ECONOMIC IMPORTANCE OF INLAND WATERWAYS TO U.S. AGRICULTURE

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Notice

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Federal Agencies

U.S. Department of Transportation Bureau of Transportation Statistics

U.S. Department of Agriculture National Agricultural Statistics Service

U.S. Army Corps of Engineers Waterborne Commerce Statistics Center

State Agencies

Washington Grain Commission

Oklahoma Department of Transportation

Arkansas Waterways Commission

Industry/Trade Associations

Oregon Wheat Commission

Washington Association of Wheat Growers

Soy Transportation Coalition

Illinois Corn Growers Association

Producers/Shippers

Marguis Energy

Cargill

Logistics Service Providers

Bruce Oakley, Inc.

CGB Enterprises, Inc.

Ports/Port Authorities

Tulsa Ports

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List of Abbreviations

Abbreviation	Term
USACE	United States Army Corps of Engineers
CIS	Capital Investment Strategy
GDP	Gross Domestic Product
USDA	United States Department of Agriculture
NOx	Nitrous Oxide
PM10	Particulate Matter (10 micrometers or less)
CO	Carbon Monoxide
BIL	Bipartisan Infrastructure Law
PIDP	Port Infrastructure Development Program
FTOT	Freight and Fuel Transportation Optimization Tool
WCSC	Waterborne Commerce Statistics Center
BLS	Bureau of Labor Statistics
BTS	Bureau of Transportation Statistics

Executive Summary

The inland waterways of the United States serve as a vital component of our national freight transportation system. These waterways provide a low-cost means of transporting bulk goods for States across the U.S. facilitating both domestic shipping, and connecting States to coastal points of export granting access to international markets. The agricultural industry is a key beneficiary of inland waterways, which bring essential inputs such as fertilizer to farms across the U.S. and enable producers and shippers to efficiently and cost-effectively move product to key ports for international export. The ability to move agricultural goods over inland waterways is in large part what helps maintain the competitiveness of prices for U.S. agricultural commodities. Without these waterways, there could be reduction in demand for U.S. agricultural goods given the highly competitive agricultural market.

This report quantifies some of the contributions of the U.S. inland waterways by measuring the economic impact of the inland waterway transportation services industry, as well as the agricultural industries utilizing these waterways to bring goods to export. This report serves as an update and enhancement of the previous Importance of Inland Waterways to U.S. Agriculture report, published in 2019. This report updates data sources and expands the number of States and commodities analyzed.

This report finds that the U.S. inland waterway transportation services industry supports over 200,000 jobs, generating nearly $17 billion in income, and contributes almost $30 billion in gross domestic product (GDP) to the U.S. economy annually. Agricultural industries in the States analyzed which rely on inland waterways to bring goods to international markets support an additional 123,000 jobs, which generate over $8 billion in income and $17 billion in GDP annually. This report evaluates the agricultural industries reliant on the U.S. inland waterways for selected States and shows the contributions of these industries for the selected States' economies.

Additionally, multiple capacity expansion and disruption scenarios were analyzed using the most recent (at the time of this report's writing) U.S. Army Corps of Engineers (USACE) Capital Investment Strategy (CIS), and customized routing software. This report finds that constructing only the subset of projects in the USACE CIS focused on lock expansion would support an additional 8,000 jobs and generate over $2 billion in GDP annually. This report also finds that disruptions to U.S. inland waterways would lead to an increased transportation cost of up to $60,000 per flotilla due to diversions to alternative transportation modes. These diversions would also lead to increased pollutants and pose a higher risk of injury and fatalities due to the relative safety of waterway transportation compared to alternative transportation modes.

Finally, this report concludes with a detailed analysis of the current U.S. agricultural export market and underscores the strategic importance of inland waterways transportation in preserving U.S. global economic competitiveness. It finds that U.S. domestic transportation costs offer the U.S. a comparative advantage against key competitors in agricultural industries, such as Brazil. This is in large part driven by the low cost of barge transportation, without which the U.S. may lose its competitive economic advantages in this area.

Section 1

Introduction

The purpose of this report is to provide an analysis of the economic importance of U.S. inland waterways in transporting agricultural commodities, in support of the U.S. Department of Agriculture (USDA). This report examines the role of U.S. inland waterways in supporting agricultural exports and estimates the contributions of agricultural transportation to the broader U.S. economy. Finally it updates and enhances a 2019 study prepared for USDA on similar topics, Importance of Inland Waterways to U.S. Agriculture. The waterways and States of focus in this report are described below and presented visually in Figure 1.1.

This report specifically aims to:

Enlarge the scope of economic analysis. This report considers several of the same agricultural commodities included in the 2019 study (namely corn and soybeans, which are the dominant commodities by tonnage shipped over inland waterways). Departing from the 2019 study, this report adds analyses of wheat, rice, and sorghum grain.

Furthermore, States not previously considered in the 2019 study have been added to this analysis given their proximity to and use of inland waterways. These new States include Alabama, Idaho, Nebraska, Oklahoma, Oregon, and Washington.

Waterways and States of Focus in this Study

Waterways

- Upper Mississippi River
- Illinois River
- Lower Mississippi River
- McClellen-Kerr Arkansas River (MKARNS)
- Ohio River
- Columbia River
- Snake River
- Tennessee River

States

AL, AR, IA, ID, IL, IN, KS, KY, LA, MN, MS, MO, NE, OH, OK, OR, TN, WA, and WI

Commodities

Corn, Soybeans, Wheat, Rice, and Sorghum Grain

Figure 1.1: Waterways and States of Focus
Source: USDOT Volpe Center, USACE WCSC

Incorporate stakeholder feedback. This report includes an analysis of stakeholder feedback to help identify the economic impact of U.S. inland waterways as well as opportunities for improvement on these waterways. The project team reached out to several stakeholders as part of this outreach effort. Stakeholders represented industries that heavily rely on waterways to move agricultural freight or agencies involved in inland waterways planning and decision-making.

Update economic scenarios. Building on the methodology used in the 2019 study, this report employs similar tools to evaluate inland waterways' economic contributions and assess the potential impacts of future investment and disruption scenarios. However, this report uses the most up-to-date data on agricultural shipments as well as the most recent U.S. Army Corps of Engineers (USACE) Capital Investment Strategy (CIS) and modeling techniques available at the time of this report's writing.

Enhance the scenario analysis approach. This report begins by quantifying the baseline economic contributions of transportation services on U.S. inland waterways. It also provides an overview of agricultural commodities exported internationally via waterways. Key metrics such as employment, labor income, gross domestic product (GDP), and output are assessed to show the economic value generated by transportation on inland waterways and the production of commodities exported via the waterway system. Appendix C: Individual State Profiles provides a breakdown of metrics by State and agricultural commodity.

Building on this foundation, the report then examines potential economic impacts from scenarios that could affect U.S. inland waterways. These include investment scenarios where different funding levels are used to expand the capacity of U.S. inland waterways and improve their efficiency. They also include disruption scenarios that evaluate the consequences of system inaccessibility due to infrastructure failures or other interruptions. These scenarios were developed in coordination with USACE using input from industry stakeholders, policy-makers, and subject matter experts.

The models used in this analysis are approximations designed to represent the economic relationships between inland waterways transportation, agricultural exports, and broader economic activity. Like all models, they rely on assumptions and simplifications to capture complex real-world dynamics. These models are intended to provide reasonable estimates of economic contributions and scenario impacts, rather than precise forecasts. For a detailed description of the modeling approaches used, including the data sources, assumptions, and methods used to develop modeling inputs, please

Source: Adobe Stock

Source: Adobe Stock

refer to Appendix A: Methodology and Assumptions.

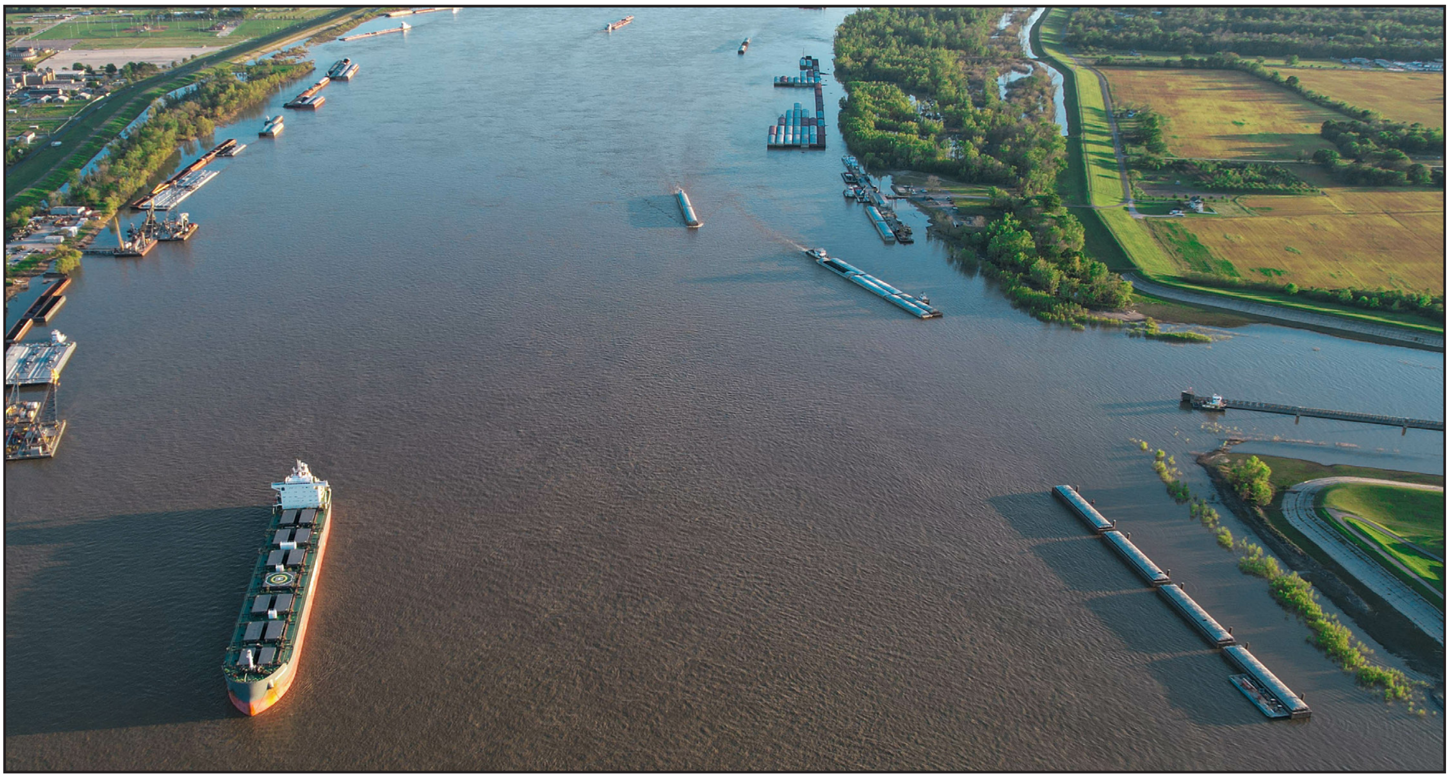
Updated export market analysis. The report concludes with an analysis of the current agricultural export market, highlighting the critical role of inland waterway transportation in sustaining U.S competitiveness. This section compares historical trends in the cost to export soybeans from key production regions in both Brazil and the U.S. to China and discusses recent investments in Brazil's infrastructure that may affect U.S. competitiveness in export markets.

