



Agricultural Goods Movement System Assessment

Requested by
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Executive Summary

Background

Agriculture plays a crucial role in California's economy, with one-third of the nation's vegetables and two-thirds of its fruits and nuts grown in the state. According to the *California Agricultural Production Statistics: 2018 Crop Year* report, agricultural production in California spanned 25.3 million acres of land, included over 77,100 farms and ranches, and generated \$50.13 billion in sales in 2017. Consequently, the movement of agricultural goods makes up a substantial portion of California's freight, especially during the summer and fall harvest seasons.

To meet the requirements of the federal Fixing America's Surface Transportation (FAST) Act and to qualify for National Highway Freight Program funding, California must produce a state freight plan every five years. The California State Transportation Agency, in consultation with a freight advisory committee, is charged with creating this plan. As the delegated lead for the California Freight Mobility Plan (CFMP) 2020, the California Department of Transportation (Caltrans) is taking the lead in facilitating the California Freight Advisory Committee (CFAC). While developing CFMP 2020, CFAC members and freight stakeholders identified a deficiency in understanding the transportation needs of the agricultural sector, specifically the gaps and deficiencies in the safe, efficient, resilient and sustainable movement of California's agricultural goods.

Caltrans sought information that could be used to develop a future study or studies that will propose projects, policies and recommendations to address these deficiencies. To assist Caltrans in this information-gathering effort, CTC & Associates surveyed three groups about the planning practices associated with their statewide agricultural goods movement systems:

- *State departments of transportation (DOTs)*. Members of the American Association of State Highway and Transportation Officials (AASHTO) Freight Planning Task Force and Committee on Planning.
- *California agencies*. Representatives from a selected group of California counties and metropolitan planning organizations (MPOs).
- *Private sector*. Representatives from a selected group of California organizations expected to have experience with the movement of agricultural goods.

A literature search supplemented the information gathered through these surveys.

Summary of Findings

This Preliminary Investigation presents findings from these efforts in three topic areas:

- Survey of public sector agencies.
- Survey of private sector organizations.
- Related research and resources.

Survey of Public Sector Agencies

Sixteen public agencies responded to the survey, including 11 state DOTs: Delaware, Illinois, Minnesota, New Hampshire, New Mexico, North Dakota, Ohio, Washington, West Virginia, Wisconsin and Wyoming. Other public agencies participating in the survey were the Association

of Monterey Bay Area Governments (AMBAG), Glenn County Transportation Commission, Kern Council of Governments (Kern COG), Shasta Regional Transportation Agency (SRTA) and Sutter County. Survey results are presented below in the following categories:

- Current efforts and future plans.
- Funding.
- Assessment.

Current Efforts and Future Plans

Planning Efforts

Seven of the 16 public agency respondents—Delaware, Minnesota, Ohio, Washington State and Wisconsin DOTs; AMBAG; and Kern COG—reported on statewide planning efforts specific to agricultural goods movement:

- In Delaware, freight plans were created that focused on agriculture, including factors such as vehicle weights, seasonal vehicle weights for some agricultural commodities, escort vehicles for slow and large equipment, and awareness signage. Several commodity flow studies also examined agricultural supply chains and transport connections.
- Minnesota DOT is participating in emergency preparedness discussions with a statewide advisory committee to prepare for moving food to areas that have an immediate need due to supply chain disruptions or food scarcity during an emergency.
- Planning efforts in Ohio are included within the state's freight, maritime and rail plans, and its long-range transportation plan. These plans consider permitted weights for seasonal loads, port infrastructure on the Great Lakes and Ohio River, and transloading facilities and intermodal hubs.
- Washington State DOT also details planning efforts in the state's freight, maritime and rail plans.
- The Implements of Husbandry (IoH) Study Group in Wisconsin addresses the impacts of larger, heavier agricultural equipment on pavement and road infrastructure. The group comprises representatives from the transportation sector, farm organizations, equipment manufacturers, law enforcement, local officials and the University of Wisconsin—Madison/Extension.
- In partnership with other agencies, AMBAG produced an interregional study that addresses goods movement on U.S. 101, a critical freight corridor between San Francisco and Los Angeles.
- Kern COG is conducting a study that will examine strategies to improve the sustainability of increased goods movement in the region and the impacts on the transportation system and surrounding communities, including disadvantaged communities.

North Dakota DOT reported that the majority of freight moved within the state is agricultural, and it considers its statewide general freight plan sufficient for planning agricultural goods movement.

Five agencies—Illinois and New Mexico DOTs, Glenn County, SRTA and Sutter County—are initiating a statewide planning effort specific to agricultural goods movement. Illinois DOT will be completing district-level freight plans, which are expected to capture more agricultural goods

movement on a local level. The Glenn County Transportation Commission plans to study the effects of the seasonal nature of agricultural activities on transportation assets and how local agencies can better support agricultural operations. SRTA and other key stakeholders produced the Far-Northern California Food Hub Study, which investigated the feasibility and potential benefits of a food hub located in the Shasta region.

Statewide and Regional Plans

Only AMBAG reported having statewide agricultural goods movement plans, noting that although the U.S. 101 Central Coast California Freight Strategy and Central Coast California Commercial Flows Study are regional and interregional in nature, they address key agricultural goods movement facilities with statewide implications.

Three agencies discussed regional agricultural goods movement plans that are either published or under development. Completed plans were provided by Minnesota DOT (Amber Roads of Grain) and Kern COG (California Inland Port Feasibility Analysis: Preliminary Business Model). AMBAG has been “closely following” Caltrans’ work on freight and goods movement planning.

Many unique collaborations and partnerships were reported to plan and move agricultural products. Five DOTs—Delaware, Illinois, Minnesota, North Dakota and Ohio—collaborate with state agriculture departments; both AMBAG and Kern COG discussed collaborative efforts with Caltrans. Also reported were collaborations with other state agencies (Delaware, Minnesota, New Mexico and Washington); freight advisory committees (North Dakota); farm bureaus (Ohio); law enforcement (Delaware); and universities (Washington).

In addition, nine agencies have established partnerships with:

- Commodity-specific cooperatives (Delaware, Illinois, Minnesota and New Mexico DOTs).
- Large agricultural conglomerates (Delaware, Illinois, Ohio and Wisconsin DOTs).
- Regional agricultural conglomerates (SRTA).
- MPOs (AMBAG and Delaware, Illinois, Ohio and Wisconsin DOTs).
- Other key agricultural goods movement stakeholders, such as trade and agri-business associations (SRTA and Minnesota, Ohio, Washington and Wisconsin DOTs) and a freight strategy task force (AMBAG).

Numerous state freight, rail and maritime plans; strategies; and studies provided by survey respondents are included in this report.

Data Sources

Ten of the 16 agencies reported on sources used to gather data for planning agricultural goods movement. State agriculture departments (Delaware, Minnesota and North Dakota DOTs); the U.S. Department of Transportation Freight Analysis Framework (FAF) (AMBAG and Illinois, Ohio and Washington State DOTs); various U.S. Department of Agriculture (USDA) resources (Minnesota, North Dakota and Wisconsin DOTs); and IHS Transearch (Delaware, Illinois and Wisconsin DOTs) were most frequently cited from a broad range of sources. Other common data sources included truck count data (AMBAG and Kern COG); ports data (Ohio and Washington State DOTs); and business data and modeling software (AMBAG and Ohio DOT).

Tracking Agricultural Goods Movement

AMBAG, Delaware DOT and Minnesota DOT have attempted to track the movement of agricultural goods through a product's complete life cycle—from harvest to packaging, distribution and point of sale. AMBAG's U.S. 101 Central Coast California Freight Strategy has assessed the supply chains of certain commodity categories, but not a single product from a specific producer. Delaware DOT has tracked movement for poultry: from eggs (from North Carolina) to chicks (brought to Delaware) and adult and finished products. Minnesota DOT and the University of Minnesota tracked movements of grains from point of production to export location (detailed in Amber Roads of Grain). In addition, the agency studied commodity flows statewide at a high level as part of its freight system plan. SRTA has attempted to track agricultural goods movement, but the available data and lack of access to private sector data did not support the effort.

Funding

AMBAG, Kern COG and Minnesota DOT described funding efforts related to agricultural goods movement in three areas:

- **Assessing the impacts on the state transportation system.** AMBAG and Minnesota DOT reported on practices to assess the impacts of the agricultural goods movement industry on pavement degradation, seasonal movements, traffic congestion and other elements of the transportation system. AMBAG's U.S. 101 Central Coast California Freight Strategy reported the impacts from 2016 but the agency does not conduct assessments annually.

Minnesota DOT has developed a pavement model that identifies the structural degradation of pavement quality based on heavy vehicle traffic counts. The agency is also studying the impacts of overweight vehicles (including those carrying agricultural loads) on pavements and bridges.

- **Specifying types of agency-funded projects.** AMBAG has previously funded planning projects related to agricultural goods movement. Because the Kern COG region is a significant producer of agricultural products, the agency considers every highway project funded as an agriculture-related project. Minnesota DOT does not fund projects specifically defined as agricultural goods movement projects, but has employed a project selection policy developed as part of the state's highway investment plan. The plan defines specific criteria that assign a project score in one of several investment categories, such as system stewardship, transportation safety, critical connections and healthy communities.
- **Funding from regional transportation agencies or MPOs.** Kern COG offers funding for all major state highway projects. In Minnesota, eight Area Transportation Partnerships fund highway and bridge projects that include qualitative discussions around the needs of agricultural goods movement. Created to increase public involvement in regional transportation planning, these partnerships comprise members from local governments, regional planning agencies, tribal governments, transit and other organizations with transportation interests.

None of the three agencies offers funding programs for agricultural goods movement improvements to address impacts to the state transportation system, provide specific criteria or a definition that a project must meet to be considered an agricultural goods movement project, or subsidize the movement of a specific agricultural commodity.

Assessment

Challenges in Agricultural Goods Movement

AMBAG, Kern COG and Minnesota DOT described both challenges and effective practices associated with the movement of agricultural goods.

Private industry representatives in the AMBAG region report two critical workforce shortages: agricultural laborers, as a result of tightening border immigration and visa policies; and truck drivers, which can limit the industry's ability to move product on time and on budget without spoilage. Minnesota's workforce is specifically impacted by an increasing agglomeration of farms and the mechanization of individual farm labor. Recent market forces have also caused significant financial pressure on farming within the region. Small- to medium-sized farms are finding it increasingly difficult to net sustainable profits.

Other challenges include:

- Rural infrastructure, specifically truck traffic on rural roads in the harvesting areas of Salinas Valley (AMBAG) and unfinished highway systems in rural areas (Kern COG).
- Traffic congestion during peak harvest season in urban areas, especially at key intersections near freight processing hubs (AMBAG).
- Pavement deterioration on local roads (AMBAG and Kern COG) and on state road interchanges and intersections near key urban agricultural goods processing hubs (AMBAG).
- Delays in truck, tourist and commuter traffic when the harvest season and tourist season overlap (AMBAG).
- Truck routing (Kern COG).
- Traffic safety (AMBAG and Kern COG).

None of the three agencies described challenges related to climatic considerations or movement of equipment or livestock.

Effective Practices

Effective practices to improve agricultural goods movement include farming buffers around public waters, streams, rivers, lakes and ponds to reduce direct runoff (Minnesota DOT); regulated use of pesticides, fertilizers and other products (Minnesota DOT); widening rural highways to improve safety (Kern COG); and working with large agricultural producers during harvest season to reduce traffic congestion (Minnesota DOT).

None of the three agencies shared practices related to urban infrastructure, movement of livestock or equipment, pavement deterioration (local or state roads), traffic congestion, traffic routing or traffic safety.

Survey of Private Sector Organizations

Two private sector organizations responded to the survey:

- California Cattlemen's Association (CCA), a lobbying organization that does not engage in the analysis or logistics of agricultural goods movement. Survey responses highlight obstacles that CCA members have reported about the efficient movement of livestock, feed and related goods.
- California Cotton Ginners and Growers Association (CCGGA).

California Trucking Association noted that the survey was directed to the agriculture industry, making it difficult for the association to provide information. The association representative was asked to encourage selected agricultural carrier members to provide information that was available to them, however, no further response was received from the association.

Survey results from CCA and CCGGA are presented below in the following categories:

- Current efforts.
- Assessment.

Current Efforts

Collaboration and Partnerships

CCA and CCGGA both collaborate with federal agencies (U.S. Environmental Protection Agency and Federal Motor Carrier Safety Administration) and state agencies (California Air Resources Board (CARB), California Highway Patrol (CHP) and University of California Cooperative Extension) to move agricultural goods. Both associations also partner with national and regional organizations, such as the National Cattlemen's Beef Association and the San Joaquin Valley Air Pollution Control District. Neither agency collaborates with MPOs, commodity-specific cooperatives, large agricultural conglomerates or regional agricultural cooperatives.

Data Sources

Association membership is the primary source used by both organizations to gather data for agricultural goods movement planning. CCGGA relies on surveys of its members. Because CCA is primarily engaged in policy advocacy, any analysis or planning related to agricultural goods movement is largely based on anecdotal reports from its members.

Tracking Agricultural Goods Movement

Neither organization has attempted to track agricultural goods movement through the full life cycle of a specific commodity—from harvest to packaging, distribution and point of sale.

Assessment

Challenges in Agricultural Goods Movement

CCGGA identified workforce challenges with reliable drivers, CARB truck regulations and port-related limitations. Other challenges were associated with:

- *Climatic considerations.* Restricted use of certain additives in biodiesel fuel makes feed trucks and other agricultural vehicles inoperable during severe cold weather events. Air quality regulations on CCGGA member trucks place significant pressure on trucking firms, especially independent owners/operators. Vehicle weight limitations also force members to make more trips than necessary.
- *Rural infrastructure.* Complying with California's intrastate hours of service regulations is difficult, given that ranch roads and rural roads used by CCA are often dirt or gravel roads that require vehicle operators to navigate at low speeds. These conditions add hours to a hauler's trip and potentially trigger a required break that can impact the well-being of the livestock being transported.

Also, some paved rural roads are in such disrepair that ranchers are unable to access cattle with a truck/trailer, requiring ranchers to drive cattle long distances by foot to reach a suitably maintained portion of road.

