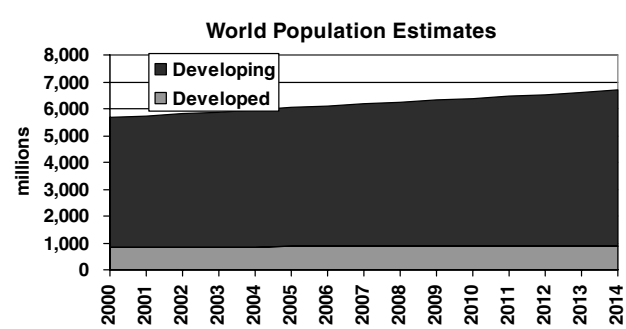

Fig. 2. Census Bureau (CB, 2005) forecasts for global population divided between developing and developed countries. The highest growth is expected to occur in developing countries. Actual population from 2000 to 2003 and estimates from 2003 to 2014; CB (2005).

One trend that can be witnessed is the phenomenon called "hyper-urbanization," the movement of populations towards cities. CSIS (2005) estimates that by 2025, 60% of the world population will be centralized in urban areas and that there will be over 20 cities in the world with populations greater than 10 million.

Perhaps more import than the growth in population is the economic growth being witnessed globally and its impact on overall food consumption. Economic and population growth is estimated to double overall food consumption in the next 30 years. A Brazilian economist stated that even though Brazil is rapidly becoming a global agricultural production power, "If every Brazilian were given 10 US dollars in one day, the country would become overnight a net importer instead of a net exporter" (Smith et al., 2002). With respect to red meat global demand and consumption, population and per capita income are extremely important. Globally, red meat and poultry are considered high value food items, in many cases, luxuries. An increase in meat consumption may not be witnessed due to population growth, but it will almost always be witnessed in the instance of economic growth (Fig. 3).

Global economic growth has not only kept pace with population growth, but it is estimated to outpace population growth in the coming years. Stuart (2005) estimated that, using a base world per capita income as of 1970 and indexing this information, world per capita income increased by 50% from 1970 to 2000, but it will increase another 50% from 2000 to 2010 (Fig. 4). If one correlates economic growth with purchase power (consumption), certain inferences can be drawn. The FAO (2003) estimates that overall meat consumption will increase by 29% from 1999 to 2015 and will increase by 67% from 1999 to 2030, with poultry estimated to have the largest share of this increase in 2030 at 108%; pork, lamb, and beef consumption will increase by 57%, 64%, and 44%, respectively. Once again, the majority of this economic growth is expected in undeveloped or developing countries. In 1999, per capita meat consumption in developed countries was 88 kg per year; FAO estimates that this will increase to 100 kg per year by 2030, an increase of 14% (FAO, 2003). In developing countries, per capita consumption of meat in 1999 was 26 kg per year; FAO estimates that this will increase to 37 kg per year in 2030, an increase of 42% (FAO, 2003). The FAO illustrates that in comparing the US and the European Union beef consumption to beef consumption in the rest of the world from 1961 to 2001, using 1961 in an index of 100, beef consumption in the US and the EU increases less than 10% over the span of 40 years while beef consumption in the rest of the world increases approximately 30% (FAO, 2003).

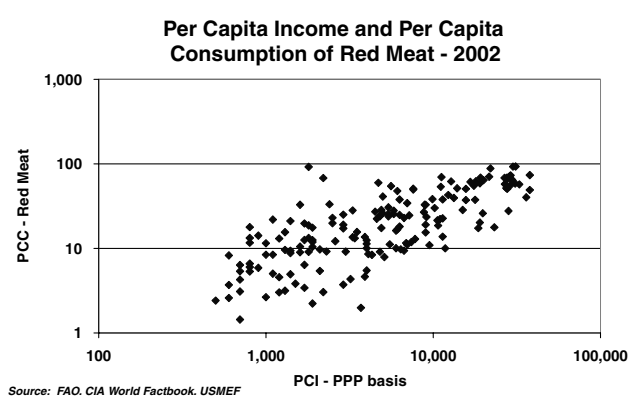

Fig. 3. The relationship between per capita income (on a purchasing-power-parity basis) and per capita consumption of red meat by country. The scatter-plot represents individual countries plotted according to per capita income and per capita red meat consumption. The relationship is positive, showing that countries with higher per capita incomes have higher per capita consumption of red meat. The slope of a simple regression line through these points shows that for every $1000 increase in per capita income, red meat consumption increases by 3.4 kg per capita annually.