Key Findings:

- The inland waterway transportation services industry directly supports about 26,100 jobs and generates about $3.4 billion in labor income and $7.8 billion in GDP annually. Furthermore, the demand placed on other industries for inputs, as well as the effect of spending income generated by these industries, produces additional GDP and supports jobs in other sectors. In total, the inland waterway transportation services industry supports about 211,500 jobs and generates nearly $30 billion in GDP annually.
- Stakeholders contacted in the outreach effort noted that inland waterways offer a safe, efficient, reliable, and cost-effective transportation option for moving agricultural commodities. They noted that the reliability offered by inland waterways provided them an economic advantage in the global marketplace. Operational delays, cost increases, product spoilage, and other impacts were seen when disruptions occurred and affected this reliability. Stakeholders also believed that funding levels for inland waterways are inadequate; they identified needs for increased investment in areas such as infrastructure rehabilitation and dredging.
- Soybean, corn, and wheat producers who rely on U.S. inland waterways to export their goods play a significant role in supporting the broader U.S. economy and represent a large segment of their respective industries. Totaled over the States analyzed:
- Soybean exports that use inland waterways support about 56,800 jobs and contribute an estimated $11.7 billion in GDP annually.
- Corn exports that use inland waterways support about 48,100 jobs and generate $4.3 billion in GDP per year.
- Wheat exports that use inland waterways support 15,800 jobs and contribute $1.4 billion in GDP annually. Though smaller in scale relative to soybeans and corn, the economic importance of the wheat sector underscores the widespread reliance of multiple commodity groups on the inland waterway network.

- Expanding the capacity of U.S. inland waterways would yield considerable economic benefits. Specifically, implementing a subset of USACE CIS projects focused on lock expansion would support approximately 8,200 additional jobs. Furthermore, the economic activity generated by this subset of improvements would add an estimated $1 billion to GDP annually.
- Disruptions to U.S. inland waterways can have significant economic and environmental impacts. As an example, for one route analyzed (Scott County, IA to New Orleans, LA), diverting a single flotilla to alternative modes of transportation (other than waterborne transportation) would result in an additional $59,000 in overall transportation expenses across that route.[1] Such diversions would also lead to increases in harmful pollutants, including nitrogen oxides (NOx), particulate matter ($PM_{10)}$, and carbon monoxide (CO). The shift to alternative modes could also elevate the risk of accidents and injuries due an increased probability of adverse safety outcomes associated with alternative modes of transportation relative to waterway transportation.
- U.S. inland waterways are vital to maintaining America's competitive position in global agricultural markets. The Mississippi River system and its tributaries carry the bulk of U.S. soybean exports, providing lower-cost barge shipping from Midwest production regions to high-capacity export terminals on the Gulf of America. The global soybean trade is dominated by two main exporters, the U.S. and Brazil, who sell a large share of their soybean exports to China. While U.S. and Brazilian soybean production costs are similar, the U.S. inland waterway system historically has given U.S. exporters a logistical advantage. Barge transport is less expensive per ton-mile than overland trucking, reducing U.S. landed costs and helping sustain market share in China. By contrast, Brazil has historically relied on high-cost road transport to reach ports. However, recent Brazilian investments in rail, highway, and waterway infrastructure are narrowing this gap. Strategic investments in inland waterways infrastructure that increase capacity and improve efficiency may preserve the U.S.'s competitiveness in global agricultural markets.

1 A flotilla refers to a group of barges lashed together and pushed by a single towboat. On the Mississippi River system, flotillas commonly comprise up to 15 barges, while on Pacific Northwest river systems they typically consist of 4 barges.



Source: Adobe Stock

Section 2

Background

Source: Adobe Stock

The United States has approximately 25,000 miles of inland, intracoastal, and coastal waterways, of which 12,000 miles are designated as commercially active.[1] Supporting this infrastructure are 191 lock sites and 237 active lock chambers, which are essential for managing river elevation changes and maintaining commercial navigability.[2]

U.S. inland and intracoastal waterways border or traverse 38 States and play a vital role in facilitating the domestic and international movement of many commodities, particularly bulk commodities and agricultural products. Even States without direct access to commercially active waterways benefit from them through intermodal connections (such as to rail and truck). These connections help link agricultural industries and producers to barge terminals and coastal ports for export shipments.

Inland waterways can have economic, operational, and logistical advantages over other freight modes. For example, barges can transport large volumes of goods at significantly lower per-unit costs relative to other freight modes, offering a cost-effective solution for bulk commodity movements.[3] Transportation on inland waterways has a strong safety record, with fewer accidents per ton-mile than other surface transport modes.[4]

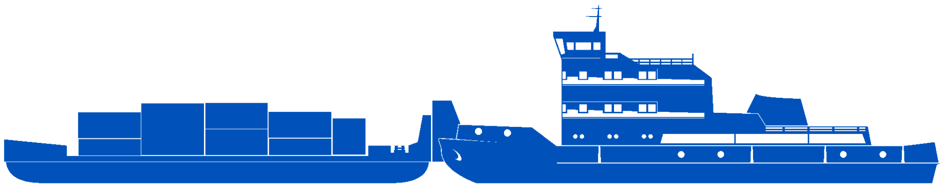
Additionally, barge transportation produces fewer emissions per ton-mile as compared to rail or truck freight, reducing overall emissions intensity from supply chain activity.[5]

Inland waterways are primarily used to transport bulk or breakbulk commodities. These include agricultural products like soybeans, corn, wheat, and fertilizers, energy goods such as coal and petroleum, and construction materials like aggregates and cement. Approximately 465 million tons valued at over $158 billion move on U.S. waterways each year, including approximately 65 percent of U.S. grain exports.[6] In 2022, over 83 million tons of agricultural goods were transported on the Mississippi River system alone, accounting for more than 41 percent of all goods moved on the Mississippi River system.[7] Waterborne transport options provide critical cost advantages for agricultural industries, enabling U.S. producers to compete effectively in global markets against major agricultural exporters such as Brazil, Argentina, Ukraine, and Canada.

Approximately 11,000 miles of U.S. inland waterways are Federally maintained and partially funded through a user fuel tax that contributes to the Inland Waterways Trust Fund (IWTF).[8] The IWTF

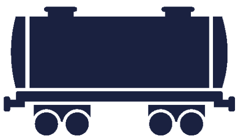
How much does an average barge tow?

Barges are one of the most efficient ways to move bulk or breakbulk goods over long distances. For example, a 15-barge tow can move:



22,500 tons | **767,500 bushels** | **6,804,000 gallons**

To carry the same amount of cargo as one 15-barge tow, you would need:



225 jumbo hopper railcars

2.25 100-railcar trains

866 semi-trucks

Source: USDOT Volpe Center

covers 50 percent of the costs associated with new construction and major rehabilitation projects. The remaining portion of project costs is funded through Federal appropriations.

However, much of U.S. inland waterways infrastructure is aging. The average lock structure is now over 60 years old and many facilities are operating well beyond their intended design life. Deferred maintenance and limited funding for rehabilitation projects have increased the risk of system disruptions, raising concerns about long-term reliability and capacity.[9] To address these challenges, recent legislative efforts—including the Infrastructure Investment and Jobs Act (IIJA) and programs such as the Port Infrastructure Development Program (PIDP)—have directed significant resources toward the modernization and repair of inland waterways. Nevertheless, current investment levels remain insufficient to fully meet the system's long-term infrastructure needs.[10]

Section 2 Endnotes

1 USACE, (n.d.). Inland Waterway Navigation Value to the Nation.
2 USACE, (n.d.). Inland Waterway Navigation Value to the Nation.
3 Bureau of Transportation Statistics, (2022). Average Freight Revenue per Ton-Mile | Bureau of Transportation Statistics.
4 Bureau of Transportation Statistics, (2023). Transportation Statistics Annual Report 2023.
5 National Waterways Foundation, (2022). A Modal Comparison of Domestic Freight Transportation Effects on the General Public.
6 Inland Waterways User Board (2023), Inland Waterways Users Board 35th Annual Report.
7 USACE Waterborne Commerce Statistics Center (2022). Waterborne Commerce of the United States 2022: Part 2 Waterways and Harbors Gulf Coast, Mississippi River System and Antilles.
8 USACE, (n.d.). Inland Waterway Navigation Value to the Nation.
9 Inland Waterways User Board (2023), Inland Waterways Users Board 35th Annual Report.
10 American Society of Civil Engineers Report Card (2024), Inland Waterways.