- *Movement of livestock.* CHP routinely stops farmers and ranchers for alleged licensing violations. Improved training for CHP about licensing regulations could alleviate this issue.

Additionally, the 26,000-pound vehicle limit may be too restrictive given modern advancements that substantially increase the weight of trucks. However, resolving that issue would likely require changes to both federal and state laws and regulations.

- *Movement of equipment.* Ranchers report that California's maximum length for truck/trailer combinations as mandated by the California Vehicle Code is overly restrictive.
- *Seasonal movement.* Roadblocks set up by CHP and the California Department of Forestry and Fire Protection (CAL FIRE) during fire season preclude ranchers from accessing livestock and threaten the animals' survival. Securing passes from the local sheriff's office to bypass these roadblocks is often challenging. A time-sensitive, statewide protocol is needed that permits ranchers to rescue their livestock.
- *Traffic congestion.* Traffic congestion increases drive time, which is associated with the hours of service concerns noted earlier.

Neither agency shared challenges related to urban infrastructure, pavement deterioration (local or state roads), traffic routing or traffic safety.

Effective Practices

CCGGA provided effective practices related to climatic considerations and rural infrastructure:

- *Climatic considerations:*
 - Air quality incentive funds to help companies replace their trucks.
 - Increased vehicle weight limitations to allow for fewer trips.
- *Rural infrastructure:* Using regional rail facilities to limit truck traffic into ports.

Neither agency shared practices related to urban infrastructure, movement of livestock or equipment, seasonal movement, pavement deterioration (local or state roads), traffic congestion, traffic routing or traffic safety.

Related Research and Resources

A literature search of domestic and international resources produced publications and other materials related to agricultural goods movement topics addressed in this Preliminary Investigation.

Domestic Research

Transportation Modes and Regional Movement

A 2010 USDA study examines agricultural transportation issues in rural areas reported in four major modes of transportation commonly used by agriculture in the United States: trucking, railroads, barges and ocean vessels. The report presents broad issues about current and future transportation needs for policymakers to consider. A 2018 USDA-funded study encompassed a 17-state area to assess the state of the short line industry and its role in the grain logistics

system. Short line railroads were found to be economically significant to the agricultural industry but insufficient funding inhibited capital investments for infrastructure and equipment.

The impact of changes in agricultural transportation technology, infrastructure and transportation cost on the regional and international competitiveness of California specialty crop industries was addressed in a 2012 USDA study. Among the study's goals was an objective to suggest changes and improvements in existing transportation mode services to policymakers and other agricultural transportation stakeholders involved with agricultural transportation issues. Key study findings: Transportation costs, shipping point prices and product availability all have an effect on California specialty crop competitiveness but the effects of each are not uniform; and highway infrastructure with an emphasis on congestion, logistical inefficiencies with regards to loading and unloading produce, and the California regulatory environment will be challenges in the future.

A 2017 study reviews the relocation of agricultural production in Florida DOT's District One. Findings focus on how this shift impacts key transportation corridors and local and state roads, identifies areas for future hubs for freight activity, and may be useful in other transportation planning efforts.

Operations and governance were examined in a 2015 Illinois study that assesses the impact and challenges of increasing containerized movements of agricultural commodities from hinterland points to overseas markets. A number of major operational issues, actions, rules and policies are considered that affect the containerized flow and its total landed cost.

Data Collection and Modeling

A 2017 FHWA report describes a South Dakota project that combined data from transportation and agriculture sources to inform transportation planning. Researchers successfully demonstrated this data-driven approach in a five-county region in central South Dakota. Two 2016 regional studies of the Upper Midwest estimate the needs of the agriculture freight transportation network using remote sensing and climate models to project future demands of the area's food system. Using multiple tools allowed researchers to gain "a deeper understanding of how national and regional food systems work today, and how long-term food shipment trends impact current and future food production and markets."

To help planners and policymakers understand how reducing freight emissions would affect the freight system, Washington State DOT collected both qualitative and quantitative data from two of the state's major supply chains: wheat production and food delivery in 2017. The results show opportunities to reduce greenhouse gas emissions, including converting from traditional to alternative fuels, diesel retrofits, emission treatment technologies or idle reduction devices. A related effort is described in 2016 research by Washington State DOT and FHWA to apply novel data collection approaches to better understand Washington's food distribution supply chains.

A 2011 journal article details efforts to quantify investments needed for local and county roads used for agricultural logistics and provide policymakers with information about the locations and repair costs of high-priority road segments in North Dakota.

Freight Transportation System Challenges

Other state research includes a 2011 Iowa DOT project that provided insight into the impact of agricultural enterprises on roadway infrastructure and to facilitate the understanding needed to implement broader energy-related policy and planning. The impacts of food systems on

infrastructure are correlated to the external cost of the distribution of the food system, such as emissions, congestion, safety and pavement deterioration costs. A 2011 Minnesota DOT study investigates the effects of farm equipment on pavement performance.

A 2011 USDOT report examines the feasibility of investment in intermodal terminals in rural Texas to reduce roadway maintenance costs, greenhouse gases and truck transportation in metropolitan areas of Texas. The analyses show an intermodal terminal in Lubbock, an intensive cotton production region, would be economically viable, reducing loaded truck-miles on state roadways, carbon dioxide emissions and truck-travel in Dallas-Fort Worth.

International Research

International research includes two Canadian resources that discussed the use of life cycle assessment to measure the environmental impact of pea and egg production. The goal of the assessment is to set a benchmark and identify best practices that lead to more efficient food production. A 2015 journal article re-examines transportation allocation and infrastructure capacity problems associated with moving grain from western Canada to market. Using grain industry data and geographic information system software, researchers identified supply chain solutions that enhance delivery efficiency.

Gaps in Findings

The survey response from public sector agencies, especially California counties and MPOs, was limited. Only five California public agencies responded to the survey, and only two provided detailed responses. Nationally, only 11 state DOTs responded to the survey. The survey response from private sector organizations was equally limited, with only two of 11 organizations supplying information. Caltrans could benefit from additional inquiries to nonresponding public sector agencies and private sector organizations such as the California Trucking Association to identify valuable policies and practices that could be adopted by California's agricultural goods movement system.

Next Steps

Moving forward, Caltrans could consider:

- Engaging with AMBAG, Kern COG and Minnesota DOT about the planning, funding and assessment practices used by these agencies. Minnesota DOT's modeling practices that identify the structural degradation of pavement quality based on heavy vehicle traffic counts and overweight vehicles may be of interest to Caltrans.
- Reviewing the numerous state freight, rail and maritime plans, strategies and studies provided by public sector survey respondents for guidance and practices related to agricultural goods movement.
- Connecting with the California Trucking Association for potential contacts with selected agricultural carrier members to better understand their experience with the movement of agricultural goods.
- Reaching out to other nonresponding organizations in both the public and private sectors for more targeted information.
- Reviewing the publications and resources identified in the literature search for additional guidance and research related to agricultural goods movement planning.
- Evaluating the concerns from the private industry regarding regulations that interfere with agricultural goods movement.

Detailed Findings

Background

Agriculture plays a crucial role in California's economy. The state's agricultural products are vital to both the nation's and the world's health and well-being. One-third of the country's vegetables and two-thirds of the country's fruits and nuts are grown in California. According to the *California Agricultural Production Statistics: 2018 Crop Year*, agricultural production in California spanned 25.3 million acres of land, included over 77,100 farms and ranches, and generated \$50.13 billion in sales in 2017. Consequently, the movement of agricultural goods makes up a substantial portion of California's freight, especially during the summer and fall harvest seasons.

To meet the requirements of federal and state legislation (such as Fixing America's Surface Transportation (FAST) Act, California Assembly Bill 14 and California State Government Code Section 13978.8(b)(1)) and to qualify for National Highway Freight Program funding, California must produce a state freight plan every five years. The California State Transportation Agency, in consultation with a freight advisory committee, is charged with creating this plan. The California Department of Transportation (Caltrans) is the delegated lead for the California Freight Mobility Plan (CFMP) 2020 and the lead in facilitating the California Freight Advisory Committee (CFAC). While developing CFMP 2020, CFAC members and freight stakeholders identified a deficiency in the understanding of the transportation needs of the agricultural sector, specifically the needs, gaps and deficiencies in the safe, efficient, resilient and sustainable movement of California's agricultural goods.

Survey of Practice

Survey Approach

Caltrans sought information from the following public and private agencies to inform a future study or studies that will propose projects, policies and recommendations for the California agricultural goods movement system:

State departments of transportation (DOTs). Members of the American Association of State Highway and Transportation Officials (AASHTO) Freight Planning Task Force and Committee on Planning.

California agencies. Representatives of the following California counties and metropolitan planning organizations (MPOs):

- Governor's Office of Business and Economic Development.
- Association of Monterey Bay Area Governments (AMBAG).
- Butte County Association of Governments.
- Colusa County Transportation Commission.
- Fresno County Farm Bureau.
- Glenn County.
- Kern Council of Governments (COG).
- Kern County Farm Bureau.
- Kings County Farm Bureau.
- Madera County Farm Bureau.
- Sacramento Council of Governments.

- San Joaquin Council of Governments.
- Shasta Regional Transportation Agency (SRTA).
- Sutter County.
- Tulare County Farm Bureau.
- Yuba County.

Private sector organizations. Representatives from the following private sector organizations:

- Almond Alliance.
- California Cattlemen’s Association.
- California Cotton Ginners and Growers Association.
- California Trucking Association.
- Dairy Institute.
- Far-Northern California Food Hub Study.
- G3 Enterprises.
- Pacific Coast Producers.
- Sunkist.
- Western Growers.
- Wonderful Company.

To assist Caltrans in this information-gathering effort, CTC & Associates surveyed these three groups about policies and practices associated with agricultural goods movement. Survey questions are provided in [Appendix A](#). The full text of survey responses is presented in a supplement to this report. A literature search supplemented the information gathered through these surveys.

Summary of Survey Results

Survey results are summarized below in two categories:

- Public sector agencies.
- Private sector organizations.

Public Sector Agencies

Sixteen public agencies responded to the survey:

State DOTs

- Delaware (partial response).
- Illinois.
- Minnesota.
- New Hampshire.
- New Mexico.
- North Dakota.
- Ohio (partial response).
- Washington.
- West Virginia.
- Wisconsin.
- Wyoming.

Other Public Agencies

- AMBAG.
- Glenn County Transportation Commission.
- Kern COG.
- SRTA.
- Sutter County.

Survey results are presented below in the following categories:

- Current efforts and future plans.
- Funding.
- Assessment.
- Supporting documents.

Current Efforts and Future Plans

Planning Efforts

Seven of the 16 public agency respondents—Delaware, Minnesota, Ohio, Washington State and Wisconsin DOTs; AMBAG; and Kern COG—reported on statewide planning efforts specific to agricultural goods movement:

Delaware DOT. In response to the FAST Act and the Moving Ahead for Progress in the 21st Century Act (MAP-21), Delaware DOT created freight plans with a focus on agriculture. Factors studied include vehicle weights, seasonal vehicle weights for certain agricultural commodities, escort vehicles for slow and large equipment, and awareness signage. The agency has also conducted several commodity flow studies that examine agricultural supply chains and transport connections.

Minnesota DOT. Minnesota DOT is participating in emergency preparedness discussions with a statewide advisory committee to prepare for moving food to areas that have an immediate need due to supply chain disruptions or food scarcity during an emergency such as the current COVID-19 pandemic.

The respondent added that since 2013, the agency has been interviewing Minnesota businesses from all sectors to better understand their specific freight transportation requirements. Information gathered from these interviews is summarized in *Manufacturers' Perspectives* (see Supporting Documents, page 26) and helps Minnesota DOT identify low-cost/high-value opportunities to provide a more responsive transportation system that focuses on infrastructure, maintenance, communication, and permitting and policy.

Ohio DOT. Planning efforts in Ohio are included within the state's freight plan, maritime and rail plans, and long-range transportation plan (see Supporting Documents, page 28). Factors studied as part of the freight system are permitted weights for seasonal loads, port infrastructure on the Great Lakes and Ohio River, transloading facilities and intermodal hubs.

Washington State DOT. Planning efforts for moving agricultural products are detailed in the Washington State Freight and Goods Transportation System Update, Marine Ports and Navigation Plan, Washington State Rail Plan, and Palouse River and Coulee City Rail System strategic plan (see Supporting Documents, page 29).

Wisconsin DOT. The agency and the Wisconsin Department of Agriculture, Trade and Consumer Protection established the Implements of Husbandry (IoH) Study Group to address the impacts of larger, heavier agricultural equipment on pavement and road infrastructure (see Supporting Documents, page 30). The group includes representatives from the transportation sector, farm organizations, equipment manufacturers, law enforcement, local officials and the University of Wisconsin—Madison/Extension.

AMBAG. In addition to supporting the Caltrans CFMP 2020, AMBAG partnered with Caltrans District 5, Santa Barbara County Association of Governments (SBCAG) and San Luis Obispo COG (SLOCOG) to produce the U.S. 101 Central Coast California Freight Strategy in 2016 (see Supporting Documents, page 22). The interregional study addresses goods movement on U.S. 101 along “a critical freight corridor between the San Francisco and Los Angeles metro areas.” AMBAG is very interested in participating in any agricultural goods movement studies with state partners.

Kern COG. The Kern Area Regional Goods Movement Operations (KARGO) sustainability study will “evaluate strategies to improve the sustainability of growing regional goods movement activity in Kern County and [the] impacts on the transportation system and surrounding communities, including disadvantaged communities” (see Supporting Documents, page 23). The focus of the study is on exports (agricultural products) and imports to the region. Phase II of the study is funded through the Caltrans Sustainable Communities Grant Program. The respondent noted that Inland Port Authority is needed to facilitate agricultural exports.

Of the nine agencies not currently supporting this type of planning effort, five have plans to initiate one:

Illinois DOT. The agency will be completing district-level freight plans, which is expected to capture more agricultural goods movement on a local level.

New Mexico DOT. The agency continues to look for ways to improve the New Mexico Freight Plan (see Supporting Documents, page 27) and better collaborate with and support transportation partners with their respective plans.

Glenn County. The Glenn County Transportation Commission plans to study the effects of the seasonal nature of agricultural activities on transportation assets and how local agencies can better support agricultural operations. The agency is interested in looking at the impacts to the system and improving efficiencies to get products to market.

