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# Farm Foundation

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## The Future of Animal Agriculture in North America

An Overview of Issues

*November 2004*



## Introduction

Animal agriculture in North America is undergoing fundamental change. Technology and production economies are moving the industry to fewer and larger production units that produce and market under contract. Concerns about environmental quality are pressuring producers to find new ways to manage air quality and waste. Consumers want not only high quality products, but more details of specific production and processing practices. Animal disease, food safety, worker welfare and animal welfare concerns are forcing the industry to trace animal products from the farm to the plate. These issues are sometimes referred to by the term "social responsibility."

Every facet of the animal food chain—from genetics to retail and food service outlets—is adjusting to the rapid pace of change. Consolidation has left many rural communities without a viable animal agriculture industry. At the same time a few communities have experienced rapid expansion of the industry, with associated social pressures. Small independent producers face fewer market outlets and are struggling to

find a profitable niche in a rapidly changing industry. There is growing concern that some segments of the industry may move off shore to reduce costs.

This white paper articulates the challenges facing animal agriculture, identifies driving forces behind these challenges and their potential consequences, and poses policy questions the industry must address. The fundamental challenges fall into seven key areas:

- Economics of animal production, processing and marketing
- Environmental challenges and opportunities
- Consumer demand
- Food safety, biosecurity and animal health
- Animal welfare
- Community and labor issues
- Global competitiveness and trade

Each challenge will be discussed in turn, but in reality are closely interrelated. This makes it difficult to examine each challenge independently, but all are addressed over the course of the paper.

## Challenge #1

### *Economics of Animal Production, Processing and Marketing*

The production and processing stages of animal agriculture are increasingly dominated by large firms aligned by vertical business arrangements rather than traditional open-access markets. The percent of hogs produced under contract or vertical integration increased from nearly zero in 1980 to almost 90 percent today, similar to the broiler industry transition in the 1960s. Drivers of this change include consumer demand, technology, access to skilled labor and management, capital availability, infrastructure/support services and government regulation.

*Consumer Demand:* Consumers are a primary driving force directing the future of the animal industries. Domestically, consumers are demanding higher quality meat products, having more consistency, variety and convenience. Some are asking for organic, natural and animal friendly products, as well as more information about how meat and poultry is produced and processed. Companies such as McDonald's are increasing concern about social responsibility. How will this affect the economics of production? Rapidly rising incomes in Asia will likely provide the strongest stimulus to animal protein demand. Trade will become an increasingly important determinant of the financial returns in animal production. But livestock production in developing countries and competing exporting countries may limit North American export expansion opportunities.

*Technology:* Technological changes on the production side have accelerated dramatically in the past decade. Advances in nutrition increased production by focusing on the specific needs of the animal during different growth phases. Prophylactic use of antibiotics, other medications and feed additives have made large scale confinement production systems easier to manage, increasing profit potential. While capital-intensive confinement housing facilities have become dominant in poultry, pork and dairy production, opportunities for less expensive production systems are being evaluated by some producers.

In processing and marketing, the dairy industry

has been able to take advantage of new processes that facilitate long distance transportation of fluid milk and extend shelf life of products. New products derived by combining dairy and soya components are challenging traditional markets and regulatory systems.

*Labor and Management:* The cost and availability of labor has a significant impact on the structure and location of animal production and processing, as well as the efficiency of individual operations. The skills required in both production and processing are increasing. The industry faces higher wage and benefit costs, periodic shortages of skilled employees and recurring training costs. Long-term, labor is relatively mobile and can move among firms and regions if the financial incentives exist. This includes importing labor from Mexico and other lower wage countries. Alternatively, production and processing units can be located in regions or countries having low-cost labor readily available.

*Capital:* Access to financing to modernize and expand animal production and processing capacity may present problems for individual firms. Production units that do not use modern technology, are smaller scale, have relatively high costs, and that do not use accepted tools and techniques to manage operating risks may encounter difficulty accessing financing at competitive costs. This is a challenge for small producers.