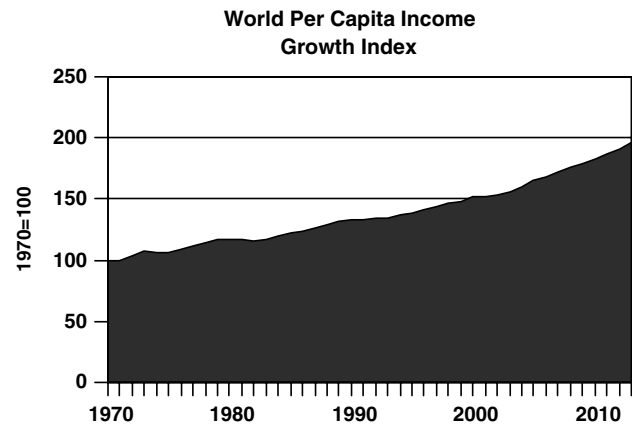

Fig. 4. World per capita growth index. This chart shows the growth of global per capita income by dividing world GDP (actual and estimates) by world populations and estimates. Indexed at 1970 equal to 100; Stuart (2005).

2.2. Global production

CSIS (2005) estimates that the world population will be roughly eight billion by 2005; thus, the world will have to double its food production to meet the nutrition needs of this population. Meat production will increase to meet the needs of the population, but the question is: where will this production increase? With populations expanding, where are the resources available to support intense agricultural production, and more specifically, livestock production? Livestock production is the world's largest user of land, either through direct use or indirect use in the form of feed production (FAO, 2003). Livestock production is expected to continue, driven by increasing meat consumption. From 1961 to 1963, cereals contributed 60% of the total calories in the average consumer's diet while products such as pota-

toes, cassava, and other roots contributed about 10% (FAO, 2003). From 1997 to 1999, while the percentage of total calories contributed to by cereals was relatively unchanged, the percent of potatoes and other roots decreased to 6.2% and animal products were the second-largest contributor at 10.6% (FAO, 2003).

What has been witnessed, and what is projected to continue, is a decrease in livestock production in many traditional producing regions. The European Union's livestock production has continually decreased in the last ten years, and with this decrease in production comes a reliance on imported products (Fig. 5; FAO, 2003). Taking the place of traditional animal protein production powers such as the European Union, are the United States, Australia, Canada, Brazil, China, and India, increasing livestock production in surplus amounts giving these countries greater export market share (FAO, 2003). Changes in production dynamics can be witnessed in many countries and regions. FAO (2003) reports that in the period from 1984/86 to 1997/99, per capita meat consumption in Japan increased from 32.6 kg per year to 41.5 kg per year; in this same time period net imports to Japan quadrupled and self-sufficiency decreased from 84% to 56%. Imports as a percentage of consumption increased not only in Japan but also worldwide for the same time period; globally, imports as a percentage of consumption increased from 9.4% to 12.7% (FAO, 2003).

