

U.S. AGRICULTURE & TRANSPORTATION: CHALLENGES & OPPORTUNITIES FOR THE 21ST CENTURY

Introduction

Poised at the beginning of the 21st century, economic expansion, long term structural change, and a wave of technological innovation – both in agriculture and the general economy – are combining to dramatically alter agriculture and rural America in profound ways. At the same time, policy makers and decision makers in the transportation arena face important investment decisions about replacing, overhauling, or even jettisoning parts of an aging transportation infrastructure. Freight transportation users are also concerned about service trends from several modes of transportation, notwithstanding what the future may bring. Clearly, the decisions that are made today and tomorrow, by individuals, businesses, advocacy and planning groups, state, local and Federal governments, on key transportation and infrastructure issues will have major impacts on the continued economic growth and development of U.S. agriculture and rural America in the 21st century.

The first National Agricultural Transportation Summit was held in July 1998, in the midst of trying times for many agricultural shippers, particularly those who ship by rail in the Western United States. Starting in the second half of 1997, a cascading service failure on several western railroads snarled traffic and brought freight shipments in some areas to a standstill. While railroad shippers in all industries were affected, agricultural shippers were particularly adversely affected. Grain began piling up on the ground, with lack of adequate storage at local elevators. Many agricultural shippers experienced delays in railcar deliveries of 30 days or more, while some agricultural shippers in the West did not receive a railcar for three months.

If there was one thing positive about the rail crisis in late 1997, it was that the rail crisis acted as a catalyst to prompt a much closer look at the role of transportation in servicing agriculture. The rail crisis was a major influence in organizing the first summit, and in developing an agenda based on outreach and research – to identify the long term agricultural trends, transportation needs, and the strategic issues and questions that will face a 21st century agriculture.

Leading up to and since the first transportation summit, USDA initiated several efforts designed to help identify and articulate agriculture's transportation needs, based on trends expected to occur in both the agriculture and transportation sectors. Efforts included focus group sessions, listening sessions, research conducted by and for USDA, constituent outreach, and forging closer, cooperative relationships with other Federal agencies chiefly responsible for monitoring the Nation's transportation network. These efforts have generated a much better understanding of the opportunities and challenges likely to shape U.S. agriculture and rural America, and have illuminated the critical role that transportation plays in promoting a competitive agriculture and vibrant rural economy.

This second National Agricultural Transportation Summit continues the public dialogue begun in 1998. It is by no means the final word on these important issues and questions. USDA views this second summit as an opportunity to present our assessment of the strategic issues and questions that will face agriculture, and to suggest how those issues and questions might be addressed. We welcome reactions and additional input from all interested parties at this summit (and from visitors to our web site on the summit) so that all levels of government, industry, and the public can move forward to provide innovative answers to address the challenges raised by these strategic questions. Our efforts to date have focused on the following:

- Understanding the forces likely to shape U.S. agriculture through the coming two decades of the new millennium;
- Understanding developments and issues facing the transportation sector – both in service and infrastructure;
- Identifying those areas where the needs of agriculture may not be satisfied by the expected changes and developments in transportation service and infrastructure; and
- Attempting to understand how important those gaps between agriculture's needs and transportation's services may be – will they frustrate agriculture's and rural America's growth, or can they be resolved through policy, communication, market incentives, or regulatory actions?

Organization of the Report

We begin with a description of the forces most likely to shape the overall direction of U.S. agriculture, rural America, and forces exerting themselves on the transportation system through innovations in today's businesses. With regard to these latter forces – through the transportation and business

climate – we rely heavily on work done by the Department of Transportation (DOT) through its own assessment, research, and outreach to transportation stakeholders – industry groups, local governments, and the public. Two sources of information from DOT – *The Changing Face of Transportation* and DOT’s Marine Transportation System Task Force Report, *An Assessment of the U.S. Marine Transportation System* – provided many of the transportation perspectives for this report. These documents facilitated our ability to develop the important linkages between U.S. agriculture and rural America, its transportation need, and the transportation services of today as well as those anticipated for the future. The forces we describe include brief discussions explaining current and expected trends, to underscore why we believe these will have important effects on U.S. agriculture.

We then develop a set of implications of these forces for agriculture and the ability of the transportation system to accommodate and support 21st century U.S. agriculture. Finally, we conclude with a set of strategic questions and issues that we believe should be addressed to ensure that transportation continues to be one of agriculture’s strongest assets as a major competitor in the world market, and not an impediment to its growth.

We encourage feedback from the participants at this summit – as our understanding of events and trends increases, our understanding of strategic issues will also evolve – becoming more focused and more effective at encouraging changes to promote an efficient agricultural-transportation relationship that promotes growth and vitality in rural America.

21ST CENTURY U.S. AGRICULTURE: CHALLENGES & OPPORTUNITIES

Research conducted by and for USDA suggests a promising and challenging future for U.S. agriculture and residents and businesses in rural America. Realizing the potential of this promising future, of course, depends on a number of factors – not the least of which are the accuracy of forecasts about population and economic growth, but also on technological innovations and their rate of adoption and acceptance by businesses and consumers.

But agriculture's success in the future also depends heavily on the infrastructure that links the farm to final user – the marketing, distribution and **transportation** sectors – that can make the difference between expanding a customer base or losing customers to competitors. Economic and agricultural policy can also make a difference – by providing a climate that encourages and supports growth and innovation and rewards risk, or by stunting opportunities for growth through regulations – unintentionally or otherwise disguised – to protect against the inevitable redistribution consequences of change.

Economic Trends, Technology, and Population Growth

Population Growth – Most experts believe that world population, now at almost 6 billion people, will grow to 8.5 billion over the next 25 years. Most of that growth will take place in developing economies – expected to account for over 97 percent of the population growth, and mostly in Asia (except Japan) and in Africa. World population growth alone – a major driver for food demand – will increase agricultural trade, particularly if developing countries are unable to become food self-sufficient in the short term; thus, that food demand will need to be met by imports.

In the United States, current projections indicate a 17.5 percent growth in population from 2000 to 2020, to a total of nearly 315 million people. Of the present 268 million residents in the United States, half of the residents reside along the East and West coasts, which make up just 11 percent of the Nation's landmass. Future population growth is likely to be highest in the West (35 percent), while the Southeast could see 21 percent more residents by 2020. Population concentrated along the coasts means interior-produced agricultural commodities must be moved longer distances to reach consumers.

Economic Growth – Most experts are generally optimistic about projections of economic growth over the coming decades. Their projections call for world

annual income growth of about 2.5 percent, with more impressive gains in developing countries of just over 4 percent. In developing countries this is critical, since income is the single largest constraint on adequate diets, both in terms of quantity and quality. In part, these projections are based on expectations that many countries are finally buying into the realization that a market-driven economy, including trade, can generate wealth, and that market forces are superior to strict regulations. Countries like Russia and China will set examples for smaller economies struggling to enter the potential prosperity afforded by global trade opportunities.

As economic growth increases in developing countries, there will be a shift from importing bulk grains to more value-added agricultural commodities to satisfy protein requirements. While bulk grain will still comprise a significant share of world agricultural trade, exports of grain will also come increasingly in the form of value-added commodities such as meats, or more processed products, like flour.

The United States economy is undergoing a major transformation from the world's largest manufacturing economy to the world's largest service economy – a transformation that has helped fueled the longest peacetime expansion in the U.S. economy. Service-producing sectors now account for about two-thirds of the nations' output and three-fourths of all jobs. As the United States shifts from mass manufacturing and distribution to custom manufacturing and retailing, there will be corresponding growth in mail-order houses and overnight delivery services. There will be more freight movements, but in smaller volumes and in greater frequency, and higher in value than freight movements 25 years ago.

Tomorrow's market will be "pull-driven" rather than the traditional "push-driven" market of a mass manufacturing economy. In a push-driven market, huge volumes of homogeneous products are manufactured, and inventory management is used to balance supply with demand. Manufacturing, distribution, retailing and transportation are organized to support mass production and sales. A "pull-driven" market, on the other hand, relies on just-in-time production and delivery, with low inventories. Retailers, distributors, manufacturers, suppliers, and shippers track customer demand daily through point of sale and electronic purchase order data tracking. Goods are "pulled" through the supply chain, and parts and final products are not produced until an order is placed, giving rise to the "just-in-time" manufacturing and retailing systems.

The keys to making a pull-driven market work are information, communication, and **transportation** networks that are fast, accurate, low-cost – in other words, efficient – with the result being lower-priced goods and

services, facilitated by cheaper transportation. In addition, production technological innovations leading to developments in trait-specific production of agricultural commodities, similar to the developments in e-commerce, will surely bring changes to agriculture every bit as dramatic as the industrial transformation that swept agriculture in the 1950s to today's commercial sector.

The pressures to compete for access to distant markets will be driven by an increasing use of electronic technology that enables transactions to take place seamlessly over long distances – even across the globe. An important benefit of electronic commerce to farm operations is the ability to directly access customers anywhere, thereby increasing their share of the consumer dollar – *provided they have access to overnight or express delivery services* that can move products to consumers quickly, and preserve the quality of the product en route. Local farmers who can raise the capital to start a locally produced specialty pasta business, for example, may be able to succeed in niche marketing if the transportation services are available.