*Infrastructure:* An aggressive and supportive lending and financing infrastructure can be a major determinant of the growth and development of a particular livestock industry. Feed companies and veterinary services organizations can play critical leadership roles in facilitating the adoption of new technology and encouraging the development of networks and other business alliances to improve efficiency and lower cost.

Transportation is crucial to deliver cost effective inputs and outputs. Infrastructure is critical to the long-term success of any industry, and over time, that infrastructure can be built in a particular area or region if it does not exist. An integrated livestock production-distribution system built to accommodate today's industry may be more efficient and responsive than adaptations of existing infrastructure systems.

*Government Policy/Regulation:* Government policies and regulations impact cost, location and comparative advantage relative to other animal production locations, including other countries. U.S. grain policies have fostered livestock production with low cost feeds. Air and water quality are dominant concerns in livestock production today. Site location decisions, and adoption of appropriate technology to reduce the potential for air and water pollution, have become critical. An industrialized livestock sector will increasingly be treated like manufacturing or any other industry when it comes to environmental regulation. Farm to market traceback is rapidly becoming a requirement for market participants.

*Future Outcomes Without Intervention:* The industry will continue to consolidate and integrate. Much of the technology in the pipeline focuses on reducing costs and assuring product quality, and will be easily adapted by large firms. Environmental issues and regulations will encourage production units and processing facilities to locate in areas where waste and odor issues can be managed more effectively, generally in arid climates away from large population centers. Labor, management and capital will move with the industry. Rising incomes in developing countries will increase overall demand for meat protein. Consumers in developed countries will demand animal products with more specific attributes. How much will be exported to those countries from North America will be affected by their domestic production increases and by competing exporters.

### **Policy Questions**

- Do the determinants of structure vary in different locations?
- Will North America be competitive as a producing region in worldwide markets?
- What are the economic opportunities for small-, medium- and large-scale production units?
- Will social responsibility and food safety concerns result in significant growth in community-based or other small-to-medium scale production systems?
- What sources of capital are available to expand and modernize operations in livestock production, processing and marketing system?

## **Challenge #2**

### *Environmental Concerns and Opportunities*

Environmental concerns and opportunities in animal agriculture encompass a wide range of issues important to various stakeholders. At present, air quality (odors and dust) and water quality are the dominant concerns. Confined Animal Feeding Operation (CAFO) regulations and other EPA requirements limit run-off from animal feedlots and require larger animal producers to meet nutrient application standards when applying animal waste to the land. Many states and provinces have, or are in the process of re-examining current air and water quality regulations.

*Industry Location:* A key determinant of the industry's geographic location will be environmental absorptive capacity. This suggests that the industry is likely to move to those geographic parts of North America and the world with lower population density and the driest climates. But access to water may limit this strategy. Improvements in transportation efficiencies have made most resources highly mobile. Livestock production will not necessarily be located in feed surplus regions. Conflicts over siting livestock facilities and land use will determine where the industry will prosper or decline.

*Industrialization:* An industrialized livestock sector will increasingly be treated like manufacturing or any other industry relative to environmental regulation. In the past, many livestock production units have been exempt from environmental regulation, in part because of the difficulty of regulating and monitoring non-point compared to point sources of pollution, and the small scale of many farms compared to those in manufacturing. With industrialization, the rationale for regulatory exemption becomes less persuasive.

*Nutrient Loading and Odor Control:* Nutrient loading on farm land from waste disposal is a major concern. Evidence suggests that in some major producing areas, nutrient application rates already exceed amounts that can be recycled effectively. Air quality poses a serious scientific challenge in establishing a measurable standard for offensive odors. Separation

from neighbors, bio-covers on waste handling and storage facilities, and the use of best management practices in manure disposal are odor control mechanisms that will increasingly be required.

*Building/Equipment/Waste Handling Technology:* Housing and environment technologies can reduce odor, dust and water pollution. But these technologies increase operating costs, thus favoring larger operations. We can expect continued improvement in air handling and controls, source control of contaminants, and more reliable, economical air cleaning equipment. Improved sensors will enhance control and monitoring of the animal environment in response to climatic changes and animal growth and activity. Remote monitoring of environmental conditions within buildings will become more reliable and affordable, minimizing the risk of failure of the air supply and control systems.