2.3. Global policy

As global livestock production patterns change along with economies and populations, emphasis on trade and the importance of imports and exports becomes more and more evident. FAO (2003) reports that in the last 50 years, international trade has increased 17 times, which is three times faster than the world economic output. Advances in transportation and communication have contributed significantly to global trade. Additionally, it has become a global goal to move towards a global free trade environment. With the Uruguay Round in 1994, the World Trade Organization (WTO) was formed and has played a primary role in reducing trade-restricting tariffs (Lindsey & Ikenson, 2001). Additionally, the WTO has made a conscious effort to reduce trade-distorting subsidies (domestic support) for industries. The consequence of this effort has been an increase in Technical Barriers to Trade (TBT), many in the form of anti-dumping measures and Sanitary and Phyto-Sanitary Barriers to Trade (SPS) (Fig. 6) (Lindsey & Ikenson, 2001). During the 1990s, there was a 50% increase in the use of anti-dumping measures versus the 1980s; the number of cases against the US alone increased by 41% in the period of 1996 to 2000 versus the period of 1991 to 1995 (Lindsey & Ikenson, 2001). As tariffs have been reduced globally, the number of TBTs has increased; Fig. 6 displays the tariff rate versus the number of anti-dumping measures in force from 1987 to 1999. Aside from anti-dumping measures, issues such as animal disease and food safety concerns have also substituted for tariffs as a trade barrier.

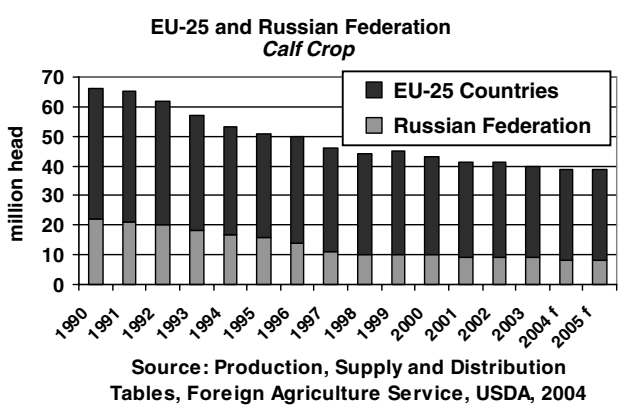

Fig. 5. This chart shows the combined decline in calf crop numbers in the Russian Federation and EU-25 nations. The EU-25 nations and Russian Federation calf crops declined −62% and −30%, respectively. The combined calf crop declined from 66 million head in 1990 to 39 million head estimated in 2005, or −41%.

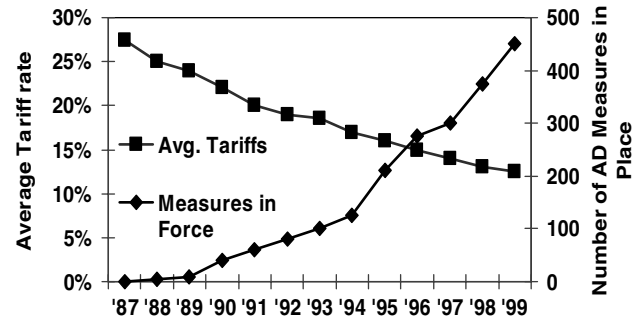

Fig. 6. Average tariffs and antidumping measures (non-traditional users, 1987–1999); Lindsey and Ikenson (2001).

3. Current issues

3.1. Effects of animal and human health concerns

Animal disease has become a topic of increased concern in the last few years. While diseases such as Foot and Mouth disease (FMD) and Newcastle disease have created a great deal of economic loss to afflicted regions, the emergence of zoonotic diseases has drawn the most intense scrutiny (CAST, 2005). Diseases such as bovine spongiform encephalopathy (BSE), highly pathogenic avian influenza (HPAI), monkeypox, West Nile virus, and severe acute respiratory syndrome (SARS) have caused economic losses not only to agriculture, but also to other industries due to travel restrictions and a simple fear of exposure. While impacts to animal agriculture

industries due to these diseases have been significant, the threat of zoonosis to a more well-informed public have forced governments to take fast and effective trade actions when these diseases occur. For example, the six human deaths attributed to the 1997/1998 Hong Kong avian influenza outbreak, the 23 deaths attributed to the avian influenza outbreak in Asia in 2003/2004, and the 35 deaths attributed to the Nipah virus in Bangladesh in 2004 were widely publicized (CAST, 2005). Public fear and worry regarding animal disease issues have affected many countries throughout the world, both economically and politically (CAST, 2005).