Technological Innovations – A technology renaissance is emerging, throughout the world's industrial sectors. E-commerce is already making possible transfers of capital and information with the stroke of a keyboard. Navigational systems, including global positioning systems (GPS), will enable freight movement to be tracked anywhere, at any time with precision, facilitating coordination of delivery, and eliminating costly downtime from delays and deterioration. Information technology will enable transactions to become seamless and nearly instantaneous. Innovations in crop and livestock production technology will also change production processes, to enable products to be tailored to exact specifications of the customer.

Intelligent transportation systems (ITS), comprising a broad range of technologies, will help improve the efficiency and effectiveness of transportation. Electronic surveillance, communications, and traffic analysis and control technologies provide information and guidance to transportation system users and help transportation agencies monitor, route, control, and disseminate information.

GPS is already in use in numerous transportation modes, and is used for both commercial and general aviation purposes. Rather than reporting locations within distances of say, 100 meters, GPS allows positions to be reported within a distance of just 10 meters.

After years of promise, biotechnology advances are now being made which have the potential to greatly change the production and marketing system for agricultural products in the United States. Even though the biotechnology

revolution is still in its infancy, significant changes in marketing, handling, and transportation are likely from continued adoption of “trait-specific” crops by producers and end users. More broadly, the production of trait-specific commodities, such as high lysine corn, will also effect changes in marketing, distribution and transportation. At the same time, acceptance of bio-engineered crops or even some trait-specific crops remains a controversial issue with some consumers --not only in the United States, but elsewhere in the world.

Transportation Implications -- The innovations in production and businesses transactions cannot be fully realized without the ability to physically move the goods and commodities from production sites to final customers. And that is one of the biggest challenges facing the transportation sector today – improving the efficiency and quality of freight movement both within the United States and throughout the globe. The gap between technological developments in production and consumer demands will become more obvious – and that means physical movement of goods will be critical to realizing the gains from improved technology in production and e-commerce.

Both the trend toward tailored crop production, and the hesitancy about its acceptance into mainstream food channels have similar marketing implications for agriculture, from farm to plate: a need for labeling and segregation. For the value of a bio-engineered product or trait-specific product to be realized and maintained by the producer, crop identity must be maintained throughout the production and marketing chain. And to accommodate concerns by consumers while acceptance is still an issue, labeling and segregation can address those concerns, providing consumers with the choice to purchase or avoid such products.

Several factors will drive the current marketing and transportation system to change in order to accommodate the emerging trends toward tailoring commodities for specific end uses. Such factors include ease of trait detection – whether a trait is observable or not makes a difference in how it can be segregated and marketed in the system; and precision processing to capture valuable traits in end products or even intermediate products, such as feed. Measurement and monitoring technology will also allow users to measure the traits that are desired, as well as those that are not wanted.

Demand-side factors influencing segregation and labeling include consumer lifestyle changes and a greater demand for information. Advances in the capability of information technology offer potential for greater traceability within commodity production and marketing systems, such as precision agriculture, the Internet, and e-commerce. These include a desire by

consumers for greater traceability of food supplies for safety and lifestyle preferences, and an emerging social demand for documentation of farm production practices as a necessary component of information for consumers (e.g., organically-produced products). Finally, global consolidation of food retailers is a factor that may lead to tighter coordination. As food retailers become larger, the demand for traceability is likely to increase, since even a small food safety problem can have large consequences for a global retailer.

Even as the demand for labeling and segregation increases, challenges are posed for the existing production, handling, and transportation system. The market structure that rewards a trait-specific agriculture and accommodates consumer concerns through segregation and labeling is considerably different from our present system – which is designed to provide maximum value through a low-cost delivery of massive amounts of homogeneous commodities, especially grains and oilseeds. The volume of homogeneous commodity grain will likely be reduced as grains with specialized traits are used in markets previously served by bulk commodity grain. Production may shift geographically, to capture benefits of producing trait-specific commodities, or to lower the overall cost of segregating trait-specific commodities from homogeneous commodities.

Transportation Implications –The implication for the marketing system of the shift to trait-specific commodities requiring segregation and labeling include changes in collection, storage, transportation, and handling at all levels, from farm to final user. Current high volume movements of homogeneous commodities rely on truck, rail, and barge as the primary modes of transport. Movements toward lower volumes of trait-specific commodities will likely favor trucks as the primary mode of transport, and perhaps partial unit trains. Movements will also be in smaller volumes, and move more frequently, minimizing the need for large inventories (except perhaps on-farm storage). Containers will increase their share of freight movement on all modes.

Depending on how rapid the shift to trait-specific production, there could be reduced demand for storage at terminal elevators (or greater demand for segregated storage at elevators) and higher utilization of on-farm storage; less use of barges to move bulk commodities, but higher use of trucks to serve the “just in time” inventory needs of end users. Terminal elevators would need to be able to segregate commodities, and on-farm storage may increase. Barge transportation could adapt to handle multiple channels, perhaps through the use of containers (facilitating “invisible” movements), and trucking capacity would need to increase. Increased trucking capacity will, in turn, increase the pressures to build and maintain a highway network capable of handling increased truck traffic.

Regardless of the pace of moving toward smaller or containerized shipments to handle trait-specific commodities, the need for freight movement of bulk commodities will continue to be strong in the short term. Thus, as freight movement shifts from dominance by bulk to more containerized shipment, there are likely to be economic adjustments that will challenge both agriculture and the transportation infrastructure system.

Domestic and Global Agricultural Policy

Domestic Policy – The United States has had 7 decades of experience in designing and molding domestic agricultural policy. The current policy environment facing U.S. agriculture is likely to continue for the foreseeable future, for a number of reasons. First, projections for world population growth and economic development support expectations for policy that will support agriculture’s ability to meet the growing demands for food through increased trade. It is unlikely that the U.S. will return to a policy environment that could hinder agriculture’s ability to take full advantage of significant opportunities to expand markets through trade. As a practical matter, even with modest growth in U.S. population, the U.S. cannot absorb all of its production – trade is the only alternative.

The 1996 Federal Agricultural Improvement and Reform Act (farm bill) is our most recent statement on U.S. agricultural policy. The 1996 farm bill took the historic step to phase out the traditional commodity programs that had influenced agricultural planting, production, and marketing decisions over the previous six decades. Supply management programs, such as acreage reduction programs, were eliminated. Loan rates were frozen at 1995 levels, and counter-cyclical deficiency payments were replaced by fixed payments. For the first time since comprehensive farm policy was enacted in the late 1930s, the 1996 farm bill allowed farmers full planting flexibility with no loss in payments, as long as other provisions of the Act were not violated.

Perhaps the most important change in policy was the de-coupling of income supports for program crops from production decisions made by farmers. The target price-deficiency payment mechanism in place since 1973 was replaced with a mechanism of “de-coupled” payments for a period of 7 years. These payments were unrelated to what the farmer planted, or to the level of farm prices. The 1996 farm bill also significantly reduced the influence of non-recourse loans in farmers’ planting and marketing decisions, by capping maximum loan rates for many commodities, allowing producers to repay loans at the lower of the market price or loan rate plus interest; and suspended the Farmer-Owned Reserve, which had held large volumes of

grain off commercial markets during periods of low prices. As a result, U.S. agriculture has been successfully weaned from a fairly strong, at times heavily interventionist policy in which government had a significant influence in production agriculture, to a sector heavily reliant on market forces to guide production and marketing decisions.

While there have been four fairly substantial “emergency” assistance measures since the 1996 farm bill was enacted, to deal with unexpected low prices or other weather-related disasters, most policy observers believe that the current market-oriented, non-interventionist policy will continue. This is important, because agriculture’s future is heavily tied to its ability to compete successfully in a global agriculture – itself more liberalized than ever before. And to be cost competitive in a global market, means that every resource used to produce the final product must also be efficiently used and priced. And that means a more visible, important role for the transportation services that move agricultural goods into international markets.

Global Agricultural Trade Prospects & Policy – It is hard to overestimate the importance of global trade to U.S. agriculture, and the sizable gains that would be given up with a return to a farm safety policy net. As U.S. agriculture continues to achieve production efficiency gains from such trends as increasing vertical coordination and industrialization, the growth in output must be absorbed by foreign markets. The U.S. population simply cannot absorb all the gains in output. Thus, it is difficult to imagine walking away from the opportunities presented by global trade with growing markets.

Current projections call for U.S. trade to more than double from 1996 tonnage levels to 2020, or grow by 3.5 percent annually. And, one of the fast growing areas in U.S. exports is high-value agricultural products – chilled, refrigerated, and processed foods – which have increased substantially in recent years. High-value agricultural exports now make up a greater proportion of total U.S. agricultural exports which have more than doubled to over \$50 billion. In 1975, high-value exports were 27 percent of the total value of exports. By 1998, they made up 63 percent of the total value. By 2008, agricultural exports are expected to increase to more than \$72 billion, with 36 percent of those bulk exports, and 64 percent high-value.

Transportation Implications – To be cost competitive in a global market, means that every resource used to produce the final product must also be efficiently used and priced. And that means a more visible, important role for the transportation services that move agricultural goods into international markets.