*Recycling and Waste Disposal:* Strategies to solve by-product disposal and environmental problems include the recycling of animal waste, methane recovery, processing waste into productive resources to be used in agricultural and industrial processes, enclosed containment of waste for later disposal, a technological decomposition process to dispose of waste, mitigation of odors through appropriate additives or changes in the feeding regime. An important question is whether technology solutions to waste disposal will also generate income. Will industry-driven changes push technological advances even faster than government regulation? Another option is relocation of the industry to geographic regions of the United States or the world, where there is more environmental absorptive capacity (lower population density, drier climate, fewer surface waterways, less permeable soils), or more willingness to exploit the environment.

*Future Outcomes Without Intervention:* Without intervention, environmental pressures will generate more litigation, social pressures and discontent with the evolution of animal agriculture. The industry may move to geographic areas with lower population density and drier climates. Environmental regulatory agencies may treat animal agriculture like manufacturing or any other industry. Technologies to mitigate environmental concerns may increase operating costs.

Until technological fixes are economically viable, environmental problems will limit the size, location and structure of the livestock industries.

### **Policy Questions**

- What critical environmental regulations will impact business decisions and air and water quality? How do these differ by state, province, region or country?
- What are the implications of CAFO and similar state, provincial and federal regulations on the costs of animal production and processing, and on the competitiveness of various states and countries?
- Do larger farms or smaller farms have an advantage in meeting or complying with environmental regulations?
- What role will food processors and marketing firms play in mitigating impacts of added costs?
- What are the options for and consequences of government intervention to reduce environmental problems?
- How important are environmental regulations compared to other determinants in siting and location decisions for firms in livestock production and processing?
- What technological advances might reduce the impacts of the livestock industries on air and water quality?
- How might animal wastes and by-products be transformed into valuable resources?

## Challenge #3

### *Consumer Demand*

Consumers are a driving force in animal agriculture. Meat consumption is increasing rapidly in developing countries as incomes rise, allowing consumers to substitute animal for plant proteins. Much of this rising demand in developing countries is for domestically produced chicken and lower cost imports, such as chicken parts and other meat cuts not favored in the United States.

In developed countries meat consumption per capita is not growing, but consumer tastes and preferences are changing. This is leading to increased chicken consumption and a decline in beef consumption. Higher incomes have made it possible for consumers in developed countries to purchase value-added, more convenient cuts at higher cost. Higher income consumers also are able to demand meat cuts with additional attributes, including health, food safety and animal welfare considerations. Driving forces in consumer demand include income, market integration, food safety and diet and health.

*Income:* Growth in real per capita income is a major factor influencing demand in both developed and developing countries. In developing countries, income growth leads primarily to improvements in the quality of the diet, including increased meat consumption. In developed countries, consumers move to higher quality cuts and greater value-added/convenience. They also have the income to pay for the extra costs imposed by environmental, animal welfare and food safety/terrorism regulations. Some consumers are willing to pay a premium to assure that livestock products are reared in a socially responsible manner.

*Market integration:* With today's real time communication and mass merchandizing systems, people throughout the world see how other people live, or experience it through travel. This changes desires, expectations, customs and if money is available, eating habits. McDonald's is a worldwide phenomena and Wal-Mart is becoming one. In a smaller sense, so are Smithfield's and Cargill's meat operations. These forces, along with trade agreements, are contributing to increased livestock market integration.

*Food safety:* Ensuring a safe food supply is important to all people. Those in developed countries have the ability to pay the higher costs that may be required. Thus the food safety focal point has been in the United States, the European Union and Japan. The incidence of BSE and *E. coli* contamination has brought demands for adoption of traceability and quality assurance systems to manage the supply chain. The dominance of international food retailers has been a key factor in wide use of such systems, even when not demanded by regulations. The rapid growth of supermarkets in developing countries and trade agreements are driving food safety concerns.