3.2. BSE: a case study

BSE has created a tremendous amount of economic damage throughout the globe in the last 20 years. Its discovery in the United Kingdom (UK) in 1986 led to the depopulation of millions of animals. In the UK alone, the Organization for Economic Co-operation and Development (OECD, 2002) reports that costs of the disease in 2002 was estimated at $1,040,685,600 (Oanda, 2005) on an annual basis, with the disease afflicting a total of 19 other European countries and 23 total countries in the world. According to the European Union Commission (2005), the total estimated costs of this disease are astronomical. The zoonotic capabilities of this disease were widely speculated upon, with some estimates being upwards of 10,000 cases of the human form of the disease (vCJD) propagated by consumption of infectious material; however, as of 2004, only about 150 deaths have been linked to vCJD, with the number of cases steadily decreasing (CAST, 2005). The perceived risk and the fear of this disease appear to far out-weigh the actual risk; nevertheless, the perceived risk must be addressed from a political standpoint, and thus, trade disruptions due to this disease have been significant.

Most countries around the world adopted a policy, which banned imports of ruminant and ruminant products from countries afflicted with the disease as a means of providing assurances to the general public that the disease could not gain entry. The World Organization for Animal Health (OIE, 2005) defined criteria for trade based on a BSE-free status which included provisions that the disease had not indigenously occurred and that no risk of exposure could be shown for seven years (OECD, 2002).

The disease has now become more of a global issue due to its discovery in Japan in 2001, in Canada in 2003, and the discovery of a non-indigenous case in the United States in 2003 (OIE, 2005). The impact of the disease on the economies of these three countries has been tremendous. The Canadian beef industry has been severely crippled as Canada exported 47% of its beef production in 2002, prior to BSE, and this decreased to 32% and 37% in 2003 and 2004, respectively, after BSE (FAS, 2005). The banning of Canadian beef by nearly all of its trading partners created a surplus of beef in the Canadian market causing prices for beef and cattle to plummet.

In the United States, economists estimate that the lack of export markets for beef and beef variety meats has resulted in a loss of $175 per head (Cattle-fax, 2004). In 2003, the US value of exports of beef and beef products was estimated to be $4,200,000; reduced by nearly 80% in 2004 due to market closures (Cattle-fax, 2004).

Japan, following traditional policy closely, quickly banned exports from Canada and the United States upon the discoveries. The self-sufficiency rate for beef in Japan in 2002 was 40%; as US beef comprised 45% of beef imports, roughly 27% of the beef consumed in Japan in 2002 was US beef (Ariji, Senda, & Kada, 2004). The ban on US beef not only caused severe economic damage to the US beef industry, it hurt many related industries in Japan; the food service, hotel, restaurant, and import industries within Japan have suffered significant financial setbacks. A study by UFJ Institute determined that the Japanese industry will lose $2,585,961,921 (Oanda, 2005) in revenue due to the ban while the unemployment rate in Japan is expected to increase by 2% (Ariji et al., 2004).

4. Challenges for the future

4.1. Knowledge

The knowledge challenge very simply refers to the unknowns, which exist within the science surrounding many animal disease, food safety, food additive, and residue issues. These unknowns create difficulties in providing definitive instructions for actions to take in situations, which they arise. BSE is an excellent example of how unknowns within science create difficulties for decision-makers within governments and other entities. The disease is still relatively new, by science standards, and extremely difficult to research. The infectious agent for BSE is widely accepted as being a miss-folded protein called a prion, but even this is still a hypothesis (Hueston, 2005). The disease appears to be species-specific. For example, the disease can be spread horizontally through direct contact in sheep and in ungulates, but in cattle, the infectious agent must be consumed. The incubation period for the disease varies by species and, in cattle, is also related to the level of exposure to the infectious agent (Hueston, 2005). Thus, to thoroughly research BSE in cattle, the study must use cattle as the subject, use a sample large enough to legitimize the study, and the study must be long enough to take into account the variance in the incubation times, all of which are extremely expensive and time-consuming.

While research in this area is ongoing, due to the length of the studies, achieving results sometimes takes years.