Projected increases in exports – especially high-valued agricultural products – but also increased freight volumes within the United States itself, is prompting growth in containerized shipping. Container shipping has also been referred to as “invisible” modal shipments, because the containers can simply be transferred from one mode to another.

Frequently cited as the transportation solution to a growing need for increased freight volume movements, however, containers also pose their own set of issues. The increased use of containers for shipping goods produces extra demand for land, because containers require significant acreage at portside locations. Many ports lack the acreage needed to accommodate the growth in containerization, but some ports have successfully expanded their land capacity by purchasing and redeveloping additional waterfront property. Of course, there are many other uses for waterfront property, such as residential and business uses, that compete with demand for increased maritime shipping.

The Uruguay Round & WTO – Two major events are illustrative of the gains to U.S. agriculture from liberalized trade initiatives – the Uruguay Round, and the North America Free Trade Agreement (NAFTA). When the Uruguay Round of multilateral trade negotiations concluded in early 1994, it produced the notable accomplishment of establishing frameworks by which agricultural trade barriers could be lowered and market access would be expanded in the future for worldwide agricultural trade. It prohibited new non-tariff barriers, required existing non-tariff barriers to be converted to tariffs, and required tariffs to be reduced an average of 36 percent for developed countries and 24 percent for developing countries. Conversion of non-tariff barriers to tariffs was a major accomplishment because it brought greater transparency to agricultural trade policies and facilitated future reductions in import barriers.

The Uruguay Round also required countries to reduce trade-distorting domestic supports, such as market price supports, and attempted to place disciplines on the use of export subsidies by member countries. Farm-sector supports considered non- or minimally-trade distorting, such as publicly funded agricultural research, extension, inspection, infrastructure, food security stocks, as well as crop insurance and de-coupled income payments were not required to be reduced. The World Trade Organization (WTO) was also created in this trade round as the successor to GATT, and the multilateral institution charged with enforcing the new trade disciplines that were adopted.

While the Uruguay Round produced notable results by establishing a framework for addressing many of the distortions in agricultural trade,

global agricultural trade is still highly protected, relative to other types of trade. The average worldwide agricultural tariff, for example, is currently over 40 percent, while the average non-agricultural worldwide tariff is 4 percent. In addition to the evolving interpretation of permissible sanitary and phyto-sanitary measures under a separate agreement, there remain other agricultural trade issues left unresolved by the Uruguay Round to be addressed under the WTO framework – issues likely to be taken up in the latest trade round commencing in 2000. The United States has submitted a comprehensive agricultural reform proposal to the WTO for correcting and preventing restrictions and distortions in world agricultural markets, covering the areas of market access, export competition, domestic support, special differential treatment, and food security. The U.S. proposal is highly suggestive of a domestic policy intention to remain on the course set by the 1996 farm bill.

U.S. agricultural exports are expected to benefit substantially from increased access to markets and fairer trade competition once all of the provisions of the Uruguay Round are finally implemented. The benefits will multiply over the longer term because open markets and expanded trade in agriculture and other areas promote world economic growth and boost incomes, thereby increasing global demand for agricultural products. Studies suggest that the Uruguay Round Agreement on Agriculture will raise world income as much as \$5 trillion by 2004, increasing U.S. agricultural exports by a projected \$4.7 billion, to \$48.7 billion higher by 2005, than would have been expected without the Uruguay Round Agreement.

For U.S. farmers and ranchers, increased exports support farm prices and increase farm incomes. Analysts project U.S. farm income could be as much as \$2.5 billion higher in 2005 than would otherwise be expected. This increase will come from the global market place, not the U.S. government. The agricultural exports stimulated by trade liberalization will support more U.S. jobs in exporting, processing, transportation, and other sectors, with roughly a third of these jobs in rural communities.

NAFTA – A Western Hemisphere Trade Success – Implemented in 1994, NAFTA is credited with expanding U.S. agricultural trade with Canada and Mexico. The annual value of U.S. agricultural exports to Canada and Mexico rose 50 percent in the first four years after NAFTA was implemented compared with the four years immediately preceding implementation. The expansion in trade has roughly followed the comparative advantages of agricultural producers in the three countries. New North-South trade flows have emerged between and among the three countries, and an increasing integration of grain supply and demand regions in Canada, Mexico, and the

United States has developed into a North American market for grain and grain products.

Mexico has benefited significantly from NAFTA. A country with limited arable land and rainfall to sustain appreciable increases in grain production, Mexico has a large and growing population concentrated in several large metropolitan areas. With NAFTA, Mexico chose greater interdependence with the United States and Canada in meeting its food needs, and rejected continued support of its domestic grain sector at high support levels, along with an unsustainable long term goal of domestic grain self-sufficiency. The result has been high levels of agricultural trade among the NAFTA countries and record Mexican imports of grain from the United States to supplement Mexico's domestic food requirements.

Between 1995 and 1999, U.S.-Mexico surface trade increased by 75 percent in value, while U.S.-Canada surface trade grew 20 percent. Mexico is now our 3rd largest trading partner in value. Rapid trade growth, especially with Mexico, means a greater flow of goods in specific trade corridors, many of which are unprepared for increased traffic. Between 1994 and 1999, for example, the value of Mexican imports by land modes passing through Laredo, Texas, increased 248 percent. Otay Mesa, California, experienced a 95-percent increase. In the gateway port of Detroit, Michigan, total surface trade with Canada increased 25 percent, and in Buffalo, New York, trade increased 53 percent.

One of the consequences of global and regional trade liberalization is that as tariffs and trade barriers are reduced, the importance of comparative costs among international competitors increases. With freer trade, an exporting country gains market share according to its cost advantage as a supplier. Cost relationships across suppliers are due not only to the cost of production, but also to the cost of transporting and distributing a product or commodity to the foreign customer. Thus, the cost of transportation should become more important in determining trading patterns among countries.

Transportation Implications – Trends toward increased trade liberalization mean greater importance of transportation costs in determining trading patterns. The increased trade as a result of NAFTA, for example, points out one significant transportation problem – overcoming new North-South freight movement congestion. In the United States, traditional trade routes have been East-West, serving coastal ports. With NAFTA, however, new north-south trade corridors are emerging. Texas is concerned about the truck traffic on its segment of Interstate 35, which is expected to increase 85 percent by 2005. Concerns also have been raised about air quality at congested border crossings. Also, because of concerns with Mexican truck

compliance with U.S. safety standards, the United States has delayed full implementation of the NAFTA trucking provision. Still, more than 70 percent of the value of the U.S.-Mexico trade moves by trucks. Cross-border delays to and from Mexico have been blamed on inadequate infrastructure, lengthy inspection procedures, heavy traffic, and U.S. efforts to halt drug trafficking.

To overcome land congestion problems with Mexico and Canada trade, U.S. ports are also seeking NAFTA business. The Port of Mobile is starting high-speed intermodal ferry service while the Canadian National Railroad and two Mexican partners, with the Port of Galveston is initiating rail-barge service to Mexico's east coast. To the north, Canadian railroads have geared up to move more goods. Canadian National, an east-west route, purchased Illinois Central, giving it access to the Port of New Orleans and the Gulf of Mexico. Canadian Pacific purchased the Susquehanna Railroad for access to the Port of New York and New Jersey.

21ST CENTURY RURAL AMERICA: CHALLENGES & OPPORTUNITIES

While a handful of the Nation's 2-million-plus farms may contribute the majority of agricultural output, 92 percent of the Nation's farms are classified as small, with gross annual sales of \$250,000 or less. For these farms, access to transportation services is critical to their operation, yet their ability to influence the transportation services in local areas is singularly limited. In addition, communities concerned about transportation's impacts on their quality of life, particularly economic development, land use, and congestion, have increased decision making authority over how transportation funds will be spent in their areas. Little by little, these decisions will help shape the national transportation system.

Although easy to overlook, transportation can play a pivotal role as either a barrier or contributor to local economic growth in rural areas. This is especially true in attempting to preserve a healthy agricultural industry in the local area. But it is becoming equally important even if agriculture is not the dominant base of economic activity in a rural economy. Transportation plays an important role for rural communities striving to attract new businesses or residents to diversify their local economies and stimulate job growth and incomes.

Although e-commerce has been touted as a potential fuel for revitalizing growth in rural areas, e-commerce can also result in a decline of locally available services that smaller farmers rely on. When large farms can command bargaining strength in the purchase of inputs or financial capital from anywhere in the country using the Internet, small input suppliers may be unable to survive on the demands from the remaining small farms in the local areas, and be forced out of business.

Research and focus group sessions conducted demonstrate that transportation and distribution services are often cited as limiting factors facing many rural areas. In today's corporate, for-profit Class I rail industry, efficiency rationalization has led to abandonment of many previously unprofitable rail lines. Abandoned rail lines and rail policies that favor shipping from a few, high-density locations can hamstring efforts to compete for access in more distant markets. Such rail policies are also pressuring local communities dominated by the movement of agricultural freight by rail to adapt to new policies or find alternative modes of transportation.