SRTA. In partnership with a consultant and representatives from the private sector, this MPO produced the Far-Northern California Food Hub Study (see Supporting Documents, page 24). As part of this effort, SRTA contacted state partners, including GO-Biz and Caltrans Freight and Rail, and other key stakeholders inside the region (economic development representatives) and outside the region (including G&Y Transport Services and California Northern Short Line Railroad).

According to the respondent, agriculture in northern California is dominated by a few counties (such as Tehama County) and producers (including nut and olive growers). The balance is cumulatively significant, but not organized in a way to take advantage of economies of scale and agricultural goods movement. The respondent added that this issue could be addressed in the state plan and have “great value and impact to our region, the North State and California.”

Sutter County. Although no plans have been developed, Sutter County has discussed this effort with county supervisors. The respondent noted a “lack of cooperation” from other county departments for a plan.

North Dakota DOT reported that the majority of freight moved within the state is agricultural, and it considers its statewide general freight plan sufficient for planning agricultural goods

movement. According to the respondent, the statewide freight plan is comprehensive and includes seasonal movements, large equipment and the needs of agricultural communities.

Statewide Plans

Only AMBAG reported having statewide agricultural goods movement plans: U.S. 101 Central Coast California Freight Strategy and Central Coast California Commercial Flows Study (see Supporting Documents, page 22). While these plans are regional and interregional in nature, they address key agricultural goods movement facilities with statewide implications.

Regional Plans

Of the 16 agencies, three discussed regional agricultural goods movement plans that are either published or under development. Completed plans were provided by Minnesota DOT (Amber Roads of Grain) and Kern COG (California Inland Port Feasibility Analysis: Preliminary Business Model) (see Supporting Documents, page 23). The AMBAG respondent noted that the agency has been “closely following” Caltrans work on freight and goods movement planning.

Collaboration and Partnerships

Agencies have formed unique collaborations with other state agencies and organizations to plan and move agricultural goods. Five DOTs (Delaware, Illinois, Minnesota, North Dakota and Ohio) collaborate with state agriculture departments. Both AMBAG and Kern COG reported collaborative efforts with Caltrans. Additional information from agencies follows:

- In New Mexico, where timber is classified as an agricultural product, New Mexico DOT has recently begun collaborating with the New Mexico Energy, Minerals and Natural Resources Department in developing the New Mexico Forest Action Plan (see Supporting Documents, page 27).
- North Dakota has an active Freight Advisory Committee that includes a representative from the agricultural industry.
- In Ohio, where seasonal permitted weight limits for trucks has increased, the DOT occasionally interacts with the Ohio Farm Bureau. For a few years the Ohio Department of Agriculture hosted an agriculture and transportation group to address agricultural goods movement planning. The DOT respondent added that a few years ago, Ohio DOT assisted the Wilmington Airport with live animal transport by air from a quarantine facility to international destinations.
- Washington State DOT collaborates with Washington State University for research and project implementation related to wheat and agricultural goods movement. The transportation agency also owns a short line rail system and grain train cars that help move agricultural products from the eastern portion of the state to market. This rail system has a strategic plan (see Supporting Documents, page 29) and receives funding in the form of grants and loans from the state Legislature.

Table 1 summarizes survey responses.

Table 1. Collaborators in Agricultural Goods Movement Planning

Agency	State Agencies	Other
AMBAG	Caltrans	
Delaware DOT	<ul style="list-style-type: none"> • Delaware Emergency Management Agency • Department of Agriculture • DOT Traffic Operations • State police 	Local police
Illinois DOT	Department of Agriculture	
Kern COG	Caltrans	
Minnesota DOT	<ul style="list-style-type: none"> • Department of Agriculture • Department of Health • Statewide Food Security Work Group 	
New Mexico DOT	Energy, Minerals and Natural Resources Department	
North Dakota DOT	<ul style="list-style-type: none"> • Department of Agriculture • Freight Advisory Committee 	
Ohio DOT	Department of Agriculture	Ohio Farm Bureau (occasionally)
SRTA		Far-Northern California Food Hub Study
Washington State DOT	Washington Grain Train	Washington State University

In addition, nine agencies have established partnerships with commodity-specific cooperatives, large agricultural conglomerates, regional agricultural conglomerates, MPOs and/or other stakeholders in the agricultural goods movement:

Commodity-Specific Cooperatives

Delaware: Poultry processing industry representatives, especially on the “transportation side.”

Illinois: Illinois Soybean Association.

Minnesota:

- Minnesota Grain and Feed Association.
- Minnesota Soybean Alliance.

New Mexico: Coordinating timber harvesting to improve permitting and bridge rating in a region of New Mexico that is used by the timber industry.

Large Agricultural Conglomerates

Delaware: Corporate representatives.

Illinois: ADM (Archer-Daniels-Midland Company), a multinational food processing and commodities trading corporation.

Ohio:

- Business and industry doing business in Ohio to collaborate with freight transport needs, maritime transport at ports and terminals.

- State freight plan stakeholders.
- Freight Advisory Council members.

Wisconsin: DeLong Company, Inc., an agricultural products wholesaler.

Regional Agricultural Cooperatives

SRTA: Shasta Growing Local/Our Smart Farms.

MPOs

AMBAG:

- Caltrans District 5.
- SBCAG.
- SLOCOG.

Delaware: Three counties, each with an MPO.

Illinois: All in-state MPOs (16).

Ohio: All in-state MPOs (17) and five in-state regional transportation planning organizations.

Wisconsin:

- All in-state MPOs.
- Duluth-Superior Metropolitan Interstate Council.

Other

AMBAG: Freight Action Strategy Taskforce, formed in 2016 to advise on the U.S. 101 Central Coast California Freight Strategy. The task force comprises private industry agricultural representatives, rail operators, highway patrol and other stakeholders.

Minnesota:

- Midwest Shippers Association.
- Minnesota Freight Advisory Committee.

Ohio: Ohio Farm Bureau.

SRTA:

- Superior California Economic Development.
- Some outreach (such as interviews and surveys) with private sector partners but no established partnerships.

Washington: Many stakeholders previously described currently participating in an agency-led effort to develop a freight advisory committee.

Wisconsin:

- Department of Agriculture, Trade and Consumer Protection.
- Madison International Trade Association.
- Midwest Food Products Association.
- Wisconsin Agri-Business Association.
- Wisconsin Farm Bureau Federation.

Data Sources

Ten of the 16 agencies reported on sources used to gather data for planning agricultural goods movement. State agriculture departments, the U.S. Department of Transportation Freight Analysis Framework (FAF), various U.S. Department of Agriculture (USDA) resources and IHS Transearch were most frequently cited from a broad range of sources. The Wisconsin DOT respondent added that the agency seeks to enhance its data for agricultural planning efforts through enhanced collaboration. Table 2 summarizes survey responses.

Table 2. Sources of Data for Agricultural Goods Movement Planning

Data Source	Agency	Description
FAF	AMBAG, Illinois DOT, Ohio DOT, Washington State DOT	AMBAG: FAF3 and FAF4.
IHS Transearch	Delaware DOT, Illinois DOT, Wisconsin DOT	N/R.
PIERS/Ports Data	Ohio DOT, Washington State DOT	Ohio DOT. Port Import/Export Report Service (PIERS) data in the past. Washington State DOT. Ports data.
State Department of Agriculture	Delaware DOT, Minnesota DOT, North Dakota DOT	Minnesota DOT. Production and crop location data.
Truck Count Data	AMBAG, Kern COG	Kern COG: Annual truck count survey.
USDA	Minnesota DOT, North Dakota DOT, Wisconsin DOT	Minnesota DOT. USDA production and crop location data. North Dakota DOT. USDA web site. Wisconsin DOT. USDA Agricultural Transport Open Data Service.
Other	AMBAG, Delaware DOT, Kern COG, Minnesota DOT, Ohio DOT, SRTA, Washington State DOT, Wisconsin DOT	<p>AMBAG:</p> <ul style="list-style-type: none"> • Caltrans: <ul style="list-style-type: none"> ○ Annual average daily traffic (AADT). ○ Statewide Integrated Traffic Records System (SWITRS). ○ Truck data. • ESRI Business Analyst business data. • IMPLAN economic modeling software. • InfoUSA business data. • SHRP Calculator. • U.S. Bureau of Economic Analysis. • U.S. Bureau of Labor Statistics employment projections. <p>Delaware DOT. Farm Bureau.</p> <p>Minnesota DOT. Production and crop location data from the University of Minnesota (Agricultural) Extension Service.</p> <p>Ohio:</p> <ul style="list-style-type: none"> • Commodity flow. • Dun & Bradstreet. • StreetLight transportation planning data. • Subconsultants (with access to specific data sets). • Ohio DOT Travel Demand Modeling group (which has access to extended data).

Data Source	Agency	Description
Other	AMBAG, Delaware DOT, Kern COG, Minnesota DOT, Ohio DOT, SRTA, Washington State DOT, Wisconsin DOT	<p><i>SRTA:</i></p> <ul style="list-style-type: none"> • Data gathered for the North State Transportation for Economic Development Study (see Supporting Documents, page 25) and for the Far-Northern California Food Hub Study (see Supporting Documents, page 24). • Various sources, including weigh station data. <p><i>Washington:</i> Waybill sample.</p> <p><i>Wisconsin:</i> Proprietary data.</p>

N/R No response.

Tracking Agricultural Goods Movement

Only three agencies (AMBAG, Delaware DOT and Minnesota DOT) described attempts by their agencies to track the movement of agricultural goods through the complete life cycle of a specific commodity—from harvest to packaging, distribution and point of sale:

- AMBAG reported that the U.S. 101 Central Coast California Freight Strategy (see Supporting Documents, page 22) has assessed the supply chains of certain commodity categories, but not one single specific product from a specific producer.
- Delaware DOT has only tracked movement for poultry. Tracking components include eggs (from North Carolina), chicks (brought to Delaware), adult products and finished products.
- As part of the Amber Roads of Grain study, Minnesota DOT worked with the University of Minnesota to track movements of grains from point of production to export location. In addition, commodity flows were studied statewide at a high level as part of the Statewide Freight System and Investment Plan (see Supporting Documents, page 26).

The Washington State DOT respondent indicated that the agency has tracked movement, but he did not provide details and instead noted other freight plans that have tracked movement such as the City of Seattle Freight Plan.

SRTA attempted to track this movement, but the available data and lack of access to private sector data did not support the effort.

Funding

Three agencies—AMBAG, Kern COG and Minnesota DOT—described efforts to fund the movement of agricultural goods:

Assessing Impacts on the State Transportation System

AMBAG and Minnesota DOT reported on practices to assess the impacts of the agricultural goods movement industry on the state transportation system, such as pavement degradation, seasonal movements and traffic congestion. AMBAG reported the impacts from 2016 in the U.S. 101 Central Coast California Freight Strategy (see Supporting Documents, page 22). (*Note:* AMBAG does not conduct assessments annually.)

Minnesota DOT has developed a pavement model that identifies the structural degradation of pavement quality based on heavy vehicle traffic counts. Data is organized by automatic traffic recorders and weigh-in-motion systems and defined by vehicle class. In addition, the

agency is studying the impacts of overweight vehicles, including those with agricultural loads, on pavements and bridges.

Funding Programs to Address Impacts

None of the three agencies offer funding programs for agricultural goods movement improvements to address impacts to the state transportation system.

Defining Criteria for Agricultural Goods Movement Projects

None of the three agencies provide specific criteria or a definition that a project must meet to be considered an agricultural goods movement project.

Specifying Types of Agency-Funded Projects

AMBAG has previously funded planning projects related to agricultural goods movement. The Kern COG respondent noted that Kern is “the No. 1 agriculture-producing county in the nation [and] every highway project we fund is an ag project.” Minnesota DOT does not fund projects specifically defined as agricultural goods movement projects, but has employed a project selection policy from the Minnesota State Highway Investment Plan (see Supporting Documents, page 26). The plan defines specific criteria that identify a project score in one of several investment categories, such as system stewardship, transportation safety, critical connections and healthy communities.

Subsidizing the Movement of Specific Products

None of these three agencies subsidize the movement of a specific agricultural commodity.

Funding From Other Planning Agencies

Kern COG and Minnesota DOT reported on funding from regional transportation agencies or MPOs for agricultural goods movement. Kern COG offers funding for all of the major state highway projects. In Minnesota, these agencies do not offer funding directly, but Area Transportation Partnerships (ATPs) fund highway and bridge projects that include qualitative discussions around the needs of agricultural goods movement. (*Note:* Minnesota’s eight ATPs are groups of “traditional and nontraditional transportation partners, including representatives from Minnesota DOT, metropolitan planning organizations, regional development commissions, counties, cities, tribal governments, special interests and the public [that develop] a regional transportation improvement program for their area of the state.”)

Assessment

These same three agencies—AMBAG, Kern COG and Minnesota DOT—described both the challenges and effective practices associated with the movement of agricultural goods.

Workforce Challenges

While Kern COG has not encountered workforce challenges associated with agriculture production, both AMBAG and Minnesota DOT described circumstances that make it difficult to move goods from “farm to fork.” Minnesota’s workforce is specifically impacted by an increasing agglomeration of farms and the mechanization of individual farm labor. In addition, recent market forces have caused significant financial pressure on farming within the region. The respondent noted that it is increasingly difficult for small- to medium-sized farms to net sustainable profits.

AMBAG has received numerous reports from private industry representatives about two critical labor shortages in agricultural goods movement: agricultural laborers (fieldworkers) and truck drivers. Tightening border immigration and visa policies have increased labor scarcity; a truck driver shortage can limit the industry's ability to move product on time and on budget without spoilage.

Other Challenges With Agricultural Goods Movement

Challenges—and in some cases, possible solutions—associated with agricultural goods movement were identified for rural and urban infrastructure, pavement deterioration (local or state roads), seasonal movement, traffic congestion, traffic routing and traffic safety:

Infrastructure: Rural

Rural roadways in AMBAG's Salinas Valley harvesting areas are often disproportionately impacted by truck traffic due to the prominence of heavy harvest vehicles in these areas. In Kern COG, rural areas have unfinished highway systems.

Infrastructure: Urban

During peak harvest season, traffic congestion often occurs in AMBAG's urban areas such as Salinas and Watsonville when trucks back up at key intersections near freight processing hubs.