*Diet and health:* Concerns about obesity and other health issues related to animal product consumption can be expected to have both positive and negative effects on consumption of meat, milk and eggs. Perceptions relating to diet and health are affecting which animal products are consumed, the form of the products consumed, and the level of consumption. In the United States, revisions in the Dietary Guidelines and Food Pyramid could lead to some shifts in consumption trends over the next few years.

*Future Outcomes Without Intervention:* As incomes in developing countries increase, foreign demand will increase as a share of domestic production of meat, particularly for pork and chicken. North American animal agriculture will depend more on export markets for demand growth, but will face competition from domestic producers in developing economies and from other exporters. There will be greater risk of market interruption due to animal disease and health considerations, as export markets grow. Potential consequences include: a) incentive to build excess production capacity domestically when markets are disrupted; b) incentives to build excess processing capacity domestically to deal with increased production and/or the potential for interruptions; and c) increased political resistance to freer trade and market integration.

Traceability systems will be imposed by government regulation or the private sector to ensure product safety, prevent agroterrorism, and as a product liability protection strategy. Product certification systems will be imposed by retailers to achieve traceability and ensure specified production practices demanded

by consumer interest groups. Producers may bear much of the brunt of the costs of such systems.

### Policy Questions

- What public policy and business strategy changes are needed to reduce the risk of market interruptions? Trade interruptions due to animal diseases are particularly problematic.
- How should North American producers prepare to serve expanding export markets? Is this strictly a private sector problem or are there public sector support roles?
- What is the appropriate division of responsibility between the public and private sector on issues of traceability and certification?
- What is the balance of industry costs versus benefits associated with addressing issues affecting consumer demand? How does it affect North America's ability to compete internationally? Who should bear those costs?
- How can the industry respond to consumer preferences concerning diet & health?

## Challenge #4

### *Food Safety, Biosecurity and Animal Health*

Animal disease is a major challenge to livestock production and has potential adverse impacts on food security, national economies and public health. Joint efforts between research universities and public agencies have controlled and eradicated many animal diseases. Advances in veterinary medicine, basic research, educational programs and animal housing have contributed to this accomplishment. However, without vigilance and effective surveillance systems, even eradicated diseases can return. Potential terrorist attacks to the food system cannot be excluded. Homeland Security Presidential Directive/HSPD-9 established a national policy to defend agriculture and the food system against terrorist attacks, major disasters and other emergencies. Driving forces in food safety and animal health include questions about feed additives, biotechnology, food borne diseases, links between animal and human diseases and traceability.

*Feed Additives:* Antibiotics are fed to many classes of livestock to decrease morbidity and enhance growth rates. Increasingly, questions are being raised about the linkage between this practice and elevated antibiotic resistance and possible impacts on human health. This has led to banning the practice in some European Union (EU) countries and, the imposition of standards by sectors of the food chain (e.g. McDonald's) in North America. Some groups are linking the feeding of antibiotics to animal health and animal welfare.

*Biotechnology:* One of the first products to impact animal agriculture was bovine somatotropin (bST). More recently, BSE, organic production, animal welfare and antibiotic use have stimulated debate over the roles of emotion, politics and science in the livestock products sector. This is a huge issue in Europe based on the precautionary principle and that there may be risks to human health from consumption of beef hormones. In Canada, the government rejected the use of bST, not on human health issues but for animal health concerns. (This decision may also have been influenced by Canada's dairy production

quota system.) While the product has been deemed safe by the U.S. Food and Drug Administration (FDA), a few consumers pay a premium for milk from non-bST treated cows or simply purchase organically produced milk. The splintering of markets into various niches when events outrun the ability of industry and government to create rational rules. Slowness in federal level regulation development and overregulation may drive some companies out of the sector.