Abandoned rail lines have another debilitating effect on the community left behind – railroads typically contribute significantly to tax revenues in the communities in which they operate. When they leave, the tax base shrinks,

further pinching the financial resources at local levels of planning and investment to improve or increase transportation infrastructure. The result can be a downward spiral, contributing to an exodus of business and families from the local area.

Bright spots are emerging, however, to bridge gaps left by rail abandonment. Short line railroads, for example, could ameliorate many of the gaps between declining Class I service and overuse of rural roads. Improvements in local roads, or investing in new highway infrastructure are also possible ways to preserve service needed for existing businesses and can help local areas attract new business.

Recently, in the Administration's report *Building Livable Communities*, two actions identified to sustain prosperity and expand economic opportunities in local communities included providing more transportation choices, and protecting farmland and open space. These are not always complementary actions.

Local investment in transportation infrastructure (new roads, bridges, bypasses, etc) can sometimes backfire for both local agricultural interests and for local residents who prefer a rural lifestyle. A lack of coordination, shared vision, and inclusion in land use planning among levels of government, including state transportation, local planning, and zoning officials can result in perverse results for agriculture and local communities.

New roads may achieve different and unintended results than the community desired. Families may be attracted to rural areas for the perceived quality of life associated with rural communities, adding commuting congestion to existing and new roads, but also raise concerns about the environmental externalities that are associated with nearby farms, including odor, noise, etc. Increased local populations also build pressure for retail and service business development, and for additional public services such as schools, health care institutions, and other government services.

Suddenly, pressure increases to convert now relatively lower-valued agricultural land to alternative uses – non-farm businesses and residential areas. As previously valuable farmland is converted to malls and subdivisions, rural communities struggle to sustain their economies and way of life. The very attributes that attracted new residents can eventually be at risk and erode as a result of developmental pressures. This further exacerbates the pressures on small farmers to survive in an increasingly industrialized agriculture where the general public is, for the most part, unaware of the value of a diverse agricultural structure, or of the potential social and economic costs associated with a loss of farmland.

Transportation Implications – The challenges facing rural communities in relation to farmland, quality of rural life, and transportation, echoed in the *Livable Communities* report, included the erosion of environmental, cultural, and economic attributes of rural America. Farms and forestland provide jobs and opportunities for recreation and a connection to the land, as well as environmental benefits including flood reduction, groundwater recharge, and wildlife habitat. But in many areas, current growth patterns fed by investments in transportation to promote growth threaten the “green infrastructure” and associated intrinsic values and human enterprises sustained in rural communities. The quality and efficiency of the Nation’s transportation system affects more than just industry or production agriculture in this instance. The economic well being and quality of life in rural areas, often directly related to agricultural activities in those areas, is significantly influenced by the availability of transportation services.

If transportation services are inadequate, it is more difficult to attract new businesses and new residents. But the catch-22 is that, without a broader economic base in the community, it is difficult to finance the investment in additional transportation services or even to make the necessary improvements to the existing infrastructure. Adding to the challenges are the potential adverse impacts on rural communities’ well being when transportation investments produce unintended developmental consequences that can erode the very attributes associated with rural community life.

21ST CENTURY TRANSPORTATION: CHALLENGES & OPPORTUNITIES{ TC \L3 "}}

The U.S. transportation infrastructure is the envy of the world – a product of innovative engineering combined with an unsurpassed natural resource endowment. The interlocking elements of the U.S. transportation system support 4.5 trillion miles of passenger travel and 3.7 trillion ton-miles of goods movement. The system includes more than 5.5 million miles of public roads, railways, waterways, and oil and gas pipelines; over 19,000 public and private airports, 230 million motor vehicles, railcars aircraft, ships, and recreational boats.

Over 5 million trucks traverse nearly 4 million miles of roads, while railroads carry 37 percent of total freight ton-miles over 170,000 miles of rail track; vessels move freight over 26,000 miles of navigable waterways with 276 locks, and 3,700 terminals on the Great Lakes, inland waterways, and ocean ports. About 29 percent of the total inter-city revenue freight ton-miles are carried by trucks and other highway vehicles. There are 4 million miles of roads and streets; 600,000 bridges on the entire network. And state and local governments control most of the nation's roads and bridges. The Nation's Interstate highway system – completed in the 1980s – makes up just 1 percent of total highway mileage, but carries 25 percent of total vehicle miles traveled.

The cost per unit to transport freight has fallen significantly over the past two decades – the result not only of innovations in transportation, but from deregulation of the transportation sector that allowed service providers to shed inefficient services and provide service motivated by profit and minimizing cost.

Many of the economic and policy influences at work in the general economy and agricultural sector are exerting similar (positive) influences in the transportation sector. Deregulation – a policy-friendly environment – isn't just an agricultural phenomenon. It's been at work in most transportation sectors for the past two decades. At the turn of the 1900s, nearly all interstate transportation was subject to government economic regulation. By 1999, the decision making process covering entry, exit, pricing, and quality of service has been significantly diminished by the federal government and turned over to the carriers and market forces. Government emphasis has shifted from economic controls over rate and entry, industry concentration, labor relations, and antitrust issues to safety, environmental, and capability concerns.

Deregulation legislation includes the Motor Carrier Act of 1980 for trucking, the Railroad Revitalization and Regulatory Reform Act of 1976, and the Staggers Rail Act of 1980 for railroads. Other legislation included the Bus Regulatory Reform Act of 1982, the Airline Deregulation Act of 1978, and the 1984 Shipping Act for ocean carriers. Railroad deregulation began in 1976, but was accelerated with the Staggers Act of 1980. Inland barge transportation – one of the most valuable assets in the economy, has generally escaped regulation. The exception has been the introduction of a barge fuel tax imposed in the early 1980s to fund the Inland Waterway Trust Fund (IW) – a means of tapping users to build up needed funding to help finance the inevitable capital improvements as the 50-60 year-old infrastructure reaches the limits of its useful life.

Furthermore, transportation is a very unique sector in the U.S. economy. Yes, it is comprised of several industries – responding to market and policy signals like any other industries. But the underlying infrastructure in many cases is either a natural resource, or shares a public good characteristic, or has many competing interests for its use – certainly for its service and performance:

- Barges operate on the inland waterways; but barge companies don't own the Mississippi, or the Illinois, Columbia, or Snake Rivers – and the rivers have multiple, valuable claims on them by the public, by environmental interests, even by the government for national security.
- Likewise, trucking companies don't own the Nation's highway system, and obviously all of us have valuable interests or stake in the quality and accessibility of the highways. The same is true for airlines – who don't own the airways – or shipping lines, who don't own the ports or oceans.

This is important, because the decisions about investments – to build, improve, overhaul, or shut down – are by their very nature broad discussions involving many groups, with inevitably different agendas and points of view.

Transportation Implications – Highlighting transportation's role in 21st century agriculture is not a subtle attempt to suggest that problems in transportation will be the weak link that holds agriculture back from the potential achievements that are possible in the next two decades. But as the world grows smaller, because distances are overcome by technological developments like e-commerce, or by more open trade policies, transportation will advance to a more prominent role in supporting the ability of business, including agriculture, to reach its customers quickly, efficiently, and without

product quality deterioration. Thus, it is worthwhile to examine the forces shaping transportation, and to consider how those forces may interact to improve (or inhibit) the performance of agriculture in coming decades.

Railroads in America

The historic role of railroads in America is changing in fundamental ways. The old “common carrier obligation” no longer carries as much weight in today’s for-profit corporate railroad structure. The movement of bulk freight, although still critical for much of America’s agricultural inputs and output, may also be changing as industrialization promotes continued specialization, as identity preservation, segregation, and labeling demand containerized shipment capability, and as changes promote movements of production areas away from or closer to processing and final use destinations.

Today’s corporate, operating for profit railroad industry means that railroads will inevitably re-evaluate the priority of their customers, and agriculture’s priority as a customer may be declining – at least in some areas, or for some time period throughout the year. Abandoned lines, policies influencing loading and unloading, switching, and co-loading, etc., are pressuring local communities dominated by the movement of agricultural freight to adapt to new policies or find alternative modes of transportation.

Abandoned track and service can also have tax revenue consequences for rural communities that depended on those revenues for public investment projects. The effects extend to local communities’ abilities to attract new businesses and residents. Not only must local areas find ways to maintain transportation services to sustain existing business and prevent their exodus, they face a challenge in being able to attract new business to diversify and rebuild the tax base without the attraction of existing transportation services like rail, to entice new business to locate in these areas.

Transportation Implications – A consequence of Class I railroad policy in the new for-profit environment has been more traffic shifting to rural roads, many of which were not constructed with the engineering integrity to withstand heavy traffic. Increased traffic on rural roads also adds to noise and congestion, and is at odds with residents who value the “bucolic” lifestyle of rural areas.

There are opportunities that can help bridge the gap between the needs of rural America and agriculture and the service the Class I railroads are willing (or able) to provide, as mentioned earlier. Since 1975, Class I railroads have shed 91,000 miles of rail lines – many of which were sold to

new, aggressive regional and short line railroads. In 1998, these regional short line railroads operated 50,000 miles of road. Short line railroads could ameliorate many of the gaps between declining Class I service and overuse of rural roads. Small railroads offer advantages of lower labor and operating costs, and they generally allow for greater flexibility in marketing and service. And, because these lines are often owned locally, small railroads can foster a sense of pride and greater community involvement in the railroads. Improvements in local roads, or investing in new highway infrastructure could also be considered as possible ways to preserve service needed for existing businesses, and can help local areas attract new business.