Pavement Deterioration: Local Roads

Rural roads in the harvesting areas of AMBAG's Salinas Valley are often disproportionately impacted by truck traffic due to the prominence of heavy harvest vehicles in these areas. In Kern COG, pavement deterioration is a primary issue.

Pavement Deterioration: State Roads

During harvest season in the AMBAG region, interchanges and intersections near key urban agricultural goods processing hubs are disproportionately impacted by traffic moving agricultural products.

Seasonal Movement

Monterey and Santa Cruz counties in the AMBAG region are popular tourist destinations. The spring and summer harvest seasons and tourist season overlap, significantly affecting traffic. Delays are reported in all truck, tourist and commuter traffic.

Traffic Congestion

As previously discussed, the overlap of the spring and summer harvest seasons and the tourist season in AMBAG's Monterey and Santa Cruz counties significantly impact traffic, delaying the movement of trucks, tourists and commuters.

Traffic Routing

Traffic routing is an issue in Kern COG. (Specific details were not provided.)

Traffic Safety

Traffic safety is a primary issue for Kern COG. (Specific details were not provided.) In AMBAG's agricultural areas, at-grade uncontrolled entries and exits from U.S. 101 significantly increase the risk of collisions during harvest season, especially when large agricultural vehicles merge into high-speed traffic. The heavy weight of these vehicles limits their ability to accelerate.

None of the three agencies described challenges related to climatic considerations or movement of equipment or livestock.

Effective Practices

Effective practices to improve agricultural goods movement were related to climatic considerations, rural infrastructure and seasonal movement:

Climatic Considerations

Minnesota has implemented farming buffers around public waters, streams, rivers, lakes and ponds to reduce direct runoff. The state has also regulated the use of pesticides, fertilizers and other products that have caused significant impacts to the water resources of the state.

Rural Infrastructure

In Kern COG, widening rural highways has improved safety.

Seasonal Movement

During the harvest season, individual operational districts within Minnesota DOT work with sugar cooperatives and other large producers to reduce traffic congestion and other impacts. This work also coincides with discussions about pavement impacts.

None of the three agencies shared practices related to urban infrastructure, movement of livestock or equipment, pavement deterioration (local or state roads), traffic congestion, traffic routing or traffic safety.

Supporting Documents

California

Association of Monterey Bay Area Governments (AMBAG)

The AMBAG respondent noted that while the two plans cited below “are regional and megaregional in nature, they address key agricultural goods movement facilities with statewide implications.”

U.S. 101 Central Coast California Freight Strategy, Cambridge Systematics, Inc., California Department of Transportation, April 2016.

https://ambag.org/sites/default/files/2019-12/1_Finished_Final_AMBAG_US101CCCFrtStudy_FinalReportCombined_REV.pdf

AMBAG produced this study in cooperation with Caltrans District 5, SBCAG and SLOCOG. In Chapter 3, Goods Movement and the Economy, beginning on page 3-1 (page 15 of the PDF), the authors note that “[g]oods movement-dependent industries provide approximately 33 percent of the jobs in the region, which is heavily driven by agriculture, manufacturing and transportation/warehousing sectors. In total, the eight industries that comprise goods movement-dependent industries accounted for more than \$13 billion of the \$52.4 billion gross regional product. These industries are highly reliant on U.S. 101 for both local deliveries and as a connection to various east-west routes that allow goods to travel throughout the United States and the world.”

Central Coast California Commercial Flows Study, Cambridge Systematics, Inc., Association of Monterey Bay Area Governments, February 2012.

https://ambag.org/sites/default/files/2019-12/Central%20Coast%20CA%20Commercial%20Flows%20Study_Final_Revised%206-12-12.pdf

From the executive summary: Over the next several decades, the Central Coast region can expect to see significant increases in freight movement due to both population increases and a continued expansion of the region's agricultural production. As a result of this demand for freight by both the local population and industries, a focus on enhancing the efficiency and safety of the region's goods movement system is critical to supporting the economic health of the region and the quality of life for its residents. To respond to this challenge, six major agencies across the five counties—comprising the California Central Coast region, from Santa Cruz County in the north to Santa Barbara County in the south—have partnered with the California Department of Transportation (Caltrans) District 5 to sponsor this study of freight flows, issues, needs and deficiencies in the region. Moreover, this study provides findings and recommendations, which can assist these agencies in proactively responding to the future freight challenges.

Kern Council of Governments (Kern COG)

Phase II KARGO Sustainability Study (Kern Area Regional Goods Movement Operations), FY 2020-21 Caltrans Sustainable Transportation Planning Grant Program Award List, Division of Transportation Planning, California Department of Transportation, June 2020.

<https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/final-2021-award-listcopya11y.pdf> (scroll to page 5)

From the project description: The Kern Council of Governments will contract with a consulting firm to work with the City of Shafter, City of Bakersfield, Kern County, Caltrans, railroads and community stakeholders to evaluate strategies to improve the sustainability of growing regional goods movement activity in Kern County and [the] impacts on the transportation system and surrounding communities, including disadvantaged communities. The study will analyze funding mechanisms for the strategies and develop an outreach program to engage and later communicate findings to stakeholders and disadvantaged communities. The study will evaluate mitigation strategies such as a regional logistics mitigation fee program. Part of the evaluation will be completing a nexus study and developing an array of mitigation measures to mitigate impacts on the transportation system and communities. Strategies and mitigation measures evaluated will look at innovative technological improvements to reduce air quality/emissions, while improving freight mobility to preserve the economic vitality of both disadvantaged communities and the region.

California Inland Port Feasibility Analysis: Preliminary Business Model, San Joaquin Valley Air Pollution Control District, April 2020.

https://www.valleyair.org/Board_meetings/GB/agenda_minutes/Agenda/2020/April/final/09.pdf

This study was commissioned to evaluate the potential development of an inland port system to shift shipping containers from trucks to rail. *From page 9 of the report, page 13 of the PDF:*

The California Inland Port Market Shed has always been California's geographic and agricultural production center, and its main source of exports. It is still the nation's number one agricultural producer, generating more than \$50 billion annually which represents 13.4% of the [U.S.] total. California's prime commodity exports are almonds, dairy products, rice, pistachios, wine, walnuts and table grapes and its top ten export markets are the EU [European Union], Canada, China/Hong Kong, Japan, Mexico, Korea, India, UAE [United Arab Emirates], Turkey and Vietnam. Over the last 10 years exports have grown over 83% and represent 28% of the entire state production.

From the report's conclusions and next steps that begin on page 20 of the report, page 24 of the PDF:

Historically there has been an acknowledgment that there is a critical need for a more effective goods movement system for the Central Valley of California. Current container-on-truck method used to transport goods between Valley consumption and production centers and seaports is highly inefficient, resulting in increased costs and air pollution.

- I-5 and SR-99 carry up to 80,000 trucks per day, many traveling to San Pedro port's complex.
- Lack of local Valley container storage facility necessitates empty containers be picked up from and returned to seaport locations (doubles needed trips).
- Regulations on truck operators limit shipping distance.

Development of an inland port near the agricultural and industrial hubs of [the Central] Valley could greatly reduce [the] amount of truck traffic and associated emissions on Valley highways by allowing goods to be shipped via railway instead of on heavy-duty trucks.

The next steps recommended to advance the inland port business model are addressed on page 21 of the report (page 25 of the PDF).

2018 Regional Transportation Plan and Sustainable Communities Strategy, Kern Council of Governments, 2018.

https://www.kerncog.org/wp-content/uploads/2018/10/2018_RTP.pdf

Chapter 4 provides a brief discussion of the rural-urban connectivity strategy, including agricultural goods movement, beginning on page 4-20 of the document (page 88 of the PDF). Chapter 5 addresses investments in freight movement, including truck, rail and port systems, beginning on page 5-14 of the document (page 145 of the PDF).

Shasta Regional Transportation Agency (SRTA) Far-Northern California Food Hub Study, Shasta Regional Transportation Agency, undated.

<https://www.srta.ca.gov/275/Far-Northern-California-Food-Hub-Study>

This web page describes a collaboration among SRTA, a consultant and the private sector (including active participants in the agriculture industry supply chain such as producers, transporters and buyers) to investigate the feasibility and potential benefits of a food hub located in the Shasta region. (For the purposes of this project, "food hub" is defined as a centrally located facility with services designed to support the aggregation, storage, processing, distribution and/or marketing of food products produced in a region.)

Early findings indicate that establishing a physical food hub was premature, with researchers citing a critical volume of commodities and value of transactions as essential to achieve before moving forward. The study's authors recommended incentivizing medium-sized producers to scale up production and identifying ways for these producers to be more cost-competitive. This could be accomplished by:

- Increasing market demand for North State agricultural commodities by developing a purchase agreement with a high-volume buyer in the Sacramento area.
- Reducing the cost of transporting agricultural products to market by developing a plan for consolidating the collection and delivery of commodities to the high-volume buyer.

The final report and related documents are available on the web site.

Related Resource:

Agricultural Cluster Assessment: Shasta and Butte Counties, New Venture Advisors, Shasta Regional Transportation Agency, September 2017.

<https://www.srta.ca.gov/DocumentCenter/View/3895/Agricultural-Cluster-Assessment-final-adopted-October-2017>

This report describes the results of a redirected research effort that moved away from the food hub concept described in the publication cited above to focus instead on the development of agricultural clusters. After identifying a separate effort to develop such a cluster strategy, researchers developed a business case for two agricultural clusters—wild rice and organic vegetables—with a focus on Shasta and Butte counties. As the authors noted, this report “is focused on process and research—as well as steps that could be taken to further investigate development of a cluster enterprise model—rather than specific implications and recommendations for a business entity.”

North State Transportation for Economic Development Study (NSTEDS): Full Compendium Report, System Metrics Group, Economic Development Research Group, DKS Associates, Wahlstrom & Associates, and Susan Jones Moses & Associates, Shasta Regional Transportation Agency, October 2013.

<https://www.srta.ca.gov/DocumentCenter/View/1043/North-State-Transportation-for-Economic-Development-Study-PDF>

From the executive summary:

According to commodity flow data, the largest commodity groups are agriculture and food products, wood products and machinery manufacturing. Roughly 15[%] of commodities produced in the North State go to customers within the North State, while about 70[%] is sent to the rest of the United States and 15[%] to the rest of the world. This compares to California as a whole, where roughly 60[%] of commodities are consumed within the state. California consumes a greater proportion of the commodities it produces because it has a larger and more diversified economy than the North State. However, the fact remains that the North State economy depends on imports and exports (domestically and internationally).

Commodity exports rely on reliable and efficient truck and rail transportation. Most of the truck travel occurs on just a few routes due to the dispersed trip generators associated with agriculture, forest and natural resource extraction. The highest truck volumes occur on Interstate 5 (I-5), but US 97, State Route 32 (SR-32)/SR-70/SR-99, US 101, SR-20, SR-299 and US 395 also carry many trucks. The Sacramento Valley is served by two Class I freight railroads—the Union Pacific (UP) and the Burlington Northern Santa Fe (BNSF). Neither railroad serves the North Coast, which has been without rail service for more than a decade.

From page 16 of the report, page 32 of the PDF:

While many North State highways have high truck percentages, most of the truck movements are found on only a few routes. This is indicative of a couple of factors. First, the economy in many parts of the North State is dependent on agriculture or forest and wood products. Both industries require seasonal harvesting over a large land area, so agriculture and logging trucks need multiple access roads to producing fields and forests. These roads often experience intense periods of truck traffic during harvesting. Second, [s]tate [h]ighways also serve truck traffic heading through the North State from outside origins.

Minnesota

Manufacturers' Perspectives Projects: Manufacturers' Perspectives on Minnesota's Transportation System, Minnesota Department of Transportation, 2020.

<http://www.dot.state.mn.us/mps>

From the web site:

Since 2013, MnDOT has been interviewing Minnesota businesses to get feedback and better understand their specific freight transportation requirements.

These Manufacturers' Perspectives projects help MnDOT identify low-cost/high-value opportunities to provide a more responsive transportation system, focusing on infrastructure, maintenance, communication, and permitting and policy.

The long-term relationships developed through these projects support economic strength by region as well as the entire state of Minnesota.

These studies include participation from the agricultural industry. District-level reports completed during the period 2014 through 2019 are available on the site. Studies in the Metro District and District 3 are underway.

Minnesota Statewide Freight System and Investment Plan, Minnesota Department of Transportation, January 2018.

<https://www.dot.state.mn.us/planning/freightplan/pdf/statewidefreightplanrevised2018.pdf>

From the plan purpose and scope (page 1 of the plan, page 5 of the PDF): This plan describes Minnesota's freight transportation system and its role in the state's economy, current and emerging industry trends, the performance of the freight transportation system, and current and future issues and needs. This plan also includes Minnesota's Freight Action Agenda for MnDOT and its partners to advance a number of strategies that will improve the efficiency, safety and reliability of the freight system.

Minnesota State Highway Investment Plan: 2018-2037, Minnesota Department of Transportation, January 2017.

<http://minnesotago.org/index.php?cID=475>

From the plan web page:

Minnesota's 12,000-mile state highway system plays a key role in supporting the state's economy and quality of life. Businesses rely on the system to move their goods and raw materials throughout the state. In addition, state highways connect Minnesotans to other transportation networks and to state, national and global markets. ... The 20-year Minnesota State Highway Investment Plan (MnSHIP) is MnDOT's vehicle for deciding and communicating capital investment priorities for the system for the next 20 years.

The investment categories and criteria used by Minnesota DOT to select agricultural goods movement projects are defined in Chapter 1 (beginning on page 12 of the plan) and discussed throughout the plan.

Amber Roads of Grain: Mapping Minnesota’s Evolving Grain Supply Chain and Its Impact on Local Roads, Story Map, Transportation Policy and Economic Competitiveness Program, University of Minnesota, 2017.

<http://umn.maps.arcgis.com/apps/Cascade/index.html?appid=0ad812f36aa44801bd4cc026a1cc1dec>

This story map examines “grain-derived, value-added supply chains” to develop a more strategic freight network in Minnesota. Minnesota DOT collaborated with the University of Minnesota to track movements of grains from point of production to export location.