*Food Borne Diseases:* A significant number of diseases are transmitted through food. In the United States alone, 5,000 people die each year from food borne disease, as many as 325,000 require hospitalization, and more than 76 million suffer some sort of food borne illness. Many of today's pathogens of concern (e.g. *E. coli* O157:H7, *Campylobacter*, *Listeria monocytogenes* and salmonella) were not recognized 25 years ago. An unknown number of people in developing and developed countries experience chronic disease from a food supply contaminated by toxic chemicals. These issues are even more pressing for developing countries, as human lives and livelihood (market access) are impacted.

*Links Between Animal and Human Diseases:* Zoonotic diseases—those transferred from animals to humans—are an increasing concern. Avian influenza, TSEs and West Nile virus are a few of concern. The BSE epidemic in the EU significantly impacted trade and consumption of beef. The discovery of BSE in Canada and the United States had a much lower impact on consumption but significantly impacted live cattle and beef trade between the United States, Canada and Japan. Exacerbating these concerns is the potential biosecurity issue of deliberate introduction of pathogens and determining the appropriate private sector strategies and public policies to mitigate potential problems.

*Traceability:* Multiple forces have culminated in worldwide emphasis on food traceability and assurance. A July 2004 report by Farm Foundation's Traceability and Assurance Panel noted that historically, U.S. protocols have not recognized differences in firm size or strategic objectives. The panel emphasized that one traceability protocol may not be appropriate for all segments of the food chain. Emotional responses to food safety issues are increasing. The

importance of traceability is also emphasized in HSPD-9. With limited resources, it is important to direct the best intervention strategies to areas of greatest risks; hence, the science of risk assessment is playing an increasingly important role. Risk assessment may need to be expanded at the farm and food animal level as it has for processed food.

*Future Outcomes Without Intervention:* An overarching concern is the increase in the role of value and emotion rather than science in issues related to animal health and food safety. A catastrophic animal health event could result in a major decline in consumption of animal products and an enormous disruption of national and international trade. There will be evolutionary change in the system based on science. Market participants will continue to have more influence on marketing strategies than government policies and regulations. Minimum safety standards will facilitate viable international trade. Consumer choice will provide outlets for emotional responses, but also opportunities for linking consumer desires to profit in the system.

### Policy Questions

- What needs to be known about emerging and re-emerging zoonotic diseases?
- What are the long-term public health impacts of food borne pathogens in domestic and foreign markets?
- Will the market or the government determine the role of antibiotic feeding in livestock production?
- How can food traceability and assurance programs be customized for each segment of the market?
- Will science or emotion drive regulations?

## Challenge #5

### *Animal Welfare*

Animal welfare is a significant public policy issue. Less than 20 years ago there was no U.S. legislation relating to agricultural animal welfare. In the last six or seven years, 50 to 60 such bills have been introduced in Congress annually, with even greater proliferation at the state level. The recent ban of gestation crates for sow housing in Florida and, standards specific to livestock and poultry production practices in New Jersey were promulgated under anti-cruelty statutes. Large scale industrial farming systems are seen by some as mass exploitation of animals and not conducive to ensuring animal welfare. Consumers are becoming increasingly concerned about animal welfare and food safety. People want more information on how and where their food is raised. While farmers and ranchers still enjoy positive public opinion, confined feeding operations and other large-scale agriculture operations are not so fortunate.

*Market Responses:* Major food retail organizations are working to develop means for third-party verification of worker training and/or compliance with best practices as cited in animal care guidelines. Several major food chains (most notably McDonald's) have adopted animal welfare guidelines, in response to current or perceived future customer concerns. The Food Marketing Institute (FMI) and the National Council of Chain Restaurants (NCCR) have specified needed animal welfare protections, with the goal of developing consistent expectations across the U.S. food system; implementing practicable and attainable animal welfare guidelines based on science; establishing a measurable verification process; and improving communications across the supply chain.

*Science-based guidelines:* Several groups have tried to develop science-based animal welfare guidelines. This effort is problematic because each set of standards, while following scientific methods, is ultimately value-based. Three basic views of animal welfare have emerged: biological functioning; affective states of animals, i.e. emotion; and ability to lead a relatively normal life. Each value-based set of guidelines has generated some improvements, but science does not provide a purely objective way to

weight the different views. Clarity is needed on the interplay of the scientific and value-related components.