Section 3

Stakeholder Engagement

Source: Adobe Stock

Introduction

Stakeholder outreach was an important component of this report's development. The outreach process involved reaching out to selected stakeholders and facilitating informal telephone conversations to obtain input on opportunities and challenges on the use of U.S. inland waterways for agricultural freight. Stakeholders also provided suggestions of areas from the [2019 Importance of Inland Waterways to U.S. Agriculture] report that they believed should be addressed in more depth in this update. The discussions focused on stakeholders' experiences with the six waterways that move the highest tonnage of agricultural products:

- Columbia-Snake River
- Upper Mississippi River
- Lower Mississippi River
- Illinois River
- McClellen-Kerr Arkansas River (MKARNS)
- Ohio River

USDA and the project team collaborated to identify and select stakeholder groups to participate in the outreach discussions. Input was sought from groups that could share a range of perspectives with the project team. The selected groups represented industries that heavily rely on the six waterways to move agricultural freight, as well as those involved in decision-making and planning activities with touchpoints to the U.S. inland waterways system.

Outreach Overview and Purpose

The outreach effort provided opportunities for stakeholders to share input on trends, opportunities, and challenges related to the use of U.S. inland waterways for agricultural freight. The discussions focused on stakeholders' experiences with six waterways of particular interest to USDA in this report.

A total of nine discussions with 12 stakeholder groups were held. Groups represented in the discussions included State transportation agencies, industry/trade associations, agricultural producers, shippers, ports, and freight logistics service providers (see Table 3.1).[11]

Discussions focused on general topics, for example:

- Supply chain or economic changes that stakeholders believed could affect their future use of inland waterways;
- Challenges affecting stakeholders' use of inland waterways and input on opportunities to address these challenges; and
- General considerations or other comments relevant to the project team's work.

Table 3.1: Organizations Participating in Outreach Discussions
Source: USDOT Volpe Center

Inland Waterway(s) of Primary Focus in Discussion	Organization Name	Organization Type	Commodity(ies) of Primary Focus in Discussion
Columbia-Snake River	Washington Grain Commission	State Agency	Grain
	Oregon Wheat Commission	Industry/Trade Association	Wheat
	Washington Association of Wheat Growers	Industry/Trade Association	Wheat
Upper Mississippi River	Soy Transportation Coalition	Industry/Trade Association	Soy
Illinois River	Illinois Corn Growers Association	Industry/Trade Association	Corn
	Marquis Energy	Producer, Shipper	Ethanol
Lower Mississippi River	CGB Enterprises, Inc.	Logistics Service Provider	Grain, soybeans
MKARNS	Bruce Oakley, Inc.	Freight Logistics Service Provider	Grain
	Oklahoma Department of Transportation	State Agency	N/A
	Arkansas Waterways Commission	State Agency	N/A
	Tulsa Ports	Port	Wheat, soybeans
Ohio River	Cargill	Producer, Shipper	Wheat, soybeans, corn, cotton, specialty grains, others

Outreach Key Themes

The following are key themes that emerged from the stakeholder outreach effort. These are presented at a high level to help illustrate the breadth of perspectives shared during the discussions. The themes are grouped under the headings of U.S. inland waterway system benefits, disruption impacts and mitigation strategies, and investment needs.

"Inland waterways are a critical part of our supply chain. We need to make sure that our rivers help us meet supply chain demands. If not, this will chip away at our competitiveness." - Industry/Trade Association Discussion Participant

Benefits

Safety, efficiency, and cost-effectiveness. Many stakeholders described inland waterways as offering a highly safe, efficient, reliable, and cost-effective transport option for their businesses. One stakeholder commented that: "if there wasn't an inland waterway system and barge capabilities, [I believe] the price of transportation would go up substantially." However, several stakeholders noted that waterway transport costs could fluctuate in response to disruptions such as changing water levels, extreme weather events, or global political events. Stakeholders described a few situations or disruptions (e.g., flooding, low river water levels, changes to global supply chains, inflation) when barging became less efficient or cost-effective than other modes and they needed to shift their logistics decision-making in response.

Reliability and resilience. Several stakeholders noted that the overall reliability offered by U.S. inland waterways transport was a critical advantage that helped increase the competitiveness of U.S. agricultural exports in global markets. For example, one stakeholder commented that while "U.S. wheat is rarely the cheapest in the world, it is known for reliability and quality. Reliability and quality are how we distinguish ourselves [especially] when entering new markets." Others noted that the reliability offered by inland waterways was critical to their business models.

A few stakeholders also described the capacity of inland waterways to act as "relief valves" for the overall U.S. freight transportation system when disruptions affected other modes. One stakeholder stated: "there is no mode of transportation that can absorb the tonnage that the river system carries. [Other modes] could band-aid a little bit, but if a lock goes down during a busy season and a farmer cannot move product [along the river],

"Often competitiveness is addressed as a relationship to cost. Cost is important, but timeliness and reliability are also part of competitiveness. Inland waterways bring all of this to the table in a way that other modes don't." - Industry/Trade Association Discussion Participant

that's highly disruptive." Another stakeholder noted that when there are disruptions to the global supply chain, "having a system like U.S. rivers that can take on other loads matters not only to our country but to other parts of the world as well. That is an opportunity to focus on."

Economic competitiveness. Nearly all stakeholders emphasized the importance of inland waterways to business operations, jobs, and economic competitiveness. Many stakeholders noted that inland waterways helped their industries gain access to broader regional or global economic markets. Others noted that barging offered reliability and capacity that other modes could not accommodate. One stakeholder commented that "barging is so important to our industry – the economics are great. It outweighs trucks and trains ...barges can hold a lot." Another stakeholder noted that inland waterways can also expand access to economic markets even for States not geographically located along commercially navigable rivers.

Source: Adobe Stock

Transport-associated pollutants and emissions. Nearly all stakeholders described opportunities presented by inland waterways transport to support environmental goals such as reducing emissions. Many stakeholders specifically described the ability of waterways transport to move agricultural commodities with fewer pollutant and emissions impacts as compared to other modes. For example, one stakeholder commented that "the efficiency and environmental gains from using inland waterways [should be at] the forefront of discussion."

Disruption Impacts and Mitigation Strategies

Operational and economic impacts. Stakeholders provided examples of both unanticipated and anticipated disruptions. Unanticipated disruptions included extreme weather events such as hurricanes or droughts that impacted river water levels, or catastrophic infrastructure failures that hindered or halted operations. Anticipated disruptions included planned lock closures or scheduled waterways infrastructure maintenance activities.

> "At many locations, there's only one lock so an unexpected closure means that no cargo can move up or down the river and there really isn't a backup plan." - Industry/Trade Association Discussion Participant

Stakeholders noted that unanticipated disruptions could have particularly far-reaching and cascading impacts. Because agricultural products can quickly spoil, disruptions on the river can mean wasting product with associated cost impacts. One stakeholder noted that when a certain lock closed, the "entire upper reaches of the river would be closed and result in hundreds of millions of dollars lost." Another noted: "when there are problems within the inland waterway system, it will often decrease the price that is paid to farmers." Another stakeholder mentioned that floods in 2019 shut down operations on the MKARNS for months. He stated that "unplanned incidents can ruin 6 or 7 months of the supply chain before it is back online and by then you're in an entirely new crop cycle."

Relationship-building, coordination, and planning. Stakeholders noted that having strong relationships enables effective coordination with relevant parties (e.g., U.S. Army Corps of Engineers) to mitigate impacts from disruption challenges. Advance notification about upcoming lock closures was also noted as an important strategy to manage potential disruption impacts. One stakeholder noted that advance notification about a lock closure allows them to "provide support to their markets – a year of preparation is really helpful." Stakeholders also noted that some disruptions could present opportunities to increase the visibility of inland waterways and their critical economic importance to decision- and policy-makers.

Investment Needs

Increased funding and more predictable funding levels. Many stakeholders expressed that current funding levels for inland waterways are inadequate. They described investment needs that would help ensure a high level of performance for inland waterways and maximize the system's ability to contribute to economic competitiveness. Specific investment needs mentioned by stakeholders included dredging to make waterways deeper and capable of carrying heavier loads, and rehabilitation or replacement of aging infrastructure, especially dams and locks. Several stakeholders noted the importance of considering redundancy as an investment priority. For example, one stakeholder noted that "it is important to build in redundancy so if something happens to a [lock] chamber you can get through another one." Another stakeholder asked if public funding could be "allocated towards [improving inland waterways] redundancy... sometimes ice will hit the side of a lock and shut it down for 24 hours. Redundancy would help eliminate some congestion [caused by

> "[Inland waterways] are grossly underfunded and this leads to reliability issues– if you don't have reliable water infrastructure, it really hurts economic opportunity." - State Agency Discussion Participant

> "There is a high value in information that helps us make the case for the importance of inland waterways. It's difficult to understand the advantages of barging when you aren't at a disadvantage." – Industry/Trade Association Discussion Participant

infrastructure shut-downs]." Stakeholders also expressed a need for more predictable funding levels that would assist them in budgeting and operations decision-making. Some stakeholders stated that unpredictable funding levels make it difficult to plan, leading to cost overruns and overall inefficiencies. For example, one stakeholder noted that "if funding is only assured for a year or two, you cannot buy equipment in bulk and cannot take advantage of economies of scale."

Data collection and quality. Stakeholders noted a need and opportunity to improve both data collection and the quality of inland waterways data to benefit investment decision-making. One stakeholder noted that it would be especially helpful to have data regarding the comparative advantage of barging relative to other modes, as well as data on barging in the U.S. relative to other countries. Another stakeholder mentioned that improving data collection and quality could help strengthen the baseline of information used by decision-makers and improve policy outcomes.

> "Competition is everything. If we can't maintain a competitive edge through our inland waterways, our economy can't survive. The rivers are what allows us to be competitive."
> – Industry/Trade Association Discussion Participant
>
> "It is very important to have dialogue between government and industry [on the importance of inland waterways]. Communication, cooperation, and collaboration should be high-priority issues."
> Industry/Trade Association Discussion Participant

Section 3 Endnotes

11 To comply with the Paperwork Reduction Act, the project team was limited to holding a total of nine discussions. Stakeholders invited to these discussions were permitted to forward the invitation to others within or outside their organization. In some instances, multiple organizations were represented in a single discussion.