The story map’s lessons learned page identifies what’s next in this examination of grain supply chains:

As the grain supply chain steadily evolves agriculture will continue to be the greatest mover of freight volume on the roads. By modeling this movement we can begin to understand the impact these supply chain shifts have on grain flow and transportation infrastructure as a whole. While the trip-based and commodity-based approaches taken in our study focuses on road infrastructure only, this model can be expanded to include mul[t]modal networks, analyze producer behavior in multiple counties, and explore the economic [e]ffect of market changes on freight bottlenecks and infrastructure degradation. These models have the potential to direct both local- and state-level policy that can stimulate economic competition and development between agriculture industry clusters—like livestock and biofuel.

New Mexico

New Mexico Forest Action Plan 2020, Second Draft, New Mexico Energy, Minerals and Natural Resources Department, August 2020.

http://www.emnrd.state.nm.us/SFD/documents/NMFAP_semi-finalSECONDDRAFT8.14.2020.pdf

(*Note:* New Mexico classifies timber as an agricultural product.) New Mexico DOT is collaborating with the New Mexico Energy, Minerals and Natural Resources Department to develop this plan, which is described as consisting of “a geospatial assessment of the state’s natural resources and a set of strategies for resource management and restoration activities.”

New Mexico Freight Plan: Moving Freight Forward, Through 2040, New Mexico Department of Transportation, August 2015.

https://dot.state.nm.us/content/dam/nmdot/planning/NM_2040_Plan-Freight_Plan.pdf

From the executive summary: The New Mexico Freight Plan (NMFP) captures the current state of freight in New Mexico, and looks ahead to 25 years of growth and progress, out to 2040. The plan looks at goods movements on the roads, rails, by air and pipeline, but focuses on the most active areas in the state and the areas that New Mexico DOT has the most active role, road and rail freight. The NMFP is aligned with the New Mexico 2040 Plan (2040 Plan), which includes freight throughout as one aspect of transportation in the state. The NMFP provides additional depth on freight issues and concerns. For example, while total vehicle miles traveled (VMT) growth has slowed, truck VMT is growing at a fast pace, especially along freight-focused corridors (e.g., I-40 and I-10), and in truck-dependent industries in the southeast and northwest of New Mexico.

North Dakota

ND State Freight Plan, North Dakota Department of Transportation, 2020.

<https://www.dot.nd.gov/divisions/planning/freight/>

The respondent noted that the majority of freight moved within North Dakota is agricultural. Rather than creating a specific plan for agricultural freight movement, the agency uses its freight

plan to guide planning for agricultural goods movement. The agency's statewide freight plan and related documents, available at this web site, are comprehensive and consider factors such as seasonal movements, large equipment and the needs of the state's agricultural communities.

2040 North Dakota State Rail Plan, North Dakota Department of Transportation, November 2017.

<https://www.dot.nd.gov/divisions/planning/railplan/FINALNorth%20Dakota%20State%20Rail%20Plan%20December%202017.pdf>

This state rail plan "assesses the rail system, provides recommendations for policies, programs, processes and projects to improve rail-related safety and service, and serves as a practical roadmap for future rail investment and policies in North Dakota." The plan's outlook for rail-dependent industries considers agriculture (page 2-86 of the report, page 142 of the PDF), and indicates that "[r]ailroads transport most of North Dakota's agricultural production, varying between 72.8[%] and 82.3[%] of the output between the 2000/2001 crop year and the 2014/2015 crop year."

Ohio

Access Ohio 2045: Ohio's Transportation Plan, Draft Plan, Ohio Department of Transportation, July 2020.

https://www.transportation.ohio.gov/wps/wcm/connect/gov/369f5c73-12f1-4d24-8b88-fc66717a268e/AccessOhio2045DraftPlan.pdf?MOD=AJPERES&CONVERT_TO=url&CACHEID=ROOTWORKSPACE.Z18_M1HGGIK0N0JO00QO9DDDDM3000-369f5c73-12f1-4d24-8b88-fc66717a268e-nd9oy.X

The state's long-range transportation plan provides a framework for multimodal transportation investment and policy decisions. Page 13 of the plan (page 16 of the PDF) summarizes global trade in goods and services, including agricultural products. Among the potential transportation impacts anticipated:

- Increased truck traffic on major Interstates and highways will create more congestion.
- Increased truck tonnage will accelerate bridge and pavement deterioration in and around industrial areas.
- Agriculture, energy and manufacturing commodity flows will increase through ports, burdening maritime and rail infrastructure.

Transport Ohio: Statewide Freight Plan, Ohio Department of Transportation, March 2019.

http://www.dot.state.oh.us/Divisions/Planning/SPR/StatewidePlanning/Documents/ODOT_FreightPlan_Updated%203.7.19.pdf

This guide was developed "to inform and support future infrastructure investments on Ohio's multi-modal freight network." The impact of trucks in rural locations is briefly discussed on page 40 of the plan (page 41 of the PDF) in relation to pavement damage on local roads and issues with small bridges and culverts.

Washington

Washington State Freight and Goods Transportation System (FGTS) 2019 Update,

Washington State Department of Transportation, February 2020.

<https://wsdot.wa.gov/sites/default/files/2006/02/13/washington-freight-and-goods-transportation-system-2019.pdf>

This freight system update includes agricultural processing centers among the first/last mile connector designation criteria. *From page 5 of the update, page 8 of the PDF:*

First/last mile connectors provide important freight linkages to strategic national defense facilities, significant intermodal facilities, warehouse districts, industrial land and distribution centers, and agricultural processing centers, and the National Highway Freight Network. Detailed designation criteria [are] shown in exhibit 4, categorized into four types. The designation criteria for first/last mile connectors [were] established under 2014 Washington State Freight Mobility Plan and [are] refined in this update to integrate [the] National Highway Freight Network.

Washington State Rail Plan: 2019-2040, Washington State Department of Transportation, August 2020.

<https://wsdot.wa.gov/sites/default/files/2020/08/27/2019-2040-State-Rail-Plan.pdf>

The short line rail system owned by Washington State DOT and used in agricultural goods movement is described in Chapter 3 (page 35 of the plan, page 42 of the PDF). Also discussed are market trends in agricultural exports (page 21 of the plan, page 28 of the PDF) and terminals that enable connections from rail to other modes of transportation (page 65 of the plan, page 72 of the PDF).

2017-2027 Grain Train Strategic Plan, Washington State Department of Transportation, November 2017.

<https://wsdot.wa.gov/sites/default/files/2008/01/18/Nov-2017-Grain-Train-2017-2027-Strategic-Plan.pdf>

From the letter introducing the plan: The WSDOT Grain Train Program is part of WSDOT's [Washington State DOT's] strategy to support cost-effective freight transportation alternatives for our state's farmers and other shippers to access global markets.

WSDOT worked in close partnership with the Grain Train Managing Port Partners, the rail operators, BNSF Railway, shippers and goods receivers, and many other stakeholders to develop the 2017-2027 Grain Train Strategic Plan. This public outreach, coupled with data-based analysis, supports implementing and funding priority strategies for the Grain Train program.

This plan outlines the vision and goals for the program and identifies operational improvements and policy changes that will ensure the program continues to enhance the economic competitiveness of Washington state. The program has six key goals:

- Move Washington-grown products reliably and efficiently to domestic and international markets.
- Help preserve Washington's short line railroads by generating revenue that may lead to better maintained or upgraded rail lines that support long-term infrastructure needs.
- Reduce greenhouse gas emissions and save fuel by reducing truck shipments.
- Help reduce wear and tear on local roadways by reducing truck vehicle miles traveled.
- Support a healthy multimodal transportation system that improves economic vitality and enables development in the region.
- Be self-sustaining and provide funds for the maintenance and preservation of the state-owned short line railroad when sufficient revenue is generated to do so.

2017 Washington State Marine Ports and Navigation Plan, Washington State Department of Transportation, 2017.

<https://wsdot.wa.gov/sites/default/files/2007/12/20/Freight-Plan-AppendixB-MarinePortsNavigationPlan.pdf>

Agricultural products are one of the top three commodities exported through Washington ports. This plan assesses the transportation needs of state marine ports and identifies transportation system improvements that are needed to support international trade and economic development, including agricultural products movement.

Palouse River and Coulee City Rail System: 2015 to 2025 Strategic Plan, Freight Systems Division, Washington State Department of Transportation, May 2015.

<https://wsdot.wa.gov/sites/default/files/2015/05/08/2015-PCC-Strategic-Plan.pdf>

The survey respondent noted this plan as part of a statewide planning effort specific to agricultural goods movement. The Palouse River and Coulee City rail system, located in eastern Washington, is part of Washington State DOT's "strategy to support cost-effective freight transportation alternatives for our state's farmers and other shippers to access global markets."

Wisconsin

Implements of Husbandry (IoH) Study Group, Wisconsin Department of Transportation, undated.

<https://wisconsin.gov/Pages/dmv/agri-eq-veh/study.aspx>

From the web site:

Agricultural equipment is getting larger and heavier, which helps in more efficient farm production, but it can also impact pavement and road structures. That's why WisDOT, in partnership with the Wisconsin Department of Agriculture, Trade and Consumer Protection, convened the Implements of Husbandry (IoH) Study Group. It involved over 20 stakeholders representing various transportation and farm organizations, equipment manufacturers, law enforcement, local officials and the University of Wisconsin–Madison/Extension.

The study group's final recommendations include:

- Create a clearer, simpler definition of IoH to reflect today's agricultural equipment, which would also include a definition for commercial motor vehicles used exclusively for agricultural operations.
- Require all IoH that cross over the centerline of the roadway during operation to meet the lighting and marking standards of the American Society of Agricultural Engineers (ASAE S279).
- Create a 60-foot limit for a single IoH and a 100-foot limit for combinations of two IoH. For combinations of three IoH the limit is 70 feet, but a three IoH combination may operate at lengths exceeding 70 feet, to a limit of 100 feet, at a speed no greater than 20 miles per hour.
- Create a new IoH weight limit which is up to 15 percent weight allowance more than currently established by the federal bridge formula. This equates to a maximum single axle weight of 23,000 pounds and a maximum gross vehicle weight of 92,000 pounds except where posted and during periods of spring thaw.
- Require written authorization to exceed weight limits. On an annual basis IoH operators may submit a travel or route plan and request written authorization to exceed the weight limit from the maintaining authority of the roadways. A nominal fee may be charged and additional conditions may be set by each maintaining authority. IoH vehicles operating in

excess of the 15 percent allowance will be fined for the amount in excess of standard gross motor vehicle weight or individual axle weight.

- Support exploration of best practices to assist in reducing the wear of roadways and structures. This includes the development of emerging innovations and best practices in manure management.
- Develop further training requirements for the operation of large loH equipment. Age requirements are to remain as presently allowed in statute, but the group recommends developing advanced training for operating larger and heavier loH.

Publications available on this web site include project reports and an loH equipment matrix.

Overview of Intermodal Freight in Wisconsin, Wisconsin Department of Transportation, March 2019.

<https://wisconsin.gov/Documents/doing-bus/freight/fac/report2019.pdf>

A discussion of Wisconsin's current intermodal operations begins on page 9 of the executive summary (page 13 of the PDF):

Wisconsin's two active intermodal freight terminals perform important functions for the regions they serve, albeit with limited volumes and capacity for expansion. Chippewa Falls has allowed one major Wisconsin business, Menards, the ability to import large volumes of merchandise at lower costs, due to the yard's proximity to the company's large distribution center. The empty containers have enabled the region's bulk agriculture operations to gain access to overseas markets, providing (until recently) a stable, predictable demand and price for their products. The Arcadia terminal operates in a similar manner, with Ashley Furniture as the beneficiary of the access to containerized freight imports, and bulk agriculture leading a small set of export commodities.

The executive summary's conclusion that begins on page 19 of the report (page 23 of the PDF) notes that the "volume of containerized shipments to and from Wisconsin indicates a strong and sustained demand by the state's businesses for use of intermodal freight. Many businesses seek enhanced opportunities to access the efficiencies inherent in containerized freight shipping, including decreased shipping costs, greater predictability of delivery times, and reduced roadway congestion. Looking forward, Wisconsin's public and private sector partners will need to overcome existing geographic and market factors before containerized freight services will be improved, especially in the eastern part of the state. Among the critical factors that intermodal service providers will need to justify expanded options are growth in business demand for containerized freight service, coupled with long-term commitments by shippers. Railroads, regional and state economic development agencies, the business community, local governments, maritime liner services, trucking companies, real estate development companies, and others will need to collaborate to optimize the potential for any new facility development."

Wisconsin State Freight Plan, Wisconsin Department of Transportation, April 2018.

<https://wisconsin.gov/Documents/projects/sfp/plan.pdf>

As this recent state freight plan indicates, "[a]gricultural products are among the top commodities moving from and through Wisconsin each year." While not addressed in a specific chapter or subsection of the report, the movement of agricultural goods is considered throughout the plan.

Private Sector Organizations

Two private sector organizations responded to the survey:

- California Cattlemen’s Association (CCA).
- California Cotton Ginners and Growers Association (CCGGA).

Note: The respondent added that CCA is a lobbying organization and does not engage in the analysis of agricultural goods movements or logistics of agricultural goods movements. Responses in this survey highlight obstacles CCA members have reported about the efficient movement of livestock, feed and related goods. Most of the obstacles discussed in the survey are related to the regulations and activities of other state regulatory agencies, not Caltrans. Information was provided given the impacts of these challenges on the movement of agricultural goods.

A representative from the California Trucking Association noted that “the survey seems to be a better fit for the processors, harvesters, farms, etc. There are some general trucking-related questions that we can address, but for the most part it would be difficult for us to get some of the requested information.” The respondent was encouraged to ask selected agricultural carrier members to provide information that was available to them, however, no further response was received from the association.

Survey results from CCA and CCGGA are presented below in the following categories:

- Current efforts.
- Assessment.

Current Efforts

Collaboration and Partnerships

CCA and CCGGA both collaborate with state and federal agencies and with national and regional organizations to move agricultural goods. Neither agency collaborates with MPOs, commodity-specific cooperatives, large agricultural conglomerates or regional agricultural cooperatives. Table 3 summarizes survey responses.