*Future Outcomes Without Intervention:* A proliferation of retail- and governmental-based guidelines or policies, especially if they are inconsistent, could hinder animal agriculture in North America. Increased consumer interest in animal welfare will feed into additional concerns associated with industrial animal production. The result could be increased pressure on large scale animal production and negative impacts on economic development in key states. Synergistic pressure on large-scale animal production will result when poor handling of animal welfare issues exacerbates other issues, such as environmental concerns, food safety, emerging infectious diseases and rural community economics and sociologic concerns.

### **Policy Questions**

- How will North America balance government regulatory systems for animal welfare with producer/processor/retail guidelines to prevent fragmentation of the industry?
- Will universities, governments and the food system provide the resources necessary for research on animal welfare that undergirds governmental policy and industry decisions?
- How will increased pressure on large-scale animal agriculture that results from environmental, food safety and rural economic and sociologic concerns affect the emotion surrounding animal welfare?
- Will the EU push to include animal welfare in WTO discussions prevail? To date, North America and developing countries have prevented the issue from becoming a major component in trade discussions. Will OIE, SPS and other agreements be appropriately brought in to the negotiations to provide a broader perspective?

## Challenge #6

### *Community and Labor Issues*

Livestock production is a fundamental value-added activity in the agricultural sector. Basic commodities are converted into higher-value products, creating additional revenue for growers and additional jobs for those industries that provide inputs or buy livestock products. The profitability and viability of the livestock industry is important to many rural communities in North America. The economic health of the industry impacts employment, incomes in primary and related industries, and tax revenues. The industry can also create community conflicts from siting decisions and the diverse ethnicity of its employees. Industry labor issues include worker availability, worker safety, working conditions and wages and benefits.

*Community Economic Impacts:* The contribution of viable and profitable livestock industries to the economic performance of many rural communities cannot be overstated. Not only does livestock production, processing and distribution create jobs directly in their respective sectors, firms in these industries buy products and services to support their business activities, thus creating additional jobs and economic activity. The employment and income multipliers for livestock production generate state and local tax revenues that support public services, particularly schools. However, large-scale production and processing facilities may also bring into communities new populations, which increase demands for services.

*Community Conflicts:* Community conflicts may also exist. Some may result from the potential of odor, dust and water pollution that often results from livestock production and processing facilities. Conflicts over facility location or siting decisions may occur, and concerns about surface or groundwater contamination may impact a larger group of community residents than just those located near the production or processing site. If employees from outside the community or from a different ethnic background are attracted to the generally lower-skilled jobs in the livestock industries, conflicts may develop in the local schools and other community-based organizations.

*Labor Availability:* The cost and availability of labor can have a significant impact on the structure and location of livestock production and processing, as well as on the efficiency of individual farms. Over time, labor is relatively mobile and moves among firms and regions if the financial rewards provide incentives to do so. Availability of labor may be a problem due to difficult working conditions and generally modest wage rates in the livestock industries. But the skills required in both production and processing are increasing. The industry may face higher wage and benefit costs, and recurring training costs. In contrast to the past, the livestock industries may be sourcing from the mainstream of the labor market. However, increasing use of technology, including robotic milking systems, may reduce labor pressures and costs with economics that may be favorable to smaller operations in some cases.

*Worker Safety:* U.S. Occupational Safety and Health Administration (OSHA) regulations establish the duties of employers and employees to provide a workplace that is free from recognized hazards that cause death or serious harm to employees. These regulatory requirements not only provide for sanctions and fines if they are violated, but are likely to be a factor in negligence lawsuits stemming from workplace accidents in any business where the regulations have been ignored.

Employee hazards and concerns include entry into potentially hazardous confined spaces, such as manure storage pits in livestock production. Another serious issue is the potential of chronic, long-term health problems from continually working in confinement facilities that have a high concentration of ammonia and other gases. The increase in animal welfare regulations may have benefits that reduce these hazards. In processing operations, ergonomic injury, dangers from knives and heavy loads are of concern.