A Short Line Success Story – Although there are obstacles in establishing a viable short line railroad, they can be overcome, illustrated by the Kyle Railroad in Kansas. In 1982, the Rock Island Railroad went bankrupt, causing serious problems for Phillipsburg, Kansas. Establishment of the Kyle Railroad was made possible through financial support from the State of Kansas, administered through the Mid-States Port Authority, an entity created in 1980 so that rail service could be preserved following Rock Island's bankruptcy. Operating on 780 miles of former Rock Island track, the Kyle serves various farming communities in northern Kansas and eastern Colorado, and specializes in hauling shipments of grain. Similar efforts have been undertaken in other States, such as South Dakota, New Hampshire, and West Virginia.

The overall challenge facing the railroad industry is to address issues of congestion, productivity, and cost in an environment of ongoing mergers and consolidation. Today's Class I carriers now own about half of the road-miles they owned in 1975. Between 1975 and 1999, the volume of freight moved on the system increased 18 percent by tons and 83 percent by ton-miles. In the past two decades federal funds have been invested for improving track and equipment and there will be continuing demands for infrastructure improvement. At the same time, rail carriers face increased demands for safe, low-cost, and efficient service. Rail service, consolidation, and access remain significant concerns with agricultural shippers. After the proposed (but withdrawn) application for the merger between Burlington Northern-Santa Fe and the Western Canadian Railway, the Surface Transportation Board (STB) proposed new rail merger guidelines to address concerns – not just of agricultural shippers, but of those concerned with a competitive rail sector (see box).

STB's Proposed Major Railroad Merger Rules – STB has recently proposed new rules for major rail consolidations that are intended to increase the burden on applicants to demonstrate that the proposed action would enhance competition as an offset to negative impacts resulting from service disruptions and competitive harm likely to result from the proposed merger.

STB's proposed rules address a number of issues, including consolidation criteria, public interest considerations, potential harm, service assurance and operational monitoring, cumulative impacts and crossover effects, and trans-national issues.

Some shippers have expressed concerns already, during the period for comments of the proposed rule changes. Their concerns reflect a skepticism that the changes will not significantly affect the regulatory environment governing rail mergers, and that the new merger rules do not indemnify shippers and other railroads for costs incurred due to merger-related service interruptions. Some commenters are concerned that the new rules do not adequately address the disparity in size – hence, negotiating power – between large Class I carriers and smaller shippers and small railroads attempting to negotiate to solve potential inequities that might arise as a result of a merger.

USDA made a number of recommendations to the STB regarding its proposed rail merger rules, a number of which were accepted and reflected in the proposed rule. USDA recommended that the STB consider downstream and crossover effects of future railroad mergers in its revised guidelines; that railroads involved in major railroad consolidations indemnify shippers and other railroads during the merger implementation period for costs incurred due to service interruptions and to require binding arbitration of all claims which the consolidated railroad disputes.

USDA also recommended considering the ability of the merged firm to make the necessary infrastructure improvements before approving a rail consolidation, requiring railroads to offer specific proposals to enhance competition and mitigate any adverse competitive consequences of consolidation on shippers. Among the other recommendations made by USDA was to carefully analyze the impacts of future major railroad consolidations upon short line and regional railroads. A full summary of STB's proposed rules, and USDA's recommendations, can be found on the Agricultural Marketing Service web site for the National Agricultural Transportation Summit.

Air Cargo and Motor Carriers

In 1975, the motor carrier industry was regulated by the (then) Interstate Commerce Commission. The ICC controlled routes of service and rates through its rate bureaus. Start-up companies were required to prove that their plan to provide new service was in the public's best interest. Only a limited number of truck (and bus) companies were authorized to provide service – 18,000 truck companies, compared with nearly 500,000 today. The Motor Carrier Act of 1980 further eased barriers to entry into the trucking industry.

Trucking companies were given authority to set rates independently, and antitrust immunity for collective rate-making was eliminated. As a result, existing carriers expanded into new services with new routes and new, smaller carriers entered the business. In the years immediately following 1980, the use of private carriers (“in-house” trucking fleets), declined as companies chose to take advantage of lower rates and improved service by the for-hire carriers. During the 1980s, the number of truck carriers and commercial trucks increased. Today, there are nearly 500,000 trucking companies providing service, most of them with six or fewer trucks.

Less than half of total trucking activity on the Nation's highway network, measured by both ton-miles and value of shipments, occurs within state boundaries. In 1994, 41 states still maintained some form of economic regulation over intrastate trucking. With interstate trucking deregulated, intrastate rates were 40 percent higher than rates for interstate moves over the same distances. Finally, in 1995, the Federal government removed intrastate regulations.

The trucking industry continues to face many challenges, including truck driver shortages (especially in the near future), hours of service changes, and exemptions for agricultural commodity truck moves.

Air cargo is becoming an increasingly popular means of freight movement. Growth in air cargo is mirroring growth in GDP, providing faster ways for businesses to deliver high-value goods to their customers. Boeing projects an average annual growth of 6 percent in international air cargo during the next decade and 6.4 percent for the next 20 years, with the most rapid growth expected in Asian markets. Cargo freight is actually growing at a faster rate than passenger movement, at about a 6.1 percent annual rate of growth. Fed-Ex and UPS are the two largest domestic all-cargo carriers, providing door-to-door service with intermodal systems.

Transportation Implications – Increasing globalization will fuel demand and growth in air cargo movement. Domestic air cargo revenue ton miles

(RTMs) are forecast to quadruple between 1999 and 2025, reaching nearly 44 billion RTMs. The increase will come from all-cargo carriers, rather than passenger travel. The carrier fleet will need to more than double by 2025, from 1,046 aircraft in 2000 to 2,646 aircraft by 2025.

The Nation's First "Interstate Highway" – Inland Waterways

Waterborne traffic moving on America's "first interstate" – long before highways, railroads, and air traffic, carries 2 billion metric tons of domestic and international products and materials. Of the total volume of trade entering or leaving the United States, 95 percent moves on water.

Waterborne foreign trade has grown 65 percent by weight since 1975. Progressive growth in domestic shipping has led to improvements in the Nation's inland waterway system, including the Tennessee-Tombigbee Waterway, new locks and dams on the Mississippi, and on the St. Lawrence Seaway.

America's inland freight system is critical, providing the connections for goods to access the water transportation network and it involves 1.3 million freight cars, 20,000 locomotives, and 5 million trucks. Of the 655 million metric tons of goods moving on the inland waterway system in 1997, 96 percent moved by barge, and farm products made up 12 percent of that traffic.

One of the most profound challenges emanating from the future role of the Nation's inland waterway system is that the public is demanding that waterways be recognized as more than an artery supporting freight movement, or a generator of electric power. The public regards the Nation's inland waterway system as a natural resource, serving recreational, residential, and environmental purposes. As such, a broad (and sometimes controversial) debate is taking place over future improvements and changes to the inland waterway system.

A unique characteristic of the inland waterway system is the combination of public investment but private use, with conflicting incentives and outcomes often a result. Shippers and towboat owners want any constraints on lock capacity to be removed at public expense, while government would like to see industry use self-help measures as much as possible to solve capacity problems. User fees, a normal response to such problems, are not presently an option because Congress has not passed legislation permitting their use. Questions of subsidy, congestion pricing, and demand-side overuse of the waterways are also not being given significant consideration. Thus far, the

legislative attitude is that commercial traffic on inland waterways generates significant public value to America.

Even if that has been the historical position, changing values and a changing environment surrounding inland navigation have put new pressure on the continued provision of navigation facilities. It is true that the cost of a facility is the value of the facility in its next best alternative use. There is little or no increase in value of economic resources if rivers are not used for transportation, so little is gained by not using the “raw river” for transportation. But the raw river is almost completely useless except for selected short hauls and expensive movements; to achieve the efficiencies of the waterway system requires maintenance expenses, operational expenses of the locks, navigational aids, etc. Further, and the source of the policy debate surrounding what priority in water use should be given to navigation, significant external costs are created by the movements. Impacts include the effects of work on property owners, turbidity of the water, recreation and commercial fishing, channelization or flood impact, wildlife habitat, and in the extreme, loss of endangered or threatened species. In-stream uses of the water are sometimes complementary and sometimes competitive – e.g., the opportunity cost of moving water through a lock rather than through a hydro-turbine providing electricity to the region.

The benefit of low cost water transportation caused the Federal government to foster its growth. Since the early 1800s, the U.S. Army Corps of Engineers (Corps) has been charged with establishing and maintaining a system of navigable rivers by improving river passage, increasing flood control, and guaranteeing minimum depths and widths. On the Upper Mississippi River there are 29 dams with 35 lock chambers; on the Illinois River there are 8 locks, and on the Columbia-Snake River there are 8 locks and 8 dams principally developed for hydroelectric purposes. The projects on the Upper Mississippi-Illinois were started in 1930 and completed in 1963. The dams and locks on the Columbia-Snake were initiated in the early 1900s and the last dam, Lower Granite, was completed in 1975. As these systems have matured, they have become major conduits for agricultural exports into international markets.