4.2. Culture

Each culture has its own identity and, in this instance, its own tolerance for risk and unknowns. Still looking at the recent issue with BSE, the differences in risk tolerances and levels of trust in government entities is apparent. Consumers in the United States seem to trust the government to deal with the BSE situation. Consumption of beef in the United States actually increased 9.68% after the BSE discovery in late 2003, with 93% of consumers remaining confident in the safety of US beef (NCBA, 2005). In looking at the cultures within Asia specifically, the levels of trust and tolerance for risk appear to be much lower. A study released for the World Economic Forum by Gallup International Environics entitled the "Voice of the People" surveyed 36,000 citizens in 47 countries across six continents (statistically equal to 22% of the world's population) with the question "Who do you trust?" (CSIS, 2002) Given 17 options ranging from armed services to the WTO to education systems to government, the survey ranked the armed forces as the most trusted, parliament/congress the least trusted, and the WTO and government being ranked eighth and ninth, respectively (Fig. 7) (CSIS, 2002). The survey also reflected that within the category of parliament/congress, almost 50% of survey participants within North America had "a lot" or "some" trust with just under 25% having "little" or "no" trust while only about 30% of survey participant in the Asia/Pacific region had "a lot" or "some trust" and about 60% responded that they had "little" or "no" trust in parliament/congress (Fig. 8). Within the past few years, several incidents within Asia have fueled this distrust and created a cultural need for 100% certainty. Many have questioned the handling of BSE in Japan after the discovery in 2001 and several statements can be found which question the efficacy and transparency in which the case was dealt with. In Southeast Asia, the avian influenza has created distrust, as many believe that a lack of transparency was an issue. It is widely believed that China under-reported cases of SARS in 2003 and that China demonstrated an unwillingness to acknowledge the seriousness of the disease (CSIS, 2003). As a result, SARS spread worldwide, infecting 8096 people and causing 774 deaths (CAST, 2005).

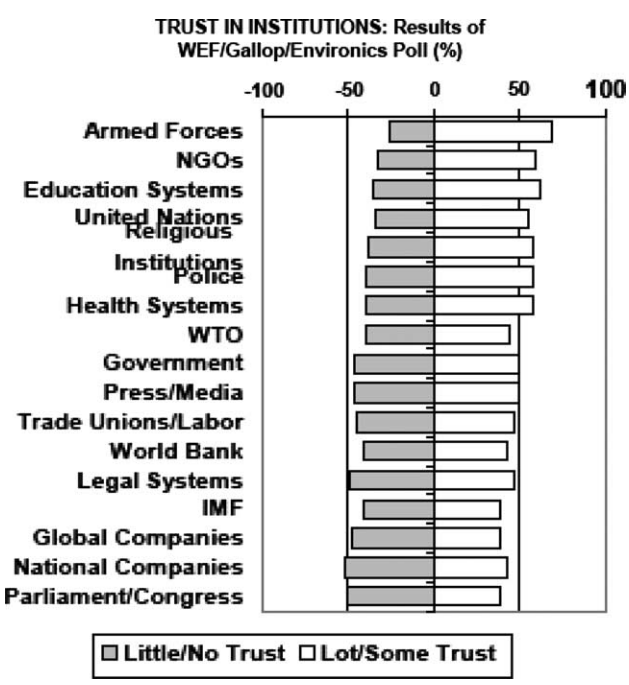

Fig. 7. Results of international opinion survey released for the World Economic Form by Gallup International Environics. Reflects views of 36,000 citizens in 47 countries across six continents. Source: CSIS (2002).