Source: Adobe Stock

Section 4

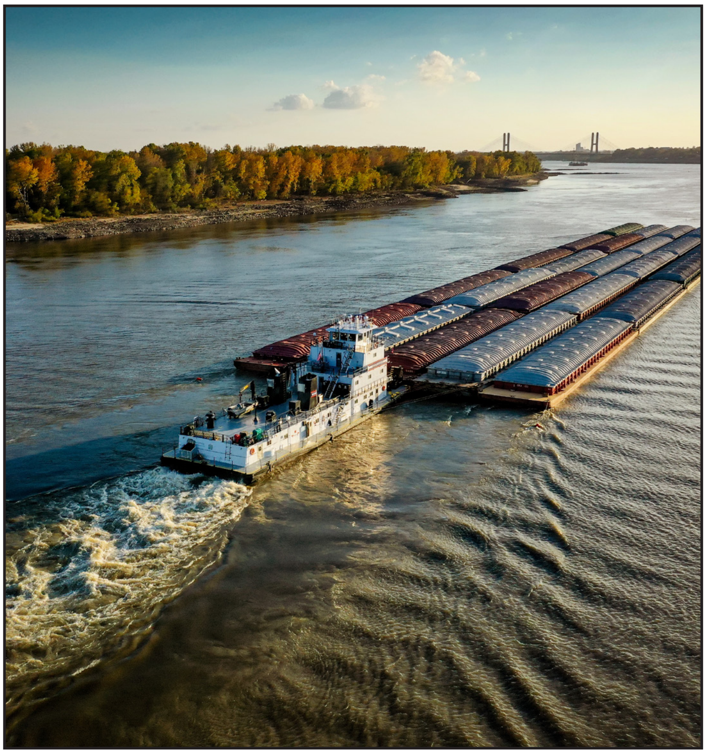
Economic Contributions of U.S. Inland Waterways

Introduction

The inland waterways network significantly contributes to the U.S. economy and serves as a vital transportation network for numerous industries, especially agriculture. These waterways provide agricultural industries with an efficient, cost-effective means to move commodities to domestic markets, export commodities internationally, and receive essential inputs like fertilizer at production sites. They also link multimodal supply chains that allow agricultural commodities to flow more seamlessly to their destinations.

The movement of agricultural commodities along inland waterways contributes to the Nation's economy through providing job opportunities and connecting U.S. industries to domestic and international markets. Further, these waterways enable agricultural industries to transport commodities at a cost that is significantly lower than other surface transportation modes. In many cases, the comparatively lower transportation cost of moving agricultural commodities along inland waterways means that the U.S. can offer a more competitive price for its agricultural commodities in global markets.[12]

This section provides insight on why moving agricultural commodities over inland waterways is important to the economies of selected States as well as the Nation's overall economic health. This section begins by estimating the overall economic contributions of U.S. inland waterway transportation services.[13] Next, this section examines the economic significance of transporting certain agricultural commodities over inland waterways for international exports, for the selected States.[14]



Source: Adobe Stock

Economic Impact Analysis

U.S. Inland Waterways Transportation Services
The economic impact of U.S. inland waterways transportation services can be assessed in terms of contributions to employment, income, GDP, and output. Tables 4.1 through 4.7 present an analysis of these contributions. Table 4.1 shows the total

Overview of Economic Impact Analysis

An economic impact analysis examines the effects of an event, project, or policy on an economy in a specific area. This report measures the economic impact of agricultural industries that transport and export goods internationally using inland waterways for a subset of States.

This report uses the following impact types to assess economic impacts:

- Direct impacts – the initial change or contribution that occurs directly from the activity analyzed.
- Indirect impacts – changes that occur from business-to-business purchases in a specified region and stem from the direct effects.
- Induced impacts – changes that occur from labor income being spent in the specified industries and those impacted across the supply chain in a specified region.

Source: Adobe Stock

economic impact resulting from firms that ship commodities on U.S. inland waterways.[15]

The total economic contributions of inland waterways services are the summation of the direct contributions of inland waterways transportation services, the indirect contributions of intermediate industries that support these services, and induced contributions from spending generated income across all sectors. Table 4.1 presents these economic contributions by impact type.

Direct economic impacts reflect the jobs, labor income, GDP, and output contributed solely by the firms and individuals that provide inland waterway transportation services. These primarily include shipping companies, and the individuals employed at these companies such as vessel operators, ship engineers, and sailors.

There are numerous industries that provide inputs to the inland waterways transportation industry, both in the form of raw materials (fuel, rope, cordage, etc.) as well as services (port operations, commodity contract trading, etc.). The demand the inland waterway transportation industry places on these intermediate industries for inputs generates additional jobs, contributes to GDP, and makes other contributions to the country's economy, known as indirect impacts.

The labor income earned by those employed in the inland water transportation services industry and its intermediate industries induces further economic impacts as employees spend their income. This spending places demand on relevant consumer industries, generating subsequent economic output. The induced impacts measure the economic contributions generated through the spending of labor income that is provided by the inland waterways transportation services industry and its input industries.

In total, the inland waterway transportation services industry supports an estimated 212,000 jobs (just under the total level of employment in some less populated States such as Wyoming), and provides $16.8 billion in labor income annually according to IMPLAN modeling.[16] The industry also generates about $29.9 billion in GDP, which is roughly equivalent to the entire GDP of a medium-sized city such as Jackson, Mississippi, or Lansing, Michigan. In total, the industry generates $64.7 billion in overall economic output.[17,18]

Table 4.1: Economic Contributions of Inland Waterways Transportation Services, U.S. Totals, 2022

Source: USDOT Volpe Center, IMPLAN, BLS

Impact Type	Jobs	Labor Income	GDP	Output
Direct	26,177	$3,384,487,000	$7,822,867,000	$23,450,192,000
Indirect	106,033	$8,244,732,000	$12,590,074,000	$24,408,414,000
Induced	79,259	$5,172,137,000	$9,447,430,000	$16,760,293,000
Total	**211,583**	**$16,815,967,000**	**$29,894,134,000**	**$64,720,126,000**

Agricultural Commodity Sectors

Relative to other transportation modes, U.S. inland waterways provide a highly cost-effective mode of transportation for agricultural industries. By transporting agricultural commodities on waterways, producers can ship to various locations while improving the competitiveness of prices they offer on the international market.[19] Without access to waterways, shippers must rely on more expensive transportation methods, which could increase costs and may reduce the volume of goods sold to international markets. Higher export prices reduce demand and can adversely affect the economic viability of producers dependent on export markets.

For this section, the project team analyzed five agricultural commodity sectors (soybean, corn, wheat, rice, and sorghum grain) to assess their economic contributions to the Nation.[20] The team focused the analysis on 19 States that border or are transversed by waterways with significant shipments of these five commodities:

- Alabama
- Arkansas
- Idaho
- Illinois
- Indiana
- Iowa
- Kansas
- Kentucky
- Louisiana
- Minnesota
- Mississippi
- Missouri
- Nebraska
- Ohio
- Oklahoma
- Oregon
- Tennessee
- Wisconsin
- Washington

The economic impact of each of the five commodity sectors in these 19 States was estimated by analyzing U.S. export ports. Shipments of various agricultural commodities moving along the inland waterways between these export ports and the 19 selected States were assessed. The total volume of shipments from each State bound for export was estimated as a proportion of its total production of each commodity. These proportions were then input into IMPLAN, an economic impact model, to generate economic impact estimates. The

Figure 4.1: Inland Waterways with Significant Agricultural by Tonnage

Source: USDOT Volpe Center, USACE WCSC

economic impacts for the five commodity sectors (soybeans, corn, wheat, rice, sorghum grains) only reflect the sum of impacts over the 19 States outlined above. For a more detailed description of the methodology behind this estimation, see Appendix A: Methodology and Assumptions. Data for this analysis came from 2022, the most recent year available at the time this analysis was conducted.[21] Appendix B provides a State-level analysis for the 19 States.

Figure 4.1 shows inland waterways that are heavily utilized to transport the five commodities listed above. These waterways were used to select States to include in the analysis. However, the analysis included shipments along any inland waterway for each of the selected States and was not limited to the primary waterways that transport agricultural commodities. Table 4.2 provides an overview of these waterways.