Table 3. Partners in Agricultural Goods Movement Planning

Partner Agency	CCA	CCGGA
Federal Agencies	Federal Motor Carrier Safety Administration	U.S. Environmental Protection Agency
State Agencies	<ul style="list-style-type: none"> • <i>California Highway Patrol:</i> Engages with CCA on enforcement matters related to agricultural goods movement. • <i>University of California Cooperative Extension:</i> Advises CCA on state transportation policy and conducts analytical surveys of California agriculturalists that clarify policy concerns related to goods transport and other issues. 	California Air Resources Board

Partner Agency	CCA	CCGGA
Other Agencies	<ul style="list-style-type: none"> • <i>Livestock Marketing Association (LMA)</i>: Addresses policy issues relative to interstate transportation of cattle and beef products. • <i>National Cattlemen’s Beef Association</i> (the national LMA affiliate): Addresses policy issues relative to interstate transportation of cattle and beef products. 	San Joaquin Valley Air Pollution Control District

Data Sources

Association membership is the primary source used by both organizations to gather data for agricultural goods movement planning. CCGGA relies on surveys of its members. Because CCA is primarily engaged in policy advocacy, not logistics and planning, any analysis or planning related to agricultural goods movement is largely based on anecdotal reports from its members. (Note: For policy advocacy, not for planning goods movement, CCA may use data from the University of California Cooperative Extension or a state regulatory agency if it is available and relevant to a policy priority.)

Tracking Agricultural Goods Movement

Neither organization has attempted to track agricultural goods movement through the full life cycle of a specific commodity—from harvest to packaging, distribution and point of sale.

Assessment

Workforce Challenges

Only CCGGA has encountered workforce challenges associated with agriculture production that make moving agricultural goods difficult. Those challenges are:

- Reliable drivers.
- California Air Resources Board (CARB) truck regulations.
- Port-related limitations.

Other Challenges With Agricultural Goods Movement

Both associations identified nonworkforce challenges in agricultural goods movement related to climatic considerations. CCA also described challenges associated with rural infrastructure, movement of livestock and equipment, seasonal movement and traffic congestion:

Climatic Considerations

CCA. Members in the northeastern counties of the state report that CARB regulations restricting the use of certain additives in biodiesel fuel make feed trucks and other agricultural vehicles inoperable during severe cold weather events.

CCGGA. Air quality regulations on trucks place significant pressure on trucking firms, especially independent owners/operators. Vehicle weight limitations also force members to make more trips than necessary.

Rural Infrastructure

CCA noted that many ranch roads and rural roads are dirt or gravel roads and require vehicle operators to navigate at low speeds, which makes it difficult to comply with

California's intrastate hours of service regulations. Safely navigating these roads adds hours to a hauler's trip, potentially triggering a required break that can impact the well-being of the livestock being transported. Ideally, hours of service requirements (under CVC § 34501.2 and/or 13 CCR § 1212(k)) would be "loosened" for the transport of live animals, whether by increasing the 12-hour drive time and/or instituting an air-mile radius exemption from hours of service requirements for livestock.

In addition, some paved rural roads are in such disrepair that ranchers are unable to access cattle with a truck/trailer. Ranchers must drive cattle long distances by foot to reach a suitably maintained portion of road. This issue most commonly occurs on federally managed roads, such as U.S. Forest Service roads.

Related Resources:

§ 34501.2, Safety Regulations, California Vehicle Code, January 2015.

http://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=VEH§ionNum=34501.2

From the code:

(a) The regulations adopted under Section 34501 for vehicles engaged in interstate or intrastate commerce shall establish hours-of-service regulations for drivers of those vehicles that are consistent with the hours-of-service regulations adopted by the United States Department of Transportation in Part 395 of Title 49 of the Code of Federal Regulations, as those regulations now exist or are hereafter amended.

....

(c) The regulations adopted under Section 34501 for vehicles engaged in the transportation of farm products in intrastate commerce shall include all of the following provisions:

(1) A driver employed by an agricultural carrier, including a carrier holding a seasonal permit, or by a private carrier, when transporting farm products from the field to the first point of processing or packing, shall not drive for any period after having been on duty 16 hours or more following eight consecutive hours off duty and shall not drive for any period after having been on duty for 112 hours in any consecutive eight-day period, except that a driver transporting special situation farm products from the field to the first point of processing or packing, or transporting livestock from pasture to pasture, may be permitted, during one period of not more than 28 consecutive days or a combination of two periods totaling not more than 28 days in a calendar year, to drive for not more than 12 hours during any workday of not more than 16 hours. A driver who thereby exceeds the driving time limits specified in paragraph (2) of subdivision (b) shall maintain a driver's record of duty status, and shall keep a duplicate copy in his or her possession when driving a vehicle subject to this chapter. These records shall be presented immediately upon request by any authorized employee of the department, or any police officer or deputy sheriff.

§ 1212(k) Driver Hours of Service: Farm Products, Section 13, California Code of Regulations, undated.

[https://govt.westlaw.com/calregs/Document/I090DFDFFA65149CAA2F136766E95EB37?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=\(sc.Default\)](https://govt.westlaw.com/calregs/Document/I090DFDFFA65149CAA2F136766E95EB37?viewType=FullText&originationContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default))

From the code:

(k) Farm products. (1) A driver when transporting farm products from the field to the first point of processing or packing, shall not drive:

(A) More than 12 hours following eight-consecutive hours off duty.

(B) For any period after having been on duty 16 hours or more following eight consecutive hours off duty.

(C) For any period after having been on duty for 112 hours in any consecutive eight-day period.

(2) A driver transporting special situation farm products from the field to the first point of processing or packing, or transporting livestock from pasture to pasture, may be exempted from the eight-day cumulative limit, specified in Sections 1212(k)(1)(C) and 1212.5(a)(4), during one period of not more than 28 consecutive days or a combination of two periods totaling not more than 28 days in a calendar year.

Movement of Livestock

In addition to the hours of service limitations noted earlier, driver's license issues are a concern. CVC § 12804.9(b)(3)(G) allows a vehicle or vehicle combination with a gross vehicle weight rating of 26,000 pounds or less to be operated with a Class C license if it is operated by a farmer or rancher, it is operated exclusively for use in agriculture, and it is operated in a not-for-hire capacity. However, California Highway Patrol (CHP) routinely stops farmers and ranchers for alleged licensing violations, "alleging that [the code] is only applicable to farmers, that it's only applicable to ranchers, and/or that farming/ranching is a commercial business that renders hauling one's own livestock/produce for-hire." The CCA respondent noted that this is a "persistent problem despite having been clarified in CHP bulletins."

Potential solutions include providing better and/or broader training to CHP about this code section and making conforming amendments to CVC § 12804.9(b)(1)(A). Additionally, the 26,000-pound limit may be too restrictive given modern advancements that substantially increase the weight of trucks. The respondent noted that solving that issue would likely require "amendments to federal law and regulation in addition to changes to California law."

Related Resources:

§ 12804.9(b)(3)(G) Issuance and Renewal of Licenses, California Vehicle Code, January 2020.

https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=VEH§ionNum=12804.9

From the code:

(b) In accordance with the following classifications, an applicant for a driver's license shall be required to submit to an examination appropriate to the type of motor vehicle or combination of vehicles the applicant desires a license to drive:

(3) Class C includes the following:

(G) A vehicle or combination of vehicles with a gross combination weight rating or a gross vehicle weight rating, as those terms are defined in subdivisions (j) and (k), respectively, of Section 15210, of 26,000 pounds or less, if all of the following conditions are met:

(i) Is operated by a farmer, an employee of a farmer, or an instructor credentialed in agriculture as part of an instructional program in agriculture at the high school, community college, or university level.

- (ii) Is used exclusively in the conduct of agricultural operations.
- (iii) Is not used in the capacity of a for-hire carrier or for compensation.

§ 12804.9(b)(1)(A) Issuance and Renewal of Licenses, California Vehicle Code, January 2020.

https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=VEH§ionNum=12804.9.

From the code:

(b) In accordance with the following classifications, an applicant for a driver's license shall be required to submit to an examination appropriate to the type of motor vehicle or combination of vehicles the applicant desires a license to drive:

(1) Class A includes the following:

(A) Except as provided in subparagraph (H) of paragraph (3), a combination of vehicles, if a vehicle being towed has a gross vehicle weight rating or gross vehicle weight of more than 10,000 pounds.

Movement of Equipment

Ranchers report that in a variety of circumstances and for a variety of reasons, California's maximum length for truck/trailer combinations as mandated by CVC § 35401(a) (65 feet) and CVC § 35401.5(a) (relating to Surface Transportation Assistance Act (STAA) routes) is overly restrictive.

Related Resources:

§ 35401(a), Length, California Vehicle Code, January 2010.

http://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?sectionNum=35401&lawCode=VEH

From the code:

(a) Except as provided in subdivisions (b), (c), and (d), a combination of vehicles coupled together, including attachments, may not exceed a total length of 65 feet.

§ 35401.5(a), Length, California Vehicle Code, January 2015.

http://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=VEH§ionNum=35401.5.

From the code:

(a) A combination of vehicles consisting of a truck tractor and semitrailer, or of a truck tractor, semitrailer, and trailer, is not subject to the limitations of Sections 35400 and 35401, when operating on the Dwight D. Eisenhower National System of Interstate and Defense Highways or when using those portions of federal-aid primary system highways that have been qualified by the United States Secretary of Transportation for that use, or when using routes appropriately identified by the Department of Transportation or local authorities as provided in subdivision (c) or (d), if all of the following conditions are met:

(1) The length of the semitrailer in exclusive combination with a truck tractor does not exceed 48 feet. A semitrailer not more than 53 feet in length shall satisfy this requirement when configured with two or more rear axles, the rearmost of which is located 40 feet or less from the kingpin or when configured with a single axle which is located 38 feet or less from the kingpin. For purposes of this paragraph,

a motortruck used in combination with a semitrailer, when that combination of vehicles is engaged solely in the transportation of motor vehicles, camper units, or boats, is considered to be a truck tractor.

(2) Neither the length of the semitrailer nor the length of the trailer when simultaneously in combination with a truck tractor exceeds 28 feet 6 inches.

....

(c) Combinations of vehicles operated pursuant to subdivision (a) may also use highways not specified in subdivision (a) that provide reasonable access to terminals and facilities for purposes limited to fuel, food, lodging, and repair when that access is consistent with the safe operation of the combinations of vehicles and when the facility is within one road mile of identified points of ingress and egress to or from highways specified in subdivision (a) for use by those combinations of vehicles.

Seasonal Movement

Each fire season, CCA members report significant obstacles preventing them from moving their livestock to safety. CHP and California Department of Forestry and Fire Protection (CAL FIRE) roadblocks preclude ranchers from accessing livestock, threatening the animals' survival. While ranchers may obtain passes from their local sheriff's office to bypass these roadblocks and access their livestock, securing this access is often challenging. Ranchers have reported that sheriff's offices sometimes require physical presence to obtain these passes, requiring long round-trip drives that delay the rescue of livestock.

The CCA respondent recommended that CAL FIRE; federal, state and local land management agencies; sheriff's offices; and other stakeholders develop a time-sensitive, statewide protocol that permits ranchers to rescue their livestock from wildfire danger in a timely manner.

Traffic Congestion

Traffic congestion increases drive time, which is associated with the hours of service concerns noted earlier.

Neither agency shared practices related to urban infrastructure, pavement deterioration (local or state roads), traffic routing or traffic safety.

Effective Practices

CCGGA provided effective practices related to climatic considerations and rural infrastructure that improve agricultural goods movement:

Climatic Considerations

CCGGA recommended two practices:

- *Air quality incentive funds*: To help companies replace their trucks.
- *Increased vehicle weight limitations*: To allow for fewer trips.

Rural Infrastructure

To improve agricultural goods movement in rural areas, CCGGA examined regional rail facilities as a way to limit truck traffic into ports.

Neither agency shared practices related to urban infrastructure, movement of livestock or equipment, seasonal movement, pavement deterioration (local or state roads), traffic congestion, traffic routing or traffic safety.

Related Research and Resources

A literature search of recent publicly available resources identified publications that are organized into the following topic areas:

- National research.
- State research and practices.
- International resources.

National Research

Study of Rural Transportation Issues, Ken Casavant, Marina Denicoff, Eric Jessup, April Taylor, Daniel Nibarger, David Sears, Hayk Khachatryan, Vicki McCracken, Marvin Prater, Jeanne O'Leary, Nick Marathon, Brian McGregor, Surajudeen Olowolayemo and Bruce Blanton, Agricultural Marketing Service, U.S. Department of Agriculture, April 2010.

<https://www.ams.usda.gov/sites/default/files/media/RTIFullReport.pdf>

From the executive summary: This report is in response to Section 6206 of the Food, Conservation and Energy Act of 2008 (PL110-246), which directs the Secretaries of Agriculture and Transportation jointly to conduct a study of rural transportation issues. The report reviews transportation and its effect on rural communities, with an emphasis on agricultural transportation. It looks in depth into each of the four major modes of transportation commonly used by agriculture in the United States: trucking, railroads, barges and ocean vessels, examining each in the light of its ability to meet rural America's transportation needs now and in the future. It identifies some broad issues that merit attention from policymakers.

State Research and Practices

Multiple States

Profile of Short Line Railroads in High Grain Production States, Michael W. Babcock, Kansas State University, January 2018.

<http://www.k-state.edu/economics/staff/websites/babcock/Profile%20of%20Short%20Line%20Railroads%20in%20High%20Grain%20Production%20States.pdf>

From the abstract: The overall objective of this study is to assess the state of the short line industry and its role in the grain logistics system, including who they are, where they are, which agricultural products they ship in major grain corridors, and in what amounts. The specific objectives are: (1) developing a list of [f]ederal and [s]tate short line assistance programs, (2) surveying the operating characteristics of short line railroads, (3) assessing the characteristics of short line agricultural carload traffic, and (4) identifying managers' perceptions on which service characteristics are most important in determining short line success. The methodology involves personal interviews and surveys of executives of short line railroads and [s]tate [d]epartment of [t]ransportation (DOT) railroad personnel from 17 [s]tates: Iowa, Illinois, Nebraska, Minnesota, Kansas, South Dakota, Indiana, North Dakota, Ohio, Missouri, Wisconsin, Texas, Michigan, Montana, Oklahoma, Idaho and Washington. The study area was selected on the basis of large crop production and geographic diversity. There is at least one [agriculture-oriented] short line in each of these [s]tates. In some cases, a short line will own other short lines, in which case each was counted separately, so altogether the sample includes 47 agriculture-oriented short lines.