The competition between modes of transport and continuing strong environmental concerns over impacts of facilities construction have contributed to debate over funding of navigation improvements. One reason was the increased user fees being paid by highway and airport users, while none was being paid by waterway users. The push for improvements at the Melvin Price Locks and Dam resulted in addressing some of those concerns in the Inland Waterways Revenue Act of 1978, which established the Inland

Waterway Trust Fund (IW), where taxes on fuel used by commercial vessels in inland navigation is held.

Recent analysis by the Corps indicates that the IW trust fund can completely support all currently authorized projects on current schedules, and several projects could be completed earlier than scheduled. Future projects, including the 1200-foot lock extensions or replacements at selected Upper Mississippi and Illinois five locks, could be initiated at intervals beginning in approximately 2008. The delay is due to the need to replenish the trust fund after current projects are completed. However, there is a possibility that revenues could be increased if the current 4.3 cent “deficit reduction tax” is diverted into the IW trust fund. Diverting the tax, paid by the towing industry, to the trust fund, would increase available funds by 20 percent and allow construction on new projects to proceed much sooner.

However, the priority given to providing inland waterway navigation has been based on the value added to the economy. The availability of trade channels and international exports to U.S. agriculture is becoming more critical as U.S. production increases and international competition intensifies. The importance of international trade to American agricultural producers is indicated by an export market accounting for 25 to 30 percent of total agricultural sales over the past two decades. Over this period, U.S. wheat producers exported an average of 51 percent of their annual production. U.S. coarse grain producers exported an average of 22 percent of their annual production, and accounted for nearly 60 percent of world trade in coarse grains. Indeed, most policy makers believe that international trade and foreign markets will continue to be a necessary complement to the domestic demand for U.S. agricultural producers. Increased trade encourages larger scale and more efficient production methods, entices investments into new production techniques, and even allows new or different combinations of inputs to be used as producers search to maximize profits and take advantage of these trade opportunities.

The public perspective towards the environment is increasing as a policy issue of importance. The National Environmental Protection Act and the Endangered Species Act reflect that current priority ranking of societal values. They also mean that navigational interests must make room for other demands on the use of the waterway system.

The locks and dams on much of the inland waterway system are undergoing serious deterioration. The average age of the locks on the Mississippi and Illinois Rivers about St. Louis, Missouri are 55 and 60 years old. Several of these locks have reached their design capacity because larger 15-barge tows, requiring 1,200 feet to traverse a lock in one pass, have become common.

Only three of these locks currently handle 1,200 foot tows – thus, expensive, inefficient congestion-increasing double-locking has to occur. Current studies indicate a price tag of over \$1 billion to do desired improvements. Although the IW trust fund can meet part of the cost, questions revolve around who should pay and which river segments should receive the investment funds, and how much is the public interest in waterways worth to divert taxpayer dollars to complete such projects.

Although environmental issues figure prominently in the current debate over investment and improvement decisions about the inland waterway system, there are environmental benefits to society from the use of the inland waterways to move freight, relative to the alternatives, especially by trucks. The ability of barges to provide low cost, large volume transportation services makes barge transportation both relatively fuel efficient and environmentally advantageous. Research suggests that on average, a gallon of fuel allows one ton of cargo to be shipped 59 miles by truck, 202 miles by rail, but 514 miles by barge. There remains some debate about these estimates, and some concerns that the advantage of barge movement may not be as fuel efficient as these estimates suggest.

The demand for transportation services on the waterways will also be affected by changes in the location and volume of total and commodity-specific production, by the capacity of the main competitors (rail and truck), and the extent of international competition facing U.S. agriculture. Recent changes in production have altered the breadth and depth of the landscape of production agriculture. Biotechnology is revolutionizing the production side of agriculture and, as societal and institutional and marketing concerns are addressed, biotechnology can be expected to sustain this revolution. In the last 10 to 12 years, there have been over 4,000 field trials of new agricultural products derived from 50 differing plant material sources. These varieties have improved yields, decreased costs, and offer better financial returns to producers. The potential extent of applications of the technological change is extremely broad. The products coming forth can be and now are tailored for specific end uses and markets. Such market specificity suggests a new emerging need for identity preserved shipments of such products.

Biotechnology is happening elsewhere in the world too, and has implications for international competition for the U.S. commodities often carried as waterborne commerce. Biotechnology serves to make domestic uses and processing more attractive, as it offers specific variety and genetic characteristics useful to these local processing outlets. Such a competitive shift from export markets to local, or at best, domestic processing, can decrease the volume available for movement on the waterway system. Further issues are whether the bulky, undifferentiated movements of the

waterway system have the capability to handle the identity preserved shipments. If biotechnology causes production to move closer to the end use or processing location, more use of truck or rail over waterways would be expected.

A direct influence on demand for waterborne commerce are the competitive rates and services of railroads, the closest cost effective mode. A continuing and more recently intense concern is the capacity of railroads to provide service as demanded by agricultural shippers. These capacity concerns occur in both the near term and long term, and in the question of short line railroad survivability. It is a given that agricultural shippers, along with other shippers of bulky, non-perishable commodities, experience rates whose rate/cost ratio for the railroads is quite low relative to other product movements. Thus, when capacity car shortages occur, bulk commodity shippers are often first to experience lack of dedicated service.

As railroads continue to try to improve their rates of return, areas of non-intramodal or intermodal (barge) competition may bear the brunt of this financial quest. Lower, but still remunerative rail rates may continue in areas of long haul waterway competition. This would be associated with domestic shippers losing service and shippers in the long-haul export market seeing continued availability of capacity. The final implication of railroad's long term capacity will depend on how railroad management assesses its opportunities in the relevant markets. As a result, waterborne commerce could see less competition or continued lower bulk rates from its railroad competition.

The impacts on agriculture of diminished navigation capacity, admitting greater priorities for alternative uses, could take the form of markets lost, increased input costs, differing production mixes, and a lower bottom line from farming operations. All of these effects are manifested in price changes: the output price drops as costs to access international markets increases, and input costs increase as distribution costs into the interior of the United States increases. Producers' responses to increased transportation costs depend on alternatives facing the farm enterprise, and the cost and availability of alternative modes. Dry land farms, compared with irrigated operations, have fewer alternatives, so impacts could be quickly felt. The location of the farm relative to differing traffic patterns will also affect the magnitude of the impact. Finally, the nearby availability of alternative transportation may be the biggest factor in incurring an impact.

Options for the future for agricultural shippers and the agribusiness industry in the face of constrained capacity are varied, but center on the concept of an entire transportation system. Capacity constraints in one subsystem or mode

have to be replaced by one or more alternatives. Methods of increasing railroad capacity and competition could include shippers or state-owned cars, support for short line railroads, improvement in the amount and extent of rural roads and bridges, etc.

Transportation Implications – Through 2020, total inland waterway traffic is forecast to grow on the order of 1 percent annually, reaching more than 836 million tons by 2020. Impacts on the inland waterway infrastructure could be significant as an aging system attempts to accommodate 738 million tons by 2010 and 836 million tons by 2020. Growth rates among major commodity groups are forecast to vary, generally between 0.9 and 2 percent; farm product traffic is expected to rebound to a growth rate of 1.6 percent. With exports comprising more than 90 percent of farm product movements on the inland waterways, total farm product traffic is projected to grow from about 88 million tons at present to about 124 million tons by 2020.

Today, more than 44 percent of the inland waterway facilities are 50 years or more in age. Many are undersized for modern commercial barge tows, which must be broken up and reassembled at each lock. This increases transit time, produces queues at locks, and results in increased operating costs and decreased efficiency. Nationwide, queuing delays total some 550,000 hours annually, and represent an estimated \$385 million in increased operating costs borne by shippers, carriers, and ultimately, consumers.

These delays will likely increase as system traffic grows and as aging infrastructure results in increased maintenance and repair time. Among the locks with high average delays, 19 are on the Upper Mississippi River-Illinois Waterway system, 5 are on the Gulf Intercoastal Waterway or its connecting channels, and 9 are on the Ohio River System. Time spent at locks is an expense, regardless of whether the tow is waiting or processing through the lock. Delay costs are in the range of \$350 to \$450 an hour, based on a 15-barge tow pushed by a 2,200 to 4,400 horsepower towboat.

Marine Transportation & Developments in Containerized Shipping

The world's general cargo trades were revolutionized by U.S. shipbuilding innovations in advanced containerships, and roll-on/roll-off vessels. Container ships, introduced first in the 1960s, now dominate freight movements, at 57 percent of carrying capacity. According to MARAD's analysis, since 1973, the U.S. port industry invested approximately \$15 billion on improvements in facilities and infrastructure. Between 1979 and 1989, new construction was 73 percent of total capital expenditures. For

1998, new construction was 73.3 percent of capital expenditures. Pacific coast ports accounted for 50 percent of total industry investment.