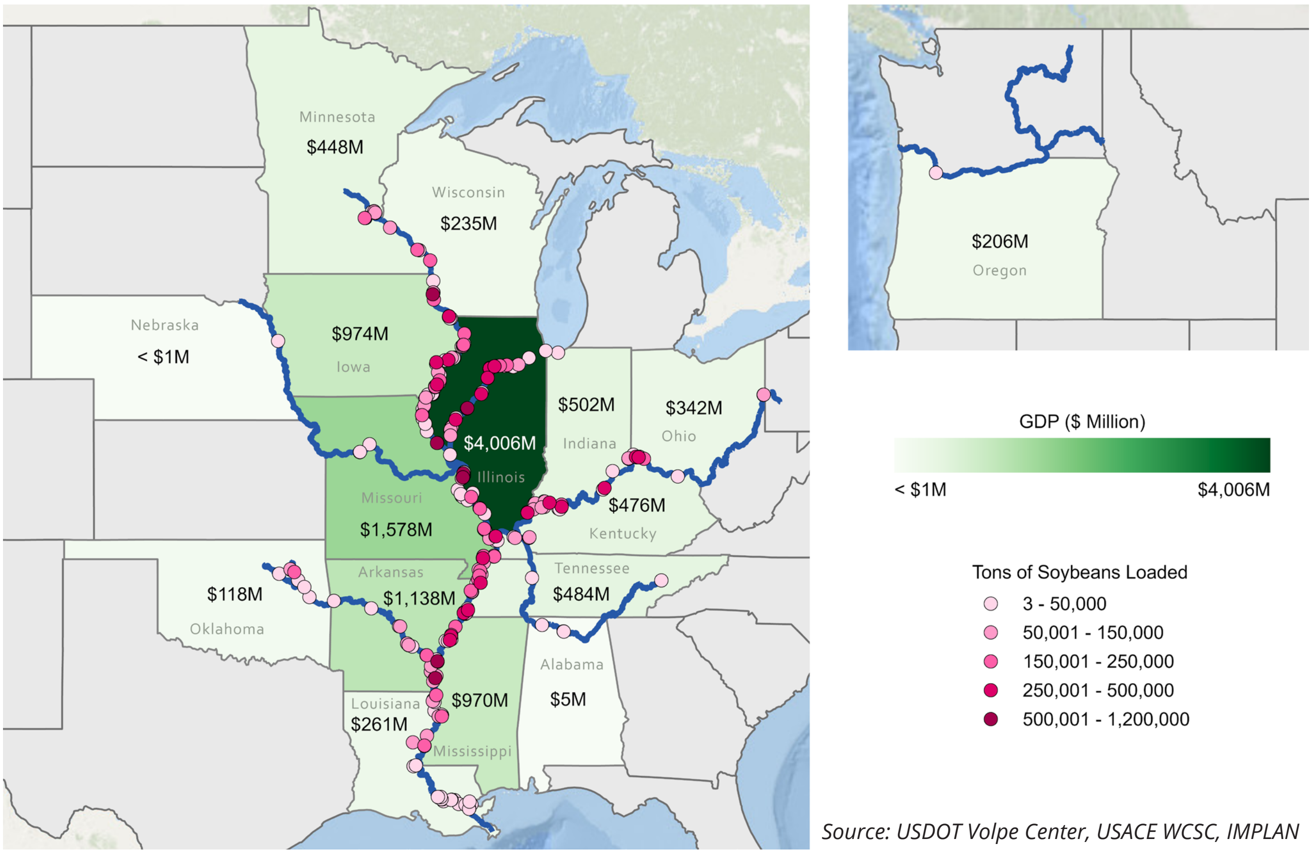
Table 4.2: Overview of Inland Waterways with Significant Agricultural Volumes by Tonnage[22]

Source: USDOT Volpe Center (view endnote 22)

Waterway(s)	Overview/Description	Key Agricultural/Other Commodities Moved
Upper Mississippi River	1,200 miles from Minneapolis, MN, to Cairo, IL. It includes 37 lock and dam sites and forms a crucial part of the inland navigation system	Soybeans, corn, fertilizer, coal and petroleum
Illinois Waterway	273 miles long stretching from Chicago to Grafton, IL; includes navigable portions of the Minnesota, St. Croix, Black, and Kaskaskia Rivers	Soybeans, corn, petroleum, and bulk aggregate
Lower Mississippi River	950 miles stretching from the Ohio confluence at Cairo, Illinois, to the Gulf of America	Soybeans, corn, wheat, and other grains, as well as fertilizer, and cement
McClellen-Kerr Arkansas River Navigation System (MKARNS)	445 miles long from mile 600 on the Mississippi River to navigational head near Tulsa, Oklahoma (includes the Verdigris, Arkansas, and White Rivers)	Soybeans, wheat, sand, gravel, rock, chemical fertilizer, iron and steel
Missouri River	2,315 miles, although only the 734 miles between Sioux City, Iowa, and St. Louis, Missouri, are navigable by barge	Corn and soybeans
Ohio River	981 miles spanning the confluence of the Allegheny and the Monongahela Rivers in Pittsburgh, Pennsylvania, to Cairo, Illinois, where the river flows into the Mississippi River	Corn, soybeans, coal, aggregates, chemicals, and industrial and petroleum products
Tennessee River	652-mile waterway flowing from Knoxville, Tennessee, to the Ohio River at Paducah, Kentucky	Soybeans, corn, coal, as well as manufactured items
Columbia-Snake River	465 miles of waterway running from the Bonneville Dam upriver of Portland, Oregon, to the Lower Granite Dam, downriver of Lewiston, Idaho	Wheat, fertilizer, petroleum products, forest products, sand and gravel aggregate

Total Contributions of International Soybean Exports Along Waterways

Figure 4.2: Outgoing Soybean Shipment Volumes by Location and GDP Contributions from Soybean Exports for Selected States



Source: USDOT Volpe Center, USACE WCSC, IMPLAN

In 2022, an estimated 28.0 million tons of soybeans were shipped on inland waterways that border or transverse the 18 States analyzed.[23] Of this total, approximately 23.8 million tons (or approximately 85%) were exported to international markets.

Illinois led in terms of total soybean volume, shipping about 8.3 million tons, which accounted for 46 percent of the State's production of soybeans. Mississippi shipped the largest share of soybeans relative to its production, moving 71% of its crop (totaling 2.7 million tons) along waterways. For most of the analyzed States, the percentage of soybeans shipped on inland waterways that were eventually exported internationally ranged from 75 to 93%. Figure 4.2 shows the tonnage of soybeans entering the waterways at various points along the system, as well as the contribution of exported soybeans to these States' respective GDP totals.

Table 4.3 summarizes the economic impact of soybean exports along U.S. inland waterways for the States analyzed, broken down by impact type. Direct effects reflect aggregated economic contributions to each State's economy from only the segment of the soybean industry focused on international exports via the inland waterways. For example, this analysis estimates that for the 18 States analyzed, 22,967 jobs are generated in the soybean farming industry for production of soybeans destined for international export via inland waterways.

In addition to direct effects, total economic contributions from soybean exports include industries that supply the inputs required to produce soybeans for international export, such as fertilizer and pesticide manufacturing. These contributions also include broader economic activity generated by the spending of income that accumulates to workers in the soybean industry and related sectors. Overall, soybean exports along inland waterways support a modeled 56,858 jobs, over $4.9 billion in income, $11.7 billion in GDP, and nearly $18.9 billion in economic output.

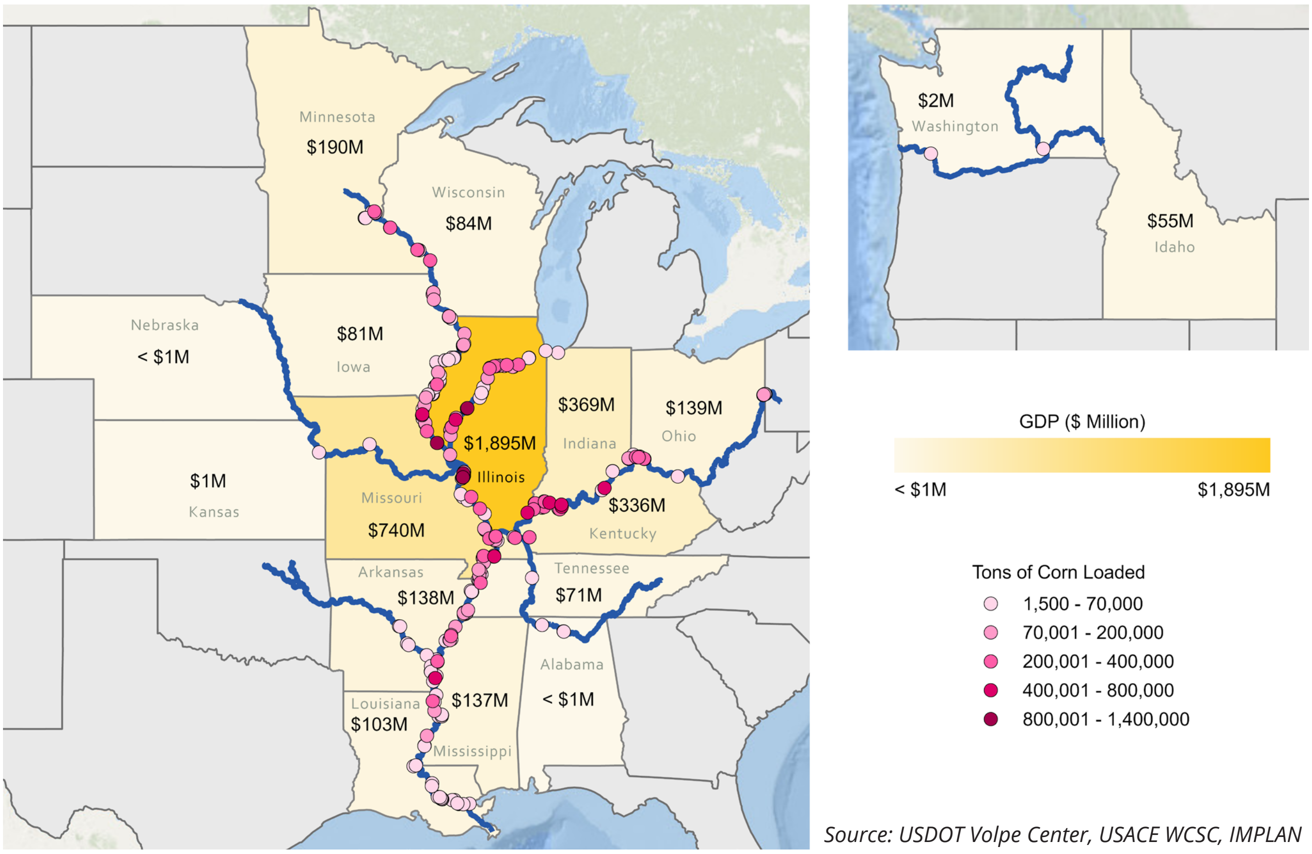
Table 4.3: Economic Contributions of Soybean Exports via Inland Waterways from Select States, 2022

Source: USDOT Volpe Center, USACE WCSC, IMPLAN

Impact Type	Jobs	Labor Income	GDP	Output
Direct	22,967	$3,118,379,000	$8,401,274,000	$12,689,372,000
Indirect	16,032	$807,062,000	$1,466,332,000	$2,954,221,000
Induced	17,859	$1,021,897,000	$1,876,506,000	$3,236,549,000
Total	**56,858**	**$4,947,338,000**	**$11,744,112,000**	**$18,880,142,000**

Total Economic Contributions of International Corn Exports Along Waterways

Figure 4.3: Outgoing Corn Shipment Volumes by Location and GDP Contributions from International Corn Exports for Selected States



Source: USDOT Volpe Center, USACE WCSC, IMPLAN

An estimated 28.8 million tons of corn were shipped along inland waterways in 2022 from the States analyzed, with 23.8 million tons exported internationally. As with soybeans, Illinois exported the most corn (11 million tons) along the waterways in terms of absolute volume. This tonnage represented 18 percent of the State's total corn production. Mississippi had the highest corn export share relative to corn production, exporting 44 percent (about 1.2 million tons) of its corn crop via waterways. The percentage of corn shipped on inland waterways that was ultimately exported ranged from 70 to 90% for most of the analyzed States. Figure 4.3 shows the tonnage of corn entering the waterways at points along the system, as well as the contribution of exported corn to these States' respective GDP totals.