Similar to environmental regulation, the livestock industries are likely to be less exempt in the future from general labor regulations. Production agriculture is one of the more hazardous occupations in terms of worker safety, yet because of the small scale of most firms, much of the industry is not regulated. With increased scale and because of more complexity in the workplace, industrialized livestock will likely encounter increased regulation concerning the work

and working conditions of its employees. This will increase costs, with small-scale units encountering more difficulties and higher costs of compliance.

*Future Outcomes Without Intervention:* As animal agriculture continues to consolidate, it will leave many rural communities. Other communities will gain significant economic activity from animal agriculture, but may also experience conflicts related to environmental concerns and changing demographics. The labor force from animal production and processing may not come from the local community, but may be immigrant labor from other countries. Agricultural production and processing is a relatively dangerous occupation, and as the industry grows, consolidates and industrializes, it will need to deal with a variety of worker health and safety issues.

### Policy Questions

- What are the direct and indirect benefits (income, employment, etc.), and costs (pollution, health, safety, etc) of maintaining or growing the livestock industry in a community, and to whom will these accrue?
- Will we have diversified grain/livestock production systems or specialized livestock production systems in the future, and where will those operations be located?
- How will the community conflict issues that are generated by livestock location/siting decisions be resolved?
- What are the employee skill sets needed by the various participants in the livestock production, processing and distribution industries, and how might prospective employees be attracted to work in those industries?
- How will the safety, health and worker condition challenges in livestock production and processing be addressed?

## Challenge #7:

### *Global Competitiveness and Trade*

Worldwide, meat demand is increasing rapidly, particularly in developing countries. Market forces and recent trade agreements have increased global trade of animals and animal products. But modern technologies utilized for mass production of livestock and poultry are readily transferable to developing economies. While in the short run countries may choose to satisfy animal production shortfalls from imports, their long-run goal may be to produce domestically by importing feed grains and soybeans.

Animal agriculture production is becoming more highly integrated and concentrated, with leading integrators often having operations in more than a single country. These firms have flexibility to shift sources of supply and markets. Further, the global animal agriculture system is vulnerable to disruptive shocks and political pressures. For example, in the decade since NAFTA, the North American cattle and swine industries became more integrated, with animals and products moving quite freely across the borders. However, recent disease-related border closings have disrupted this integration, produced price/market aberrations, and reduced industry support for open trade policies.

Drivers of change for global competitiveness and trade include income growth, animal disease, health concerns and regulation, vertical integration and supply chain management, global competition and market integration.

*Incomes:* Experience has repeatedly shown that increases in incomes in developing countries will lead to large increases in the demand for meat, milk and eggs. While the preferences may vary from country to country, the overall thrust is anticipated to continue.

*Animal Diseases, Health Concerns and Regulation:* Animal disease and health concerns have brought about labeling, certification and traceability requirements by both the public and private sector, all of which impose higher costs, particularly in developed countries. But the spread of supermarkets into developing countries creates the potential for comparable

requirements in these countries. These cost increases will be borne primarily by producers in developed and developing countries.

*Vertical Integration and Supply Chain Management:*

The forces of vertical integration have existed in poultry since the 1950s and have intensified over time, encompassing a larger number of livestock and crop subsectors. Integration is credited with having put poultry in a more competitive position relative to other meats. Arguably, it is having the same effect in pork.

*Global Competition:* The combined forces of technology transfer with plentiful production of feed grains and oilseeds, particularly in South America, create a challenge for U.S. producers to remain competitive. Continued research and extension of findings by publicly-supported universities and government agencies will be necessary to retain competitiveness in North America.

*Market Integration:* Until recently, the overall trend in livestock has been in the direction of increased integration of the market into that of other countries. This has been particularly the case among the United States, Canada and Mexico under NAFTA. However, the recent disruptive border closing suggests that the forces favoring greater market integration are more uncertain.