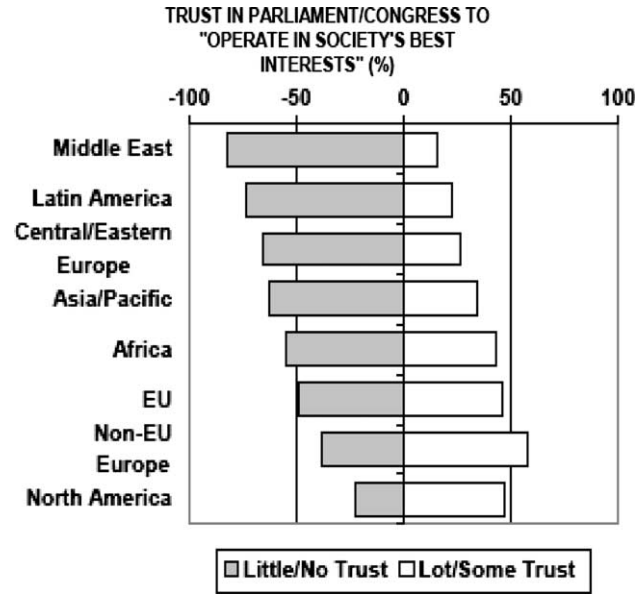

Fig. 8. Results of international opinion survey released for the World Economic Form by Gallup International Environics. Reflects views of 36,000 citizens in 47 countries across six continents. Source: CSIS (2002).

4.3. Politics

The political challenge is tied strongly with the cultural challenge, as a government must act in a way that is viewed as appropriate by its citizens. Thus, if a culture demands 100% certainty and is extremely risk averse, then the political actions and decisions made by the government will tend to reflect this attitude. Many governments have displayed an unwillingness to recognize international guidelines for a variety of issues and have instead attempted to implement individual rules and

regulations. Governments become torn between utilizing what has come to be known as "The Precautionary Principle" instead of utilizing risk analysis to make key decisions. If a culture demands 100% certainty, many governments utilize this principle to give the citizens a perceived sense of achievement and safety versus the realities of risk analysis. A paradox in global policy can be observed by reviewing the differences in how the same country adheres to various OIE guidelines. The OIE has guidelines for trade established for both FMD and BSE; however, while countries may strictly adhere to these guidelines for FMD, the guidelines are widely overlooked by those countries in the case of BSE (Clayton, 2004). As the OIE only provides guidelines, no enforcement measures exist that allow flexibility in interpretation. Organizations such as the OIE and CODEX attempt to implement scientific guidelines for the global community; however, the efficacy of these organizations is challenged by a lack of influence on government decisions in many cases.

In the results of the "Voice of the People" survey, the results clearly demonstrate that respondents had a great deal more trust in organizations such as the United Nations than they had for governments (CSIS, 2002).

5. The new reality

Gaining the trust of the average global consumer should be the goal of the animal product industry, and in order to accomplish this, the industry must realize that the consumer awareness has greatly increased (Seng, 2005). The consumer is much more informed than ever before and with new access to information comes the ability to demand certain qualities or attributes in the products they purchase and consume. Consumers are now more aware of how products end up on retail shelves, but they continue to demand to know more about the products they purchase. The growing trend of "branded products" or "story products" is a result of the demand for more knowledge and a demand for the ability to make decisions based on this knowledge (Seng, 2005). As trade in animal products increases, the need for globally accepted standards and science regarding animal diseases, food ingredients, residues, etc., is obvious.

As discussed previously, the primary population and economic growth appears to be occurring in developing countries; unfortunately, scientific understanding for development of regulated risk minimization is minimal (Clayton, 2005). China has recently implemented a policy, which states that it will maintain "zero-tolerance" for all pathogens, such as *Salmonella* spp. on fresh or frozen red meat and poultry. This policy is not science based and indicates a poor grasp or understanding of modern scientific practices and principles (Clayton, 2005). Prior to 1994, political scientists were necessary when dealing with tariff-based trade issues; trends would indicate that other forms of science such as microbiology and epidemiology will be more important in making key global decisions in the future (Seng, 2005). Consumers have a greater trust in global scientific organizations that are viewed as working toward a public good; this indicates that science is and will continue to be vital in trade and political decision-making.

Implementation of and adherence to globally accepted standards provided by organizations, which can be viewed, as working for the public good is vital and ultimately builds trust with consumers (Clayton, 2005). The role of the industry is to provide the necessary information and knowledge to consumers to convey the validity of globally accepted standards which relate, for instance, to ensuring consumer safety or animal welfare, and provide assurances that these standards are being met within the production sector (Seng, 2005).

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