Table 4.4 provides an estimate of the economic impact of international corn exports along inland waterways for the States analyzed. The analysis shows that corn exports along waterways contribute to an estimated 48,101 jobs, nearly $2.5 billion in income, $4.3 billion in GDP, and $10.8 billion in economic output.

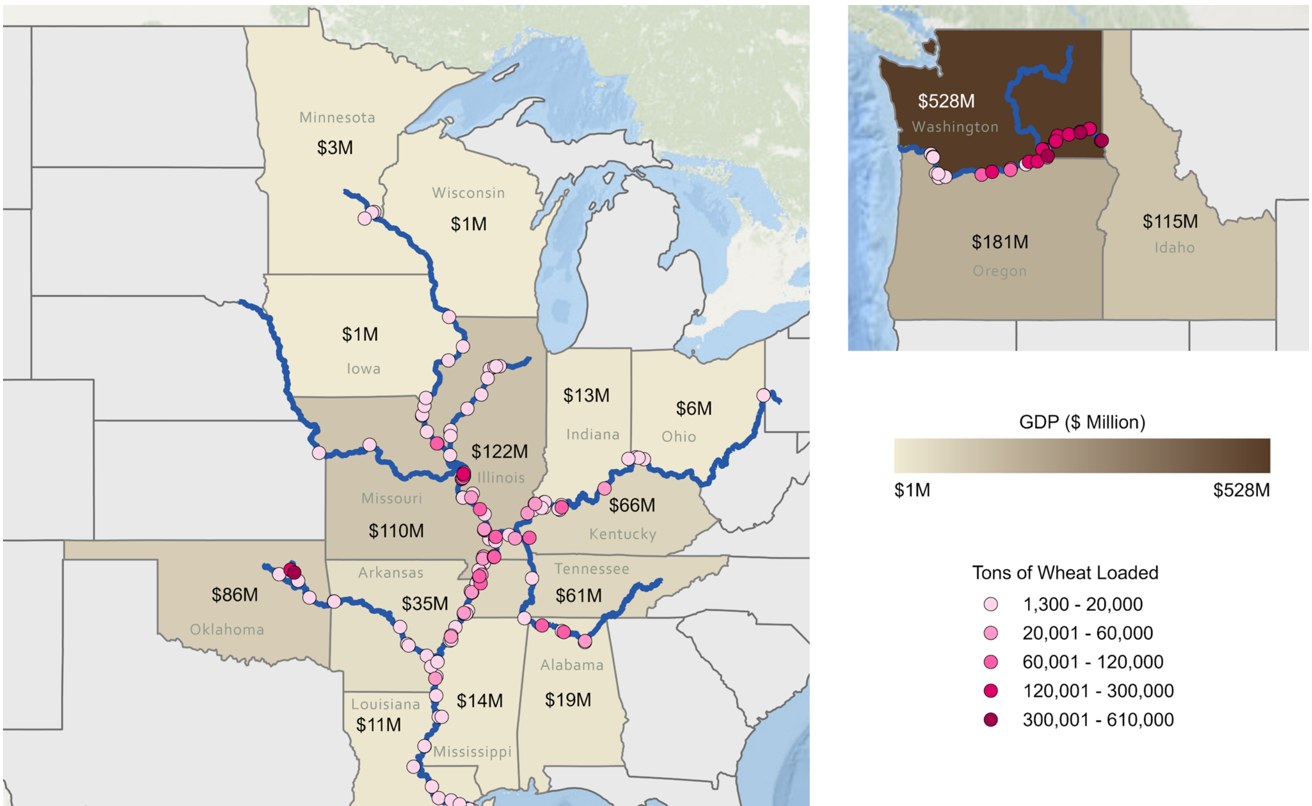
Table 4.4: Economic Contributions of Corn Exports via Inland Waterways for Selected States, 2022

Source: USDOT Volpe Center, USACE WCSC, IMPLAN

Impact Type	Jobs	Labor Income	GDP	Output
Direct	23,199	$1,051,287,000	$1,783,842,000	$6,006,667,000
Indirect	15,960	$886,107,000	$1,594,353,000	$3,143,071,000
Induced	8,942	$530,931,000	$961,095,000	$1,645,958,000
Total	**48,101**	**$2,468,325,000**	**$4,339,290,000**	**$10,795,694,000**

Total Economic Contributions of International Wheat Exports Along Waterways

Figure 4.4: Outgoing Wheat Shipment Volumes by Location and GDP Contributions from International Wheat Exports for Selected States



Source: USDOT Volpe Center, USACE WCSC, IMPLAN

In 2022, an estimated 9.8 million tons of wheat were shipped on inland waterways from the States analyzed, with approximately 6.5 million tons exported internationally. Of the States analyzed, Washington shipped the most wheat on inland waterways by volume (2.5 million tons), which represented 53% of the State's wheat production. Of the States analyzed, Missouri shipped on inland waterways the highest percentage of wheat (74 percent or about 650,000 tons) relative to its total wheat production. For most of the analyzed States, the percentage of wheat exported internationally after being shipped on inland waterways ranged from 45 to 98%. Figure 4.4 shows the locations where wheat entered the inland waterway system for the States analyzed, as well as the contribution of exported wheat to these States' respective GDP totals.

Table 4.5 outlines the economic impact of wheat exports along inland waterways. Direct economic contributions from exporting wheat over inland waterways for the selected States include over 7,000 jobs, nearly $289.2 million in labor income, about $549.8 million in GDP, and nearly $1.8 billion in economic output. When the analysis considers input industries and spending of income generated by the industry, total contributions sum to 15,876 jobs, about $756.4 million in income, $1.4 billion in GDP, and almost $3.3 billion in economic output.

Table 4.5: Economic Contributions of Wheat Exports via Inland Waterways for Selected States, 2022

Source: USDOT Volpe Center, USACE WCSC, IMPLAN

Impact Type	Jobs	Labor Income	GDP	Output
Direct	7,101	$289,232,000	$549,808,000	$1,790,955,000
Indirect	6,271	$316,237,000	$536,643,000	$1,027,526,000
Induced	2,505	$150,916,000	$285,156,000	$480,946,000
Total	**15,876**	**$756,386,000**	**$1,371,607,000**	**$3,299,427,000**

Economic Contributions of Other Commodities Moved Along Waterways

For the States analyzed, corn, soybeans, and wheat are the most common commodities exported internationally via inland waterways, by volume. Other agricultural commodities are also shipped for international export via waterborne transportation. For example, sorghum grain and rice contribute significantly to several of the analyzed States' economies, but lower volumes of these commodities are shipped via waterways relative to corn, soybeans, or wheat.

In addition to crops, other commodities that support agricultural industries are shipped on inland waterways. For example, inland waterways are a key pathway for transporting fertilizer, one of the largest inputs to farming industries across the country. Louisiana is a significant origin location for fertilizer shipments moved over inland waterways. This is in large part due to Louisiana's large fertilizer production industry and the presence of international ports in the State that bring in fertilizer imports. Typically, fertilizer moves from points in Louisiana to other States located along inland waterways.

International Rice Exports

Source: Adobe Stock

In 2022, about 1.2 million tons of rice were shipped on inland waterways for the States analyzed. Of this tonnage, over 725,000 tons were ultimately exported internationally.

Table 4.6 presents an estimate of the overall economic impact of rice exports along inland waterways for the selected States. Direct contributions include as estimated 1,015 jobs, $39.4 million in labor income, $48.9 million in GDP, and $244.5 million in economic output. In total, rice exports along inland waterways in the States analyzed support 2,212 jobs, nearly $94 million in income, about $150.2 million in GDP, and $450.7 million in economic output.

Table 4.6: Economic Contributions of Rice Exports via Inland Waterways for Selected States, 2022

Source: USDOT Volpe Center, USACE WCSC, IMPLAN

Effect Type	Jobs	Labor Income	GDP	Output
Direct	1,015	$39,436,000	$48,902,000	$244,518,000
Indirect	852	$37,383,000	$68,223,000	$147,317,000
Induced	345	$17,152,000	$33,056,000	$58,867,000
Total	**2,212**	**$93,972,000**	**$150,181,000**	**$450,701,000**

International Sorghum Grain Exports

In 2022, about 97,000 tons of sorghum grains were shipped on inland waterways for the States analyzed. Of this tonnage, nearly 83,400 tons were ultimately exported internationally.

Table 4.7 estimates the overall economic impact of international sorghum grain exports along inland waterways for the selected States. Direct contributions from these exports include 73 jobs, over $3.4 million in labor income, nearly $5 million in GDP, and over $20.6 million in economic output. The total economic contributions of sorghum grain exports via inland waterways are 164 jobs, $8.1 million in income, $13.4 million in GDP, and $37.6 million in economic output.

Source: Adobe Stock

Table 4.7: Total Economic Contributions of Sorghum Grain Exports via Inland Waterways for Selected States, 2022

Source: USDOT Volpe Center, USACE WCSC, IMPLAN

Effect Type	Employment	Labor Income	GDP	Output
Direct	61	$2,618,000	$3,363,000	$16,354,000
Indirect	53	$2,436,000	$4,455,000	$9,617,000
Induced	23	$1,168,000	$2,217,000	$3,904,000
Total	**138**	**$6,223,000**	**$10,035,000**	**$29,875,000**

Upbound Fertilizer

Agricultural commodities typically travel downstream on inland waterways from producing States to points of domestic distribution or points of international export like coastal ports. By contrast, fertilizer typically moves upstream from points of international import such as coastal ports or from points of domestic production to support farming industries in producing States. This two-way movement benefits farmers by providing a cost-effective transportation method for their commodities and the essential inputs required to produce these commodities. At the same time, it benefits businesses operating on the waterways by allowing barges to bring goods upstream instead of returning empty, which helps offset the costs of these movements. Without these waterways, transporting inputs would be more expensive, raising production costs and, ultimately, the cost of final agricultural products.