Today, freight movement is becoming “mode invisible” with performance (time, cost, and reliability) determining the choice of mode or modes. The ability to interchange goods between modes in a timely, cost-effective manner primarily through containerization has become critical to measuring system performance. Today, freight transportation logistics goals are performance-based, not modally-based, and the ability to interconnect and interchange among modes to optimize end to end movements is vital. At the same time, individual modes can continue to fill market niches within an intermodal framework (e.g., based on characteristics desired, such as low-cost or high-speed).

Today’s major U.S. trade routes have also shifted. Transpacific trade is now the primary traffic route for U.S. ocean-borne commerce. Our top five trading partners account for approximately 42 percent of the tonnage and value. Currently, Venezuela is our leading trading partner in terms of tonnage (primarily oil), but Japan is still our leading trading partner in terms of value. Mexico and Saudi Arabia joined the ranks of our top trading partners in terms of tonnage.

Using new technologies that provide longer-range travel, container ships now regularly make round-the-world trips. Additionally, the Panama Canal has become less crucial to global maritime trade because shipping companies often use new, long-range containerships that cannot negotiate the canal. Also, transcontinental rail offers a cost-effective alternative to the canal.

U.S. ports and terminals, as the land/water transportation interface, are the pivotal links for movement of our Nation’s international trade. Generally intermodal, ocean freight movements rely on other modes to haul cargo to and from ports. Containers make connections to rail and truck much more efficient. In fact, increased use of containers over the past 25 years has far outpaced other types of maritime trade (dry bulk, tanker, or general cargo).

Ships, on average, are getting bigger. Today’s container vessels have 50 percent or more cargo capacity than those of 1975, and some are triple that size. The first mega-container ship, with a capacity of 8,000 20-foot equivalent units (TEUs – the length of a container divided by 20), was developed by a German consortium in 1997.

The container revolution has emphasized the serious infrastructure problems facing the U.S. ports and waterways. The newer, larger ships of the 1970s required deepening of waterways and ports, but a political stalemate over

funding in the early 1980s stopped these improvements. The Water Resources Development Act (WRDA) of 1986 provided the impetus for many U.S. ports to deepen channels to enable them to handle large bulk ships. The WRDA fundamentally altered the financial basis of the maintenance of American harbors by creating a new Harbor Maintenance Trust Fund. Rather than relying on general appropriations to pay for port deepening and maintenance dredging, funds were collected by a tax – the Harbor maintenance Tax – on cargo value. The WRDA also for the first time, required local project sponsors (state and local agencies) to pay a share of costs. Since then, the U.S. Supreme Court has ruled that the Harbor Maintenance Tax is an unconstitutional tax when applied to exports.

The ruling that the Harbor Maintenance Tax is an unconstitutional tax on exports has placed funding for port dredging in jeopardy. Proposals have been made for different tax structures or to return to the use of general appropriations for port projects. This could have a major effect on the future of port expansion, deepening, and maintenance projects.

Many areas of the country, such as New York, Boston, and Oakland, have experienced lengthy permit application processes for dredging ports because of environmental concerns related to disposal of dredged material in the ocean.

Ports, in cooperation with other modes of transportation, must also look to innovative means of moving cargo to and from land-side destinations. The total volume of domestic and international marine trade is expected to triple over the next 25 years. Major U.S. ports face problems of land-side congestion and scarcity of land to accommodate these increasing cargo flows.

The use of new information technologies is likely to increase the global nature of shipping as more freight is auctioned, and as freight rates are provided, ships chartered, and transportation documents transmitted worldwide on-line.

Projected growth in international freight poses an enormous challenge for U.S. ports and their land-side access connections. For example, the Ports of Long Beach and Los Angeles handle 20,000 truck and 30 train movements each day. These figures are expected to reach 50,000 trucks and 100 trains by 2020. Of the top 20 container ports in the world (1998), Long Beach ranks sixth, Los Angeles ranks eighth, and New York/New Jersey 13th.

In southern California, the Alameda Corridor is under construction to move the huge volumes of cargo to and from the Ports of Los Angeles and Long Beach. The 20-mile, \$2.4 billion corridor, expected to open in 2002, connects

the ports by rail to an intermodal transfer site. Accompanying truck lanes are also part of the project. In northern New Jersey, officials are considering construction of a new portway for trucks to move cargo to and from Port Newark and Port Elizabeth. Other ports are also considering projects to provide better on-dock or near-dock rail access and to improve the flow of truck traffic into and out of ports.

Transportation Implications – As foreign trade continues to grow, U.S. ports face some significant problems. First, the ports must seek new financial resources for expansion and deepening projects to accommodate the new generation of bigger, faster cargo ships. Second, environmental concerns that have impacted port expansion must be addressed. Third, maintenance projects and land-side connections must be improved.

The major ports are predominantly located in large metropolitan areas, where truck and rail traffic competes with commuters on crowded highways. Numerous rail at-grade street and highway crossings impede access to ocean terminals and cause delays and increased dwell time in ports. Crashes associated with at-grade crossings and roads are already a problem and promise to become worse because of competing demands of expanding populations and increased trade. Ports, in cooperation with other modes of transportation, must look to innovative means of moving cargo to and from land-side destinations. The total volume of domestic and international marine trade is expected to triple over the next two and a half decades. Major U.S. ports face problems of land-side congestion and scarcity of land to accommodate these increasing cargo flows.

When transportation is constrained, potential trade benefits can be lost. U.S. exports of agricultural commodities and related products move mostly as waterborne commodities through the Nation's ports. Exports are often transported through particular ports because of their proximity to that port, availability of low cost transportation to the port, and accessibility to specific foreign destinations. For example, approximately 70 percent of the bulk export grain is moved through U.S. Gulf ports after being barged down the Mississippi River from production areas. Larger ships are being used in the maritime leg of the movement; these ships then put pressure on port service characteristics such as deeper drafts and accompanying dredging, and more storage and unloading/loading capacity.

The need for increased and continuous dredging is counterbalanced by environmental concerns and required environmental reviews. Inland modal congestion as well is affecting the efficiencies of port and ship utilization, thereby increasing costs to access the international market. For example, trucks haul cherries produced in Washington to ports, but two-thirds of the

travel time occurs on congested highways within 50 miles of the port. Continued port constraints could make other alternative markets and transportation alternatives more attractive and profitable, such as rail to the Pacific Northwest for interior-produced grains.

STRATEGIC QUESTIONS & ISSUES FACING 21ST CENTURY U.S. AGRICULTURE & RURAL AMERICA

As this report has illustrated, the changes expected to take place – in business technologies such as e-commerce, in agricultural production technologies, in global markets, and in the transportation system – will have profound impacts on U.S. agriculture and rural communities. Understanding the transportation needs of agriculture and rural America in the 21st century leads us to a set of strategic questions and issues – based on what we expect will be the economic, policy, and technological environment that will shape agriculture – that we believe must be how best to address those strategic questions. In doing so, existing transportation infrastructure must be considered. Perhaps as important, strategic thought also needs to be given to the future needs of agriculture and the Nation's rural areas.

To ensure that transportation contributes positively to the growth and development of agriculture and rural America, public and private decision-makers need to consider several issues. What are the transportation needs, both current and future, of local communities and businesses? Can existing transportation modes physically meet those needs? If so, do the necessary incentives exist to provide the needed service? If transportation capacity is lacking, what are the alternatives? For example, if the alternative to rail transportation is trucks, are there appropriate plans and resources for investment in roads and bridges? If the consequence of reduced or more costly rail service is the threatened survival of local industries, are the potential losses significant enough to warrant public incentives? These considerations apply at the local, State and Federal levels.

There is also the matter of how investments and incentives to address transportation needs are best provided. Government decision making may not always assure a market-efficient outcome. However, deregulating an industry so that it can be guided by profit incentives may not guarantee efficiency, especially if there is a broader public interest at stake. Put another way, market failures can and do occur – if those market failures are significant, there may be need for some type of government intervention.

Based on results of the first National Agricultural Transportation Summit, as well as subsequent research, listening sessions, and other input, it seems clear that future transportation needs must be considered in the context of several strategic issues and questions. Planning and investment in transportation infrastructure to meet the needs of 21st century agriculture and rural America will necessarily be guided by public and private thinking on these strategic issues and questions.

STRATEGIC QUESTION: WHAT AGRICULTURAL PRODUCTS WILL BE MARKETED?

As the rate of market growth for trait-specific commodities and value-added products, relative to the market for bulk, homogeneous commodities, what implications will these shifts have for the investment decisions made about the Nation's transportation infrastructure?

As the present transportation infrastructure continues to age, deteriorate, and bear increased traffic pressure, significant overhaul, improvements, and new investments will be required. But as our marketing system changes – moving to a “pull-driven” system, or smaller volume, trait-specific agricultural commodities, for example – the investment and planning decisions made about the transportation infrastructure must take these evolving marketing shifts into account. The decision process will be complicated by the uncertainties of the anticipated changes, and how quickly or slowly they occur.

- For example, if future agricultural markets are dominated by continued large movements of high volume, homogeneous commodities how much emphasis should be given to rail and inland waterway investments relative to investments in the trucking and highway system?
- On the other hand, is there a risk of over-investment in parts of the transportation infrastructure if future agricultural markets shift toward lower-volume, specialty products that require specialized containers for shipment, more frequent movements, and seamless intermodal connections? Should the emphasis shift to investment in increased on-farm storage, trucks and roadways, and containerized capability. How will the rail and barge industries need to change to accommodate segregated shipments?