Related Resource:

Profile of Short Line Railroads in High Grain Production States (Summary), Jesse Gastelle, Agricultural Marketing Service, U.S. Department of Agriculture, February 2018.

<http://dx.doi.org/10.9752/TS215.02-2018>

From the conclusions: There have been few studies that seek to identify the determinants of a profitable short line railroad or that focus on the relationship between short line railroads and agriculture. This study documents the state of the short line industry and its relationship to the grain logistics system. It concluded that short line railroads are economically significant to the agricultural industry and that, from a public perspective, short lines are underinvesting in capital for infrastructure and equipment due to insufficient funds. In light of the benefits described by DOT personnel, the study indicated that assistance programs are valuable and [s]tates that do not currently have them could benefit from them. Future research is needed to conduct a deeper assessment of the competition between short lines and trucks, as well as research to better understand the role of multi-short line holding companies.

Estimating the Future Agriculture Freight Transportation Network Needs Due to Climate Change Using Remote Sensing and Regional Climate Models, Janey Camp and Paul Johnson, National Center for Freight and Infrastructure Research and Education, December 2016.

<https://rosap.ntl.bts.gov/view/dot/32094>

From the abstract: A reoccurring challenge with increasing fuel prices is optimization of multi- and inter-modal freight transport to move products most efficiently. Projections for the future of agriculture in the United States (U.S.) combined with regional climate models indicate a shift in warm temperatures northward and potential shift in agricultural growing seasons and conditions for optimized crop yield which leads to a potential change in how much and where freight to move these crops will be needed in the future. Given recent history, the country is already experiencing changes in regional weather trends and growing seasons likely due to climate change and these can be used as indicators of future changes. It would be beneficial for freight carriers to have an awareness of where and to what extent fleets will be needed to continue export of grains from the [U]pper Midwest to the rest of the U.S. and the world. This project seeks to use recent historical climate and crop information combined with regional climate modeling and other tools to project forward the demands on freight transportation for the [U]pper Midwest grain distribution in the future.

Regional Food Freight: Lessons From the Chicago Region, M. Miller, W. Holloway, E. Perry, B. Zietlow, S. Kokjohn, P. Lukszys, N. Chachula, A. Reynolds and A. Morales, Agricultural Marketing Service, U.S. Department of Agriculture, October 2016.

<https://localfoodeconomics.com/wp-content/uploads/2018/02/miller-et-al-2016-Regional-food-freight-final-2.pdf>

From the report's conclusion on page 30: By considering the Upper Midwest regional food system as a whole, we were able to see patterns in how food could move more efficiently and support a more resilient, diversified agriculture. Food freight transportation links production and consumption regions into a complex web that has outgrown its ability to meet public and private objectives. Simple, targeted public and private investments in transportation and distribution infrastructure specifically to support small and medium supply chains could improve this.

Using systems tools, we identified potential solutions to food transportation-specific challenges, such as safety, congestion and inadequate public resources for transportation infrastructure maintenance and development. All these potential solutions currently lay outside the traditional boundaries of the transportation system. By improving the food distribution system, they

improve the transportation system, especially in a region critically important to national food flow, like Chicago. By using multiple methodologies, we gained a deeper understanding of how national and regional food systems work today, and how long-term food shipment trends impact current and future food production and markets.

California

An Analysis of California Agricultural Transportation Origins, Destinations, Modal Competition and Industry Perspectives: Selected Fresh Fruits and Vegetables, Mechel S. Paggi, Jay E. Noel, Fumiko Yamazaki, Sean Hurley and Michael McCullough, Agricultural Marketing Service, U.S. Department of Agriculture, July 2012.

<http://www.fresnostate.edu/jcast/ifa/documents/1An%20Analysis%20of%20California%20Agricultural%20Transportation.pdf>

From the study problem statement and objectives: The basic problem addressed by this study was the lack of information and analysis available to assess how changes in the agricultural transportation technology, infrastructure and transportation cost might impact the regional and international competitiveness of California specialty crop industries.

The specific objectives associated with answering the basic problem included:

- Gather primary and secondary data on the various modes of transportation. This data would include product market and transportation market information by region and specialty crop sector.
- Identifying those transportation modes (truck, rail, air, ports) where the California specialty crop grower, shippers and transportation industry firms are experiencing or may experience changes in their regional and international competitiveness due to logistical and cost issues associated with current and projected changes in transportation technology, infrastructure and agricultural transportation markets. The importance will be identified by specialty crop category and California region.
- Evaluate the impact that changes in agricultural transport technology, infrastructure and agricultural transportation markets will have on the future competitiveness of California specialty crop producers in the regional and international marketplace.
- Provide policymakers and other stakeholders involved with agricultural transportation issues suggestions on maintaining or improving the regional and international competitiveness of California specialty crop industries through changes and improvements in existing transportation mode services.

Florida

Agricultural Growth and Development in District One and the Impacts to Transportation and Freight Logistics: FDOT District One, Florida Department of Transportation, 2017.

<https://www.colliercountyfl.gov/home/showdocument?id=77831>

From the introduction: The relocation of agriculture production in District One has particular relevance to freight movements since the [d]istrict is home to major agribusinesses with large-scale agricultural operations. These agribusinesses are vital suppliers of agricultural goods to large wholesale and retail grocery and other food production companies across the United States and the world. It is anticipated that such a shift of agriculture production operations of this scale will have a profound impact on some areas/counties within the [d]istrict. Some of this impact may produce a reduction in agriculture-related truck traffic, but in other areas it may increase the pressure of heavy truck traffic on the surrounding area/network—particularly in areas where there may not be any state highway facilities to support such an industrial operation.

This report aims at identifying where the encroachment on agricultural land will likely occur in District One with particular focus on the coastal counties. It looks at where the agriculture production will likely shift to other counties in District One, and how this shift will impact the transportation network across the [d]istrict. Findings focus in the areas of impact on a regional basis, impact on key corridors and state roads, impact on local roads, identification of areas for future hubs for freight activity, and how this information may be useful in other transportation planning efforts.

Idaho

2015 Agricultural Freight Study, Community Planning Association of Southwest Idaho (COMPASS), November 2015.

<https://www.compassidaho.org/documents/prodserv/CIM2040/2015AgFreightStudyReport.pdf>

From page 8 of the study, page 10 of the PDF:

The agricultural freight study provided an increased understanding and awareness of some of the freight movements that must be accommodated in our transportation network. Moving forward, COMPASS staff will be able to use this valuable data and information as a starting point for expanding the scope to incorporate all forms of freight.

COMPASS received a Second Strategic Highway Research Program (SHRP2) grant in 2015 to better integrate freight into its long-range planning. The grant funds vehicle classification data collection on over 70 sites. These sites were identified using the common or known freight route information and additional information provided by the agricultural freight study.

COMPASS established a Freight Advisory Workgroup to advise freight issues and concerns, and help to develop the freight component for the long-range transportation plan. The multiyear freight planning work plan includes additional data collection and development of an action plan and implementation plan.

Illinois

“Container Repositioning and Agricultural Commodities: Shipping Soybeans by Container From US Hinterland to Overseas Markets,” Christopher Clott, Bruce C. Hartman, Elizabeth Ogard and Althea Gatto, *Research in Transportation Business and Management*, Vol. 14, pages 56-65, March 2015.

Citation at <https://www.sciencedirect.com/science/article/abs/pii/S2210539514000686>

From the abstract: Export by container offers advantages for moving agribusiness products due to the availability of empty import containers that can be repositioned, making accessible inland “dry ports” more important in supply chains. This paper assesses the impact and challenges of increasing containerized movements of agricultural commodities from hinterland points to overseas markets, regarding both operations and governance. Products like soybeans have complex supply chains affected by weather, seasonality, price, equipment availability, congestion, modal delay, cargo ownership, and sustainability or product quality requirements. About 5[%]–7% of the total US soybean export crop moves in ocean containers today; with business and governmental support, 12[%]–15% could be attained, benefitting soybean producers, ports, ocean carriers, and shippers. Our case study of soybeans exported from the US state of Illinois examines a number of major operational issues, actions, rules and policies affecting this containerized flow and its total landed cost. One factor, delays in barge links, is studied with a commodity flow model combining product movement with container repositioning. A study of this case can shape operations practice and decisions for governance of intermodal agricultural product export movements.

Iowa

The Actual Cost of Food Systems on Roadway Infrastructure, Omar Smadi, Inya Nlenanya, Marwan Ghandour and Silvina Lopez Barrera, Leopold Center for Sustainable Agriculture, Center for Transportation Research and Education, Iowa State University, March 2011.

https://intrans.iastate.edu/app/uploads/2018/03/food_systems_cost_on_infra_w_cvr.pdf

From the abstract: This research was designed to provide more insight into the infrastructure challenges of agricultural enterprises in Iowa and to also facilitate the understanding needed to implement broader energy-related policy and planning. Specifically, this research effort focused on achieving the following objectives: (1) Capitalize on current research efforts to develop a systematic methodology for estimating the actual cost of moving food produce from farm to market including: environment (carbon emissions and air quality; infrastructure; energy (fuel); congestion; safety; and user (taxpayer) costs. Use data on the highway system (roads and bridges) from the Iowa Department of Transportation (DOT) to test the methodology. (2) Estimate the impact of local, regional and conventional food systems (using truck and vehicle size as a measure) on roadway infrastructure. Correlate impacts to road costs; then, develop comparisons using distance as a variable. The impact of the local food system is estimated by using case studies in Story, Adams and Taylor [c]ounties. The regional and conventional food systems are estimated based on statewide food freight data. The impacts are correlated to external cost of the distribution of the food system, such as emissions, congestion, safety and pavement deterioration costs.

Minnesota

Effects of Implements of Husbandry (Farm Equipment) on Pavement Performance, Jason Lim, Andrea Azary, Lev Khazanovich, Shiyun Wang, Sunghwan Kim, Halil Ceylan and Kasthurirangan Gopalakrishnan, Minnesota Department of Transportation, April 2011.

https://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=1062&context=intrans_reports

From the abstract: The effects of farm equipment on the structural behavior of flexible and rigid pavements were investigated in this study. The project quantified the difference in pavement behavior caused by heavy farm equipment as compared to a typical [five]-axle, 80 kip semi-truck. This research was conducted on full[-]scale pavement test sections designed and constructed at the Minnesota Road Research facility (MnROAD). The testing was conducted in the spring and fall seasons to capture responses when the pavement is at its weakest state and when agricultural vehicles operate at a higher frequency, respectively.

The flexible pavement sections were heavily instrumented with strain gauges and earth pressure cells to measure essential pavement responses under heavy agricultural vehicles, whereas the rigid pavement sections were instrumented with strain gauges and linear variable differential transducers (LVDTs).

The full[-]scale testing data collected in this study were used to validate and calibrate analytical models used to predict relative damage to pavements. The developed procedure uses various inputs (including axle weight, tire footprint, pavement structure, material characteristics and climatic information) to determine the critical pavement responses (strains and deflections). An analysis was performed to determine the damage caused by various types of vehicles to the roadway when there is a need to move large amounts agricultural product.

Montana

“Estimation of Seasonal Daily Traffic Flow of Agricultural Products and Implications for Implementation of Automatic Traffic Recorders,” Shane Forsythe, Jerry Stephens and Yiyi Wang, *Transportation Research Record* 2477, Issue 1, pages 18-26, 2015.

Citation at <https://journals.sagepub.com/doi/abs/10.3141/2477-03>

From the abstract: This work focused on predicting the spatial distribution of seasonal traffic resulting from agricultural activities by using a new method that combines geographic information system spatial functions and the four-step travel demand model. This research collected information about township grids for Montana (as proxies for trip origins), grain elevators (trip destinations), agricultural ground cover, and crop yield estimates to estimate flows in tonnage at the grid level on the road network. Results suggest that the proposed method using the location of major crops and the locations of grain elevators can be used to predict tonnage of product that will be added to individual routes. The predicted values can then be compared with reported heavy-truck traffic to locate sites that may have underrepresented traffic flows. Although this work considered specifically three crops, the method can be applied to any resource flow that has known origin and destination information. The method can be enhanced by refining assumptions of the composition of heavy trucks transporting agricultural products and by field measurements of vehicle flows to better test the validity of the model.

North Dakota

“Modeling Investments in County and Local Roads to Support Agricultural Logistics,” Denver Tolliver, Alan Dybing, Pan Lu and EunSu Lee, *Journal of the Transportation Research Forum*, Vol. 50, Issue 2, pages 101-115, Summer 2011.

<http://ageconsearch.umn.edu/record/207300/files/2741-5491-1-PB.pdf>

Researchers sought to “quantify needed investments in local and county roads used for agricultural logistics and provide policymakers with detailed information on the locations and costs of high priority road segments” in North Dakota. The detailed GIS model developed by researchers that “predicts flows from 1,406 crop-producing zones to 311 elevators and six ethanol plants was integrated with a mathematical programming and roadway cost model.” The article’s conclusion highlights study’s findings:

- The average farm-to-market trip distance in North Dakota has increased from 12 miles in 1980 to 26 miles in 2009.
- The estimated resurfacing cost per mile on major agricultural distribution routes is 40% greater than the estimated resurfacing cost per mile on non-agricultural routes.
- The average annual cost to resurface and maintain paved agricultural roads is \$18,300 per mile, exclusive of any reconstruction or widening cost.
- The average annual cost to maintain gravel surface agricultural roads ranges from approximately \$3,900 per mile for roads with the lowest traffic levels to roughly \$6,600 per mile for roads with 150 to 200 average daily traffic.
- The estimated cost to maintain 20-year pavement life cycles and acceptable levels of service on county and local roads in North Dakota is roughly double the historical funding level.

South Dakota

Farm to Markets: Innovative Data Sources Enhance Agriculture Freight Connectivity; Freight Demand Modeling and Data Improvement Implementation Support, Federal Highway Administration, August 2017.

<https://ops.fhwa.dot.gov/publications/fhwahop16091/fhwahop16091.pdf>

From the executive summary: The agriculture industry has a \$20.9 billion impact on the South Dakota economy. To ensure that agricultural products can be moved efficiently to market, the South Dakota Department of Transportation (SDDOT) routinely makes investment decisions to add and improve transportation infrastructure across the [s]tate. While these investment decisions are made based on the needs of the transportation system and are a function of the demand for agricultural products, the SDDOT generally does not use agriculture production data to assist in making these investment decisions.