The methodology used in the previous sections to assess the economic contributions of moving commodities like corn, soybeans, and rice on inland waterways is based on evaluating industry outputs. However, fertilizer is an input to the farming industry rather than an output. As a result, this methodology cannot be used to assess the economic contributions of moving fertilizer on inland waterways. As a proxy, evaluating data on fertilizer purchases helps to capture the relative reliance of the selected States on inland waterways for their fertilizer supplies.[24]

This analysis was conducted by comparing shipments recorded in Waterborne Commerce Statistics Center (WCSC) data to Environmental Protection Agency (EPA) data on the amount of nitrogen fertilizer purchased in each State from 2003 to 2017. The EPA data was linearly extrapolated to 2022 to compare it to the most recent WCSC data. Figures 4.5 and 4.6 show the total tonnage of nitrogen fertilizer received by each State via inland waterways in 2022 as well as the amount as a share of the total nitrogen fertilizer projected to be purchased by farmers in each State, respectively.

Figure 4.5: Tons of Nitrogen Fertilizer Received Via Waterways, 2022
Source: USACE WCSC

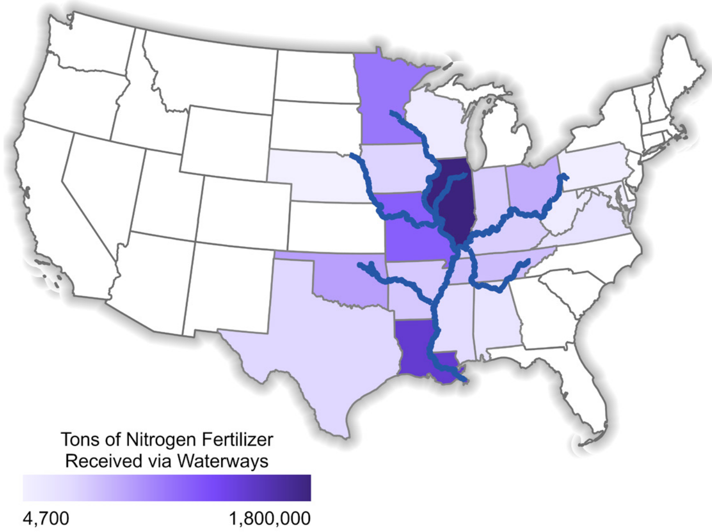
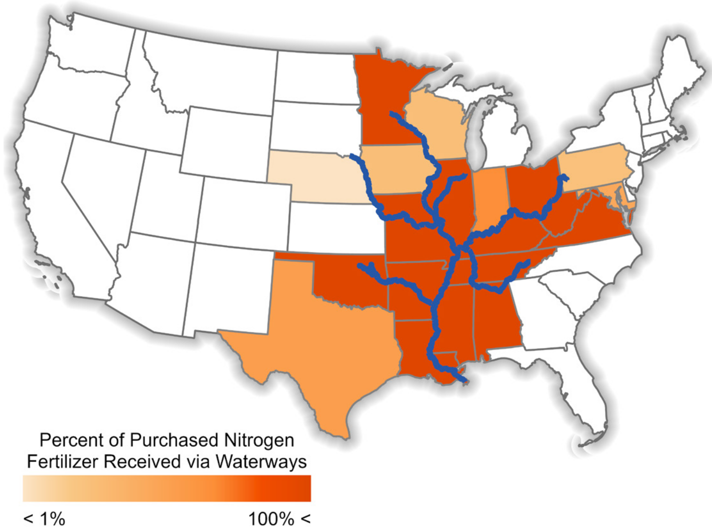


Figure 4.6: Percentage of Purchased Nitrogen Fertilizer Received via Inland Waterways, 2022
Source: USACE WCSC



Illinois received the most fertilizer by tonnage in 2022 (more than 1.8 million tons), followed by Louisiana, Missouri, and Minnesota, respectively. In general, most of the analyzed States received more nitrogen fertilizer in 2022 than what was projected based on the EPA data.[25] This not only implies that most States along inland waterways use the waterways to satisfy most or all of their demand for fertilizer, but also that neighboring States not directly bordered or transversed by inland waterways may still utilize the waterways to fulfill their fertilizer demand.

Source: Adobe Stock

Although States in the Pacific Northwest did not record any nitrogen fertilizer shipments via inland waterways in 2022, they did import over 237,000 tons from overseas sources. Furthermore, these States received more than 115,000 tons of other unspecified fertilizers via the inland waterway system.

The analysis shows that without inland waterways, agricultural producers across the country would need to rely on potentially costlier modes of transportation to ship fertilizers, driving up the final cost of these inputs, and in turn the cost of the final agricultural commodities produced. This would hinder the country's ability to remain competitive on the international agricultural market and would increase the costs of agricultural commodities for consumers.

Section 4 Endnotes

12 See Section 6: Export Market Analysis for a detailed descriptions of the international market for U.S. agricultural goods.

13 Employment data for these services was provided by the Bureau of Labor Statistics (BLS) and covers firms classified under the North American Industry Classification System (NAICS) code 483200 (Inland Water Transportation). Estimates reflect the most up-to-date data at the time this study was conducted in December 2024. Source: https://www.bls.gov/oes/2023/may/naics4_483200.htm#:~:text=NAICS%20483200%20%2D%20Inland%20Water%20Transportation,NAICS%20483200%20%2D%20Inland%20Water%20Transportation.

14 The States analyzed ship significant volumes of agricultural goods via waterways. The analysis limits the scope to certain inland waterways accessible to the selected States.

15 All metrics are estimated on an annual basis. However, when measuring the impacts across time, employment should not be considered cumulative.

16 Employment level for Wyoming sourced from BLS, 2022. Source: Wyoming - May 2022 OEWS State Occupational Employment and Wage Estimates

17 For definitions, please see Appendix A: Methodology and Assumptions.

18 GDP estimates for Jackson, MS, and Lansing, MI, come from BEA, 2022. Source: GDP by County, Metro, and Other Areas | U.S. Bureau of Economic Analysis (BEA)

19 For an in-depth discussion of the current market for agricultural exports see Section 6: Export Market Analysis.

20 These industries were selected for analysis due to their economic importance to States connected to the inland waterways and the agricultural volume shipped along waterways.

21 These results reflect the sum of economic impacts estimated individually for each of the 18 states. Because each State-level analysis excludes cross-State economic effects, any activity—such as jobs or output—generated outside a given State as a result of its exports was not captured in the final totals. As a result, the impact of inland waterway exports presented in this section may underestimate the total economic contributions from these exports across the 19 States.

22 Information presented in Table 3 comes from a variety of sources, including: Lower Mississippi River Conservation Committee, (n.d.), Bureau of Transportation Statistics, 2022, Oklahoma Department of Transportation, 2020, Ohio River Valley Water Sanitation Commission, (n.d.), and U.S. Army Corps of Engineers, (n.d.). Navigation on the Ohio River/Ohio River Basin.

23 The term "shipped" in both the text and graphics refers strictly to tonnage loaded on U.S. inland waterways and is not limited to tonnage ultimately exported internationally.

24 This analysis included all States receiving shipments of nitrogen fertilizer.

25 A similar trend can be observed in other fertilizer types such as phosphorous and potassium fertilizers, which are critical inputs used in the production of soybeans.

Section 5

Scenarios

Introduction

The previous section demonstrates the current economic contributions of the inland waterway system and highlights its essential role in supporting agricultural trade and regional economies. However, the ability to maintain these benefits or achieve additional economic gains depends on the condition and capacity of the system's infrastructure. Issues or trends such as aging infrastructure, shifting demand, and climate-related events all pose challenges to this system. To maintain or enhance the competitive advantages offered by inland waterways, significant investment is needed for infrastructure that supports efficient, reliable, and seamless flow of commerce along the system. These investments may take several forms:

Maintenance, which can reduce unscheduled downtime at key points (e.g., locks or dams) along the waterway network;

Resilience improvements, such as dredging, which can help mitigate the effects of flooding and other natural events that affect waterways or surrounding terrain; and

Capacity expansions, which aim to increase overall throughput along waterways.

This section applies multiple modeling techniques to evaluate the economic impacts of several investment scenarios. Specifically, it assesses three capacity expansion scenarios developed by USACE. In addition, it includes a disruption scenario to analyze changes in routing, transportation costs, and emissions resulting from a potential diversion of traffic from the inland waterway system to alternative modes.

Description of the CIS

Developed through coordination between the Inland Waterways Users Board (IWUB), the Office of Management and Budget and USACE, the CIS fulfills a statutory requirement to develop a 20-year (2025 – 2045) capital investment strategy for the inland and intracoastal fuel-taxed waterways. The CIS also acts as a planning framework that informs the budget process; the CIS does not represent a funding commitment. The CIS includes three scenarios: Constrained, Accelerated, and Enhanced.

The three capacity expansion scenarios explored in this section are based on those included in the USACE Capital Investment Strategy (CIS):

Constrained: Completes eight investment projects by 2045. Follows historical funding trends and assumes each project will have multiple construction contracts.

Accelerated: Completes nine investment projects by 2045. Provides funding such that new lock construction projects are completed in eight years or less.

Enhanced: Completes 10 investment projects by 2045. Provides funding such that each project will need only one construction contract.

Each scenario outlines specific infrastructure projects that are scheduled to receive funding over the

Source: Adobe Stock

next 20 years, along with their anticipated completion dates. The analysis in this section describes the CIS scenarios, identifies the projects within each scenario likely to influence inland waterways' capacity to move agricultural commodities, and estimates the annual economic impacts associated with each scenario.