In the near to medium-term, of course, some combination of these two scenarios seems most likely. Nevertheless, the pace and extent to which agricultural markets evolve to more specialized or value-added products will affect planning and investment in transportation infrastructure. Public and private interests will need to reach a common understanding on the strategic direction that the agricultural product mix will take to effectively guide future development of our transportation system.

STRATEGIC QUESTION: HOW DO WE ENSURE A FLEXIBLE TRANSPORTATION INFRASTRUCTURE?

As the nature of the demand for agricultural commodities changes, how will this affect the need for flexibility in transportation infrastructure to meet surges in shipping requirements?

- If the present domestic farm policy and the global trading environment persist well into the 21st century, will this increase agriculture's dependence on transportation services, as well as storage and marketing capacity?
- How do we best ensure efficiency in transportation services and rates in order for U.S. agriculture to maintain a competitive position in world markets and realize new marketing opportunities as they emerge?
- In a liberalized international marketplace, the demand for U.S. agricultural commodities is likely to become more price elastic; that is, small changes in prices will elicit larger changes in the volume demanded. Thus, the ability to move product quickly will become more important in a price-elastic global market. What does this mean for investment decisions in storage capacity, and for flexibility and responsiveness by rail, inland waterway, and ocean transport services?

To seize new opportunities to develop markets in foreign countries will require thoughtful assessment of future investments in storage as well as transportation infrastructure, but will also mean continuing to support a liberalized domestic and global policy trading environment

STRATEGIC QUESTION: WHAT IS NEEDED TO MOVE TOWARD A TRULY NORTH AMERICAN MARKET?

As more and more north-south freight movement comes with expanded trade with Mexico and Canada, how can we broaden infrastructure planning and investment needs to take these new north-south freight movements into account, while continuing to ensure efficient traditional east-west freight movements in the United States?

A number of issues and questions have arisen recently with expanded trade as a result of NAFTA that will have significant implications for transportation investment decisions.

- What efforts can be taken to reduce delays? Should there be more physical crossing points, or increased available customs personnel with

expanded operating hours; is there new technology available that could streamline cargo checking cargo and automating paperwork?

- Should there be development of “free trade” zones on both sides of the border, that could significantly facilitate trade movement by allowing goods to move to bonded warehouses for customs and other necessary clearances?
- What are the best ways to support Mexican investment in transportation infrastructure, particularly in providing greater capitalization of the Mexican rail system?
- While the fourth bridge added at Laredo has helped reduce congestion and inspection problems, would a fifth bridge serving only commercial traffic alleviate congestion further and be justifiable on a cost-benefit basis?
- At the same time, east-west freight movements also may take on greater significance as value-added agricultural products grow more prominent. How will this affect movements of raw materials to manufacturing locations within the United States and to market finished value-added products domestically as well as internationally?

These and other infrastructure issues need to be addressed if we are going to move to a truly North American free market.

STRATEGIC QUESTION: HOW BEST DO WE FACILITATE GLOBAL COMMERCE?

How will U.S. ports prepare to accommodate larger, next-generation ocean-going vessels and provide efficient intermodal connections to rail and truck?

Over the past two decades, motor carriers, railroads, and ports have invested in container facilities to reflect a growing efficiency achieved by containerized transport. Railroads established connections with trucking and ocean-shipping companies so that today, intermodal traffic has grown from 3.1 million trailers and containers in 1980 to 8.8 million in 1998.

Growth in container transportation globally has also contributed to a growth in intermodal transportation. In turn, this has fed demand for larger, specialized container ships and intermodal capacity to handle increased land-side traffic. Today, for example, an increasing proportion of cargo from the Pacific Rim moves through West Coast container ports, particularly Los

Angeles and Long Beach. To accommodate the growing container volume, the Alameda Corridor is being built in California to allow rail lines to haul containers to an Intermodal Container Transfer facility and beyond. Other regions are considering similar facilities. But U.S. ports, the marine transportation system – indeed, the Nation’s transportation network – face significant issues as they strive to meet the future demands for increased freight movements.

- A key to U.S. agriculture’s competitiveness in 21st century world markets will be seamless, flexible, and efficient movement of products, whether they be bulk, homogeneous commodities, trait-specific commodities, or value-added products. How will U.S. ports provide the critical linkages between domestic transportation modes and competitive oceangoing vessels?
- Perhaps as importantly, how will U.S. ports make the necessary changes while addressing environmental, safety, and competing land and water use concerns of other key interested groups and stakeholders as they accommodate the needs of shippers and carriers?

Work is already underway to address many of the pivotal issues facing U.S. ports and the marine transportation system, along with the linkages to rail and inland waterway systems. There is now a Federal interagency collaborative group, consisting of all Federal agencies with an interest or stake in the marine transportation system – for trade, for national security, or a host of other interests – that is examining these issues and developing a strategic vision for addressing the changes that will be needed in the 21st century. In addition, there is a new Federal advisory committee, made up of non-government stakeholders that will work with this interagency group. Thus, some of the critical strategic questions regarding how best to facilitate global commerce will likely come from this organized mechanism already in place.

STRATEGIC QUESTION: HOW CAN WE ENCOURAGE ADEQUATE COMPETITION IN THE NATION’S RAIL SECTOR?

What is the best way to promote competition among railroads and between rail and alternative modes of transportation, to ensure continued cost-effective rail service which is so critically important to shippers of agricultural goods?

- How can government and rail carriers address the concerns that mergers of Class I railroads, with reduced emphasis on common carrier obligations, have led to reduced rail competition?
- What are the service and competitive implications for agriculture of abandoned track, promotion of unit trains, and other Class I rail policies, and what can agricultural shippers expect in the future?
- Should there be more monitoring or closer scrutiny of Class I railroad behavior while consolidation effects continue to be felt, and as new mergers continue to be proposed? In particular, should regulatory bodies focus attention on watching for evidence of price-setting behavior? Should they (regulatory bodies) use federal-state partnerships to maintain rural rail service to rural areas and prevent “isolation” effects; consider repealing the “bottleneck” decision; and promote policies for better, not just bigger, service? What steps can be taken to ensure that the STB is supported in analyzing data about rail performance?
- How do we promote the “bright spots” emerging in short line and regional railroads, that many believe could ameliorate many of the gaps between declining Class I service and overuse of rural roads?
- Or are improvements in local roads, or investments in new highway infrastructure, better ways to preserve service needed for existing businesses to help local areas attract new business to spur economic growth and development, rather than fostering the short line or regional rail sector as an alternative to the Class I railroads?

STRATEGIC QUESTION: WHAT IS NEEDED TO PROMOTE GROWTH & DEVELOPMENT FOR RURAL COMMUNITIES IN AMERICA?

How important is the availability and performance of transportation infrastructure on the economic and social prospects for rural America, and how much emphasis should transportation receive in rural development growth and planning decisions?

The challenges facing rural communities in relation to farmland, quality of rural life, and transportation include the erosion of environmental, cultural, and economic attributes of rural America.

- A key question facing rural communities and their local governments today is how important is the quality and efficiency of the nation’s

transportation system in determining the economic well being and quality of life in rural areas?

- If transportation services are inadequate, will local communities be able to attract new businesses and residents? At the same time, they face the catch-22 that, without a broader economic base in the community, it is difficult to finance the investment in additional transportation services or even to make the necessary improvements to the existing infrastructure.
- Local communities face another dilemma as well: sometimes the transportation investments they make, to encourage growth and development, inadvertently jeopardize their rural quality of life and produce unintended developmental consequences that can erode the very attributes associated with rural community life. How can they best balance these investment decisions of growth at the local level with the desire to preserve a “sustainable” rural lifestyle?
- Increased flexibility to make local decisions about multi-modal use of Federal highway funds under the newly passed TEA-21 Act will significantly help local communities direct funding where it can have the greatest impact for their areas. But, should there be, or is there a need for some type of coordination nationally, or at least regionally, to avoid fragmented or disjointed transportation results among states?
- Should local communities encourage investment in short line and regional railroads? Are these solutions for the transportation gaps that have arisen as Class I railroads adjust their service and policies to improve their efficiency? Small railroads offer local communities advantages of lower labor and operating costs, and they generally allow for greater flexibility in marketing and service. And, because these lines are often owned locally, small railroads can foster a source of pride and greater community involvement in the railroads. Improvements in local roads, or investing in new highway infrastructure could also be considered as possible ways to preserve service needed for existing businesses, and can help local areas attract new business. Given the significant costs associated with starting short line railroads, however, local communities must engage fully in a dialogue with all stakeholders before contemplating such investments, promising as they may appear.

Closing

U.S. Agriculture and rural America face a host of transportation challenges as we enter the 21st century. Efficient and effective transportation will play a key role in the economic vitality of this nation’s farm sector and its rural

areas. Thus, it is critically important that we identify and address the strategic issues and questions that characterize the agriculture-transportation relationship.

Although a number of strategic issues and questions have been identified, USDA encourages feedback and dialogue that expands and sharpens our mutual understanding and assessment of these issues and questions.