*Future Outcomes Without Intervention:* There is significant potential for creation of more barriers to trade and less market integration. Without new and more effective methods for dealing with sanitary and phytosanitary trade issues, the potential for export market disruption is ever present.

Regulations induced by animal diseases, health concerns, environmental externalities, and animal welfare considerations may lead to sufficiently higher costs in developed countries that these producers/growers could be placed at a competitive disadvantage. However, the increasing spread of international supermarkets into developing countries will create accompanying requirements to meet their standards for domestic producers and processors in those countries.

**Policy Questions**

- How does the North American animal agriculture sector keep markets open if a new animal disease/health threat develops or other major adverse development occurs?
- What contingency plans exist and/or need to be developed?
- What public and/or private institutions are needed to deal with issues that cut across subsectors of animal agriculture?
- What public and/or private institutions are needed to deal with issues that transcend countries?
- How does North American animal agriculture remain competitive in the face of regulatory demands that are increasing, but differ across countries? What public and/or private action is needed to bolster North American competitiveness?
- What strategies can facilitate informed discussion and resolution of problems, thus reducing divisiveness within animal agriculture so that consensus positions can be developed to address key problem areas?

## Summary

Animal agriculture in North America is at a cross-road, facing conflicting signals and forces. Demand for meat protein is on the rise in much of the world, yet it is not clear that the North American animal industry will be able to supply this increased demand. Technologies have reduced production, processing and marketing costs, yet many segments of the animal food chain operate on smaller and smaller margins. Industrialization and consolidation of the industry may reduce some costs and facilitate traceability and product quality control, but may cause the industry to lose some of its current regulatory flexibility for meeting environmental and worker safety standards. At the same time emerging consumer demand in and supermarket entry into developing countries may provide more incentives for domestic production within those countries, as well as increasing import competition.

An additional important issue that cuts across all areas is the role of the U.S. Land Grant university. Historically, the Land Grant university, through various departments and the three-part mission of discovery, learning and engagement, has provided leadership in dealing with issues related to animal agriculture. Alarming, federal, state, local and industry support of teaching, research and extension programs is decreasing. A key to answering the following critical questions is a healthy Land Grant system. The need is exacerbated by the complexity of the issues.

Interdisciplinary programs that transcend departments and universities are absolutely required if animal agriculture is to remain economically, environmentally, ecologically, and socially sustainable in North America. Collaboration across borders to provide coverage without unnecessary duplication will be critical to successful programs in the future.

The industry is facing critical questions:

- How can small producers compete?
- What are the opportunities for less industrialized livestock production, processing, and distribution systems?

- Do larger farms or smaller farms have an advantage in meeting future environmental regulations or other concerns related to social responsibility?
- What technological advances might reduce the impacts of animal agriculture on air and water quality, or turn waste into marketable products?
- What is the appropriate division of responsibility between the public and private sectors on issues of traceability and certification?
- What is the future for antibiotic feeding in livestock production? Who will decide?
- What are the long-term public health impacts of food borne pathogens in both the North American and foreign markets?
- Will the market or the government set animal welfare standards?
- Can modern animal agriculture be a positive economic and social force in rural communities? Will government policy or industry initiatives evolve to promote economic viability of small to medium sized livestock farms?
- Will North American animal agriculture be able to attract the capital, management and skilled labor needed for the future?
- Will the animal food chain continue to integrate across borders or will trade frictions reverse recent trends?
- Can the animal agriculture industry in North America remain competitive in a global economy?

In summary, what specific private sector initiatives and public sector policies are needed to maintain a viable animal agriculture industry in North America?

While we may not be able to answer these questions with complete certainty, industry, government and academic leaders have considerable knowledge of the industry and these issues. It is time to integrate this knowledge, examine these critical questions and help prepare the industry for the future.

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**Farm Foundation**  
1211 W. 22nd Street, Suite 216  
Oak Brook, IL 50623  
(630) 571-9393 Fax (630) 571-9580  
*[www.farmfoundation.org](http://www.farmfoundation.org)*