....

Given the importance of agriculture to the [s]tate, SDDOT completed a project to develop and demonstrate a framework to combine agriculture and transportation data with the goal of using agriculture data to inform transportation planning. This project included a literature review and stakeholder interview process to understand agriculture trends and identify agriculture data sources. Data requirements were developed, and available data sources were evaluated to understand how each source met the newly defined requirements. With a prioritized list of new data sources, the project team devised an approach to combine available transportation and agriculture data sources and identified a five-county region in central South Dakota where the project team successfully demonstrated the research approach.

Texas

Improving Intermodal Connectivity in Rural Areas to Enhance Transportation Efficiency: A Case Study, Stephen Fuller, John Robinson, Francisco Fraire and Sharada Vadali, U.S. Department of Transportation Research and Innovative Technology Administration, May 2011.

http://utcm.tamu.edu/publications/final_reports/Fuller_07-07.pdf

From the abstract: Congested roadways in Texas' metropolitan centers are important arteries for transporting agricultural commodities into domestic and international markets. Truck transportation of these commodities contributes to the observed congestion and delay in these urban centers. As an example, cotton, which is a major field crop in Texas, is transported via Dallas-Fort Worth and Houston roadways to access container transport to the international market, the principal outlet for this commodity. This study examines the feasibility of investment in intermodal terminals in rural Texas with the implications for reducing roadway maintenance costs, greenhouse gases and truck transportation in Texas' metropolitan areas. The analyses show an intermodal terminal in west Texas' intensive cotton production region (Lubbock, Texas) would be economically viable, reducing loaded truck-miles on state roadways, carbon dioxide emissions and truck-travel in the Dallas-Fort Worth metropolitan center.

Washington

A Climate of Choice: Understanding the Environment That Shapes Decisions in Washington's Food and Grain Supply Chain; Freight Demand Modeling and Data Improvement Implementation Support, Federal Highway Administration, August 2017.

<https://ops.fhwa.dot.gov/publications/fhwahop17016/fhwahop17016.pdf>

From the executive summary:

Challenges

Representing more than 1.4 million jobs and nearly \$130 billion in regional domestic product, freight-related industries make up a significant portion of Washington State's

economy. Within the transportation sector, several opportunities exist to reduce greenhouse gas emissions, including converting from traditional to alternative fuels, diesel retrofits, emission treatment technologies, or idle reduction devices. However, planners traditionally had little insight how [s]tate policy scenarios aimed at reducing freight emissions would affect the freight system. Given the importance of the [s]tate's freight industry and lack of understanding regarding different policy scenarios, the Washington State Department of Transportation (WSDOT) completed a study to collect both qualitative and quantitative data from two of the [s]tate's major supply chains: wheat production and food delivery.

Approach

A literature review was conducted to identify key actors within the supply chains and provide insight into the data collection plan. Qualitative interviews were conducted to understand the wheat- and food-related supply chain responses to market conditions and potential policy changes aimed at reducing freight emissions. Surveys were developed to explore hypothetical policy and market scenarios focused on financial incentives/disincentives for alternative fuels, changes in fuel costs and changes to alternative fuel technologies. Finally, truck counts were conducted at grocery stores in the Puget Sound area to understand truck behavior at the user-end of the food supply chain.

Related Resources:

Data Collection for Two Distinct Supply Chains: Food Distribution and Wheat, Anne Goodchild, Luka Ukrainczyk, Jeremy Sage, Ken Casavant, Barbara Ivanov, Matthew Pahs, Vidya Mysore, Birat Pandey, Sharleen Bakeman, Sharon Love and Nicholas Kehoe, Washington State Department of Transportation and Federal Highway Administration, March 2016.

<https://www.wsdot.wa.gov/sites/default/files/2014/09/22/food-distribution-research-supply-chains.pdf>

From the introduction: The purpose of this research is to develop knowledge of food distribution supply chains in Washington State through application of novel data collection approaches. This will allow WSDOT to provide the necessary information to support ongoing development and refinement of the Washington State Supply Chain Model, and will allow USDOT to develop recommended data collection approaches in support of the SHRP2 C20 freight data and modeling program. [The third round of the second Strategic Highway Research program (SHRP 2) was the Freight Demand Modeling and the Freight Data Improvement (C20) product grants.] This research meets SHRP2 C20 goals by using interviews and questionnaires to collect information on characteristics of business and likely behavioral responses (route and mode choice) to various conditions; and supporting truck trip modeling by collecting truck count data at food distribution facilities under a variety of land use scenarios.

Wheat Supply Chain Data Collection, Jeremy Sage and Ken Casavant, Washington State Department of Transportation, February 2016.

<https://www.wsdot.wa.gov/research/reports/fullreports/853.1.pdf>

From the abstract: As the Washington State Department of Transportation's (WSDOT) interest in developing a statewide freight model has grown, so too has the need to better understand potential responses of major industries to different policy and market scenarios aimed at reducing freight emissions. This research seeks to understand the wheat supply system and its transportation characteristics, as well as potential behavioral responses by wheat suppliers to changes in policy and market conditions, particularly the feasibility of alternative fuel adoption. To accomplish this, the research team has conducted both new interviews within the wheat supply chain actors, as well as identified existing data sources

that help broaden the picture of wheat movement. Results suggest that research is needed to better understand and develop both the power generation of alternative fuel engines as well as the logistics of fuel distribution infrastructure. This is particularly evident for rural freight networks that move heavy agricultural or natural resource[-]based products.

International Resources

Canada

Commodity Life Cycle Assessment and Sustainability Reporting, Government of Alberta, Canada, 2020.

<https://www.alberta.ca/commodity-life-cycle-assessment-and-sustainability-reporting.aspx#toc-1>

As this web site notes, “[t]he agriculture industry uses life cycle assessment (LCA) to measure and report its environmental footprint.” This site provides access to LCA reports on the eggs and peas produced in Alberta, Canada.

“Measuring the Environmental Footprint of Alberta Peas (PCN Summer 2017),” *Pulse Crop News*, Alberta Pulse Growers, July 2017.

<https://albertapulse.com/2017/07/measuring-environmental-footprint-alberta-peas-pcn-summer-2017/>

From the online article: Sustainability of agri-food systems has never been more important than it is today. To gain a comprehensive understanding of sustainability performance and identify opportunities for improvement, the Alberta Pulse Growers (APG) collaborated with Alberta Agriculture and Forestry (AF) to conduct an Alberta pea environmental footprint assessment using a method called life cycle assessment (LCA).

LCA is a holistic yardstick of the environmental performance of products and services. It measures how much environmental impact the production of a product contributes throughout its life. It looks at all significant environmental impacts including carbon footprint, water footprint, eutrophication, acidification, photochemical smog, etc.

“Having a published LCA number is not the overall objective of the process,” explained Nevin Rosaasen, APG’s policy and program specialist. “Conducting an LCA sets a benchmark, identifies certain ‘hotspots’ where there are best management practices. Employing targeted fertility programs, and other extension opportunities to growers on how they can save money and produce food more efficiently are other motivators.”

“Canada’s Grain Handling and Transportation System: A GIS-Based Evaluation of Potential Policy Changes,” Savannah Gleim and James Nolan, *Journal of the Transportation Research Forum*, Vol. 54, Issue 3, pages 99-111, Fall 2015.

https://trforum.org/wp-content/uploads/2016/10/2015v54n3_06_CanadaGrainHandling.pdf

From the abstract: This research re-examines both transportation allocation and infrastructure capacity problems associated with moving grain from the Western Canada to export position. The analysis is conducted with geographic information system software using grain industry data. In contrast with historical grain industry logistics methods, the analysis and simulation framework allows the authors to re-examine logistic solutions in this vast supply chain in the interest of improving overall delivery efficiency. In addition, the authors found that rail network capacity should not constrain any major expansion of grain movement in the system over the foreseeable future.

Contacts

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Appendix A: Survey Questions

State Department of Transportation and Public Sector Survey

The following survey was distributed to members of the American Association of State Highway and Transportation Officials (AASHTO) Freight Planning Task Force and Committee on Planning and to representatives from a selected group of California counties and metropolitan planning organizations expected to have experience in agricultural goods movement. Respondents were encouraged to consider the range of modes used to move agricultural goods—highways, railways, waterways and air—in their responses.

Caltrans Survey on Planning for Agricultural Goods Movement

Plans and Planning

1. Does your agency support a statewide planning effort specific to agricultural goods movement?
 - No (Please respond to **Question 1A.**)
 - Yes (Please describe these planning efforts.)
- 1A. Is there interest within your agency to initiate a statewide planning effort specific to agricultural goods movement?
 - No
 - Yes (Please describe any plans your agency has to initiate this planning effort.)
2. Does your agency have a statewide agricultural goods movement plan?
 - No
 - Yes (Please provide a copy of the plan. Send any files not available online to chris.kline@ctcandassociates.com.)
3. Are you aware of regional agricultural goods movement plans that are under development or have been published in your state?
 - No
 - Yes (Please identify the owners of the plan(s). If you have access to the plan(s), please provide a link to the plan or send any files not available online to chris.kline@ctcandassociates.com.)
4. Does your agency collaborate with other state agencies on agriculture-related goods movement planning efforts?
 - No
 - Yes (Please identify the agencies and briefly describe the collaborative efforts.)
5. Please describe any partnerships your agency has established with the agricultural goods movement stakeholders listed below.
 - Commodity-specific cooperatives
 - Large agricultural conglomerates
 - Regional agricultural cooperatives
 - Metropolitan planning organizations
 - Other (Please describe.)
6. Please describe the data sources your agency uses to gather the data needed for agricultural goods movement planning.

7. Has your agency attempted to track agricultural goods movement through the full life cycle of a specific commodity—from harvest to packaging, distribution and point of sale?
 - No
 - Yes (Please describe this life cycle analysis.)

Funding

1. Does your agency assess the impacts from the agricultural goods movement industry to your state's transportation system (such as pavement degradation, seasonality movements, congestion, etc.)?
 - No
 - Yes (Please describe how this assessment is made.)
2. Does your agency offer funding programs for agricultural goods movement improvements to address impacts?
 - No
 - Yes (Please describe these programs.)
3. Does your agency have specific criteria or a definition that a project must meet to be considered an agricultural goods movement project?
 - No
 - Yes (Please describe the criteria or definition.)
4. What types of agricultural goods movement projects has your agency funded previously?
5. Does your agency subsidize the movement of a specific agricultural commodity?
 - No
 - Yes (Please describe the subsidy program.)
6. Do the regional transportation agencies or metropolitan planning organizations within your state offer funding for agricultural goods movement?
 - No
 - Yes (Please identify these agencies.)

Assessment

1. Has your agency encountered workforce challenges associated with agriculture production that make it difficult to move goods from "farm to fork"?
 - No
 - Yes (Please describe these challenges.)
2. Please describe the **effective practices** your agency has applied to improve agricultural goods movement in your state in connection with the factors listed below.
 - Climatic considerations
 - Infrastructure (rural)
 - Infrastructure (urban)
 - Movement of equipment
 - Movement of livestock
 - Movement seasonally
 - Pavement deterioration (local roads)
 - Pavement deterioration (state roads)
 - Traffic congestion
 - Traffic routing
 - Traffic safety
 - Other (Please describe.)

3. Please describe the **challenges—and possible solutions**—associated with agricultural goods movement that your agency has identified in connection with the factors listed below.
 - Climatic considerations
 - Infrastructure (rural)
 - Infrastructure (urban)
 - Movement of equipment
 - Movement of livestock
 - Movement seasonally
 - Pavement deterioration (local roads)
 - Pavement deterioration (state roads)
 - Traffic congestion
 - Traffic routing
 - Traffic safety
 - Other (Please describe.)

Wrap-Up

1. Please provide links to documents associated with your agency's planning efforts specific to agricultural goods movement (other than documents you have already provided). Send any files not available online to chris.kline@ctcandassociates.com.
2. Please provide any comments or additional information about your previous responses.

Private Sector Survey

The following survey was distributed to a selected group of contacts from private sector organizations expected to have experience with the movement of agricultural goods. Respondents were encouraged to consider the range of modes used to move agricultural goods—highways, railways, waterways and air—in their responses.

Caltrans Survey on Planning for Agricultural Goods Movement

Plans and Planning

1. Please describe any partnerships or collaborative efforts your organization has established with the agricultural goods movement stakeholders listed below.
 - State agencies
 - Federal agencies
 - Metropolitan planning organizations
 - Commodity-specific cooperatives
 - Large agricultural conglomerates
 - Regional agricultural cooperatives
 - Other (Please describe.)
2. Please describe the data sources your organization uses to gather the data needed for agricultural goods movement planning.
3. Has your organization attempted to track agricultural goods movement through the full life cycle of a specific commodity—from harvest to packaging, distribution and point of sale?
 - No
 - Yes (Please describe this life cycle analysis.)

Assessment

1. Has your organization encountered workforce challenges associated with agriculture production that make it difficult to move goods from “farm to fork”?
 - No
 - Yes (Please describe these challenges.)
2. Please describe the **effective practices** your organization has applied to improve agricultural goods movement in connection with the factors listed below.
 - Climatic considerations
 - Infrastructure (rural)
 - Infrastructure (urban)
 - Movement of equipment
 - Movement of livestock
 - Movement seasonally
 - Pavement deterioration (local roads)
 - Pavement deterioration (state roads)
 - Traffic congestion
 - Traffic routing
 - Traffic safety
 - Other (Please describe.)
3. Please describe the **challenges—and possible solutions**—associated with agricultural goods movement that your organization has identified in connection with the factors listed below.
 - Climatic considerations
 - Infrastructure (rural)
 - Infrastructure (urban)
 - Movement of equipment
 - Movement of livestock
 - Movement seasonally
 - Pavement deterioration (local roads)
 - Pavement deterioration (state roads)
 - Traffic congestion
 - Traffic routing
 - Traffic safety
 - Other (Please describe.)

Wrap-Up

1. Please provide links to documents associated with your organization’s activities specific to agricultural goods movement. Send any files not available online to chris.kline@ctcandassociates.com.
2. Please provide any comments or additional information about your previous responses.