The disruption scenario uses the Freight and Fuel Transportation Optimization Tool (FTOT), a geographic information systems (GIS)-based route optimization tool developed by the U.S. Department of Transportation Volpe National Transportation Systems Center. FTOT identifies an optimal route (based on criteria that include cost minimization) for freight between user-selected origin and destination locations.[26] While FTOT is not designed for economic impact analysis, it is well suited to assess changes in routing and mode choice under differing scenarios. In this case, FTOT was used to model a waterway disruption in which shipments from specified areas on inland waterways were unable to traverse the system.

Investment Scenarios

Table 5.1 summarizes the three USACE CIS inland waterway investment scenarios and shows the differences between each scenario in terms of funding availability and project status by 2045 (the end year in the CIS study period). Each scenario assumes a different level of annual funding and construction schedule.[27]

In the Constrained scenario, spending is constrained by historical funding and disbursement trends and assumes each project will have multiple construction contracts. Between Fiscal Year (FY) 2024 and FY2044, eight projects would be completed, two projects would be ongoing, and several major rehabilitation projects would be completed for a total cost of $7.68 billion.

The Accelerated scenario accelerates the construction timeline such that new lock construction projects are completed in eight years or less. This scenario also assumes timely and certain funding, which allows for efficient construction delivery. Finally, this scenario assumes that each project will need only one construction contract. Between FY2025 and FY2044, nine projects would be completed, two would be ongoing, and several major rehabilitations would be completed for a total cost of $9.75 billion. Relative to the Constrained scenario, the Accelerated scenario devotes an additional $2.1 billion in project funding.

Table 5.1: CIS Scenario Project Operational Status After Planned Investment by 2045[28]
Source: USACE CIS

Project Name	Status by 2045 in Constrained Scenario	Status by 2045 in Accelerated Scenario	Status by 2045 in Enhanced Scenario
Chickamauga Lock	Completed	Completed	Completed
MKARNS Three Rivers	Completed	Completed	Completed
Monongahela Locks and Dam 2, 3, & 4	Completed	Completed	Completed
Navigation and Ecosystem Sustainability Program Mooring Cells	Completed	Completed	Completed
Kentucky Lock	Completed	Completed	Completed
Montgomery Lock	Completed	Completed	Completed
Brazos River Flood Gates	Completed	Completed	Completed
Mississippi Lock 25	Completed	Completed	Completed
LaGrange Lock	Construction Ongoing	Completed	Completed

Table 5.1: CIS Scenario Project Status After Investment, Cont.

Source:

Project Name	Status by 2045 in Constrained Scenario	Status by 2045 in Accelerated Scenario	Status by 2045 in Enhanced Scenario
Next Lock A	Construction Ongoing	Construction Ongoing	Completed
Next Lock B	Not Started	Construction Ongoing	Construction Ongoing
Next Lock C	Not Started	Not Started	Construction Ongoing
Total Funding for Misc. Rehabilitation Projects	$720 million	$720 million	$720 million
Total Funding	**$7.68 billion**	**$9.75 billion**	**$11.55 billion**

The Enhanced scenario makes the same assumptions as the Accelerated but provides increased annual funding across all projects. Between FY2024 and FY2044, 10 projects would be completed, two would be ongoing, and several major rehabilitations would be completed for a total cost of $11.55 billion. Relative to the Accelerated scenario, the Enhanced scenario devotes an additional $1.8 billion.

Economic Impact of Investment Scenarios

While the USACE CIS includes a range of infrastructure improvements, this analysis focuses specifically on projects most likely to impact the movement of agricultural commodities. Pursuant to this, only the CIS projects focused on lock expansion and located on waterways that carry a significant tonnage of agricultural commodities were included in the analysis.[29] These projects are listed below and illustrated in Figure 5.1:

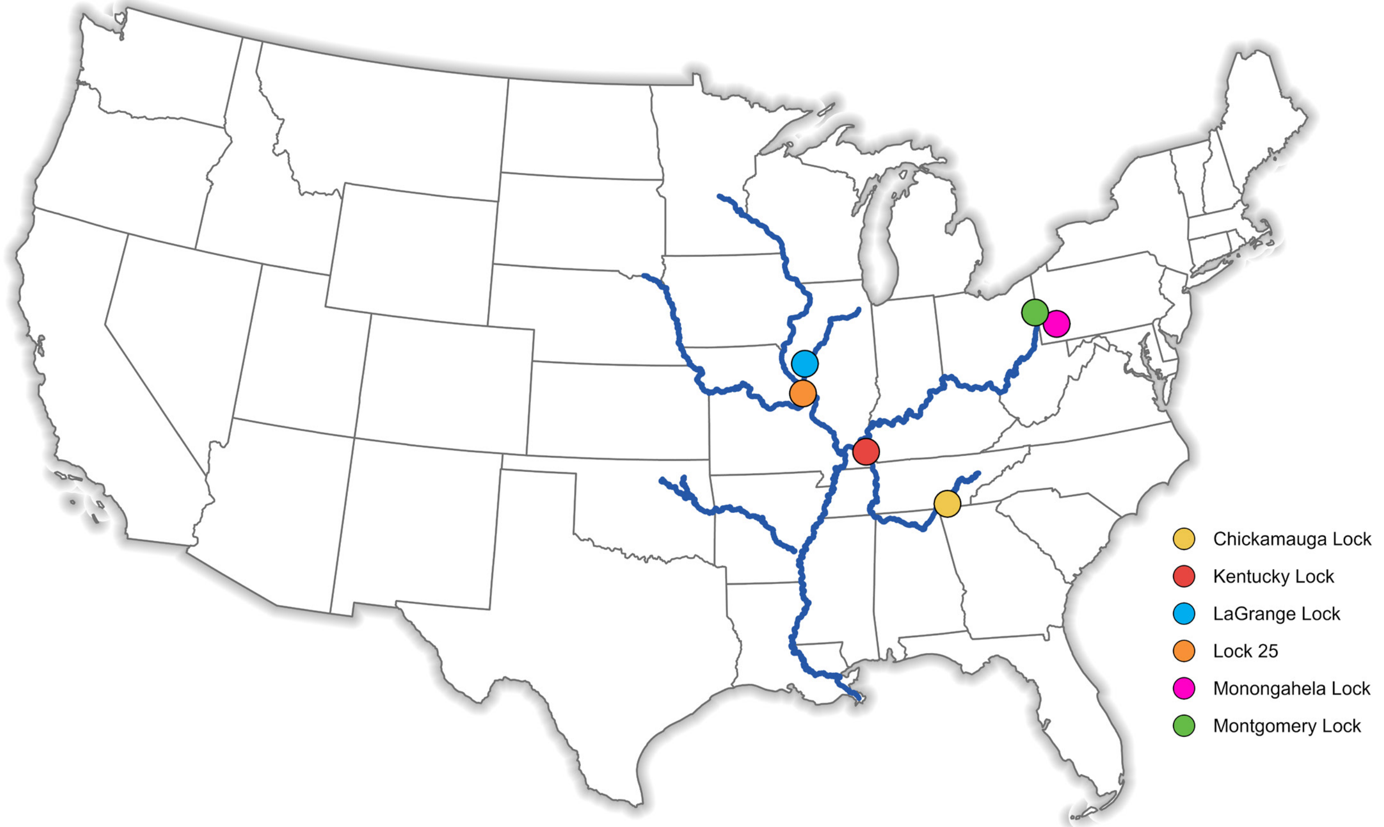
- Montgomery Lock
- Chickamauga Lock
- Monongahela Lock
- Kentucky Lock
- LaGrange Lock
- Lock 25

In the USACE CIS, the total cost and construction timeline for each funded project vary across investment scenarios. However, by the end of the CIS study period (2045), all lock expansion projects are expected to be complete across each scenario.[30] The primary differences between scenarios lie in how quickly each project is completed and the total cost incurred along the way. To highlight these differences between scenarios, this analysis focuses on a specified year within the CIS study period when the set of operational projects differs by scenario. A review of the CIS identified 2038 as a key point of divergence, with significant variation in the number of operational projects across scenarios. Table 5.2 lists the projects expected to be operational by 2038, grouped by CIS investment scenario.

To estimate the expected economic impact from each CIS scenario, the project team analyzed changes in demand for inland waterway transportation services. These changes in demand were estimated in terms of spending on inland waterway transportation services and then used as inputs to the IMPLAN model. More detailed steps are outlined below.

This process began by estimating the additional barge traffic expected to be induced as a result of each project's completion. This was performed by assuming the capacity of each lock will increase after expansion, and barge traffic will increase until the level of utilization (the ratio of vessel traffic to lock capacity) returns to the pre-expansion level.[31,32] Some of this new barge traffic is likely due to shifts from other modes of transportation to the waterways, but some traffic may also be derived from entirely new demand for U.S agricultural commodities as the competitiveness of U.S. agricultural prices improves with access to this lower-cost transportation options. However, for this analysis, these second-order effects were not considered;

Figure 5.1: Selected CIS Project Locations
Source: USACE CIS, USACE WCSC



the results presented here reflect solely the impact of additional spending on inland waterway transportation services.

For each lock expansion project, the distribution of new barge traffic by time of year and origin location was estimated using data from the WCSC.[33] This additional barge traffic was then converted into an estimate of tonnage and allocated across origin locations and weeks of the year.

Using weekly grain barge rate data from USDA, the estimated tonnage at each origin location in each week was multiplied by the corresponding barge rate to calculate the shipping cost of the additional freight.[34, 35] Costs were aggregated by project and then summed across the subset of capacity expansion projects in each CIS scenario.[36] The resulting increase in inland waterway shipping expenditures was treated as the additional demand generated in each scenario and used as input to the IMPLAN model.

Table 5.3 presents estimated economic impacts in 2038 for each CIS scenario, categorized by impact type.

The overall economic impact of investment in the inland waterway system increases as more projects become operational, regardless of the

Table 5.2: CIS Projects Expected to be Operational by 2038, by Scenario
Source: USACE CIS

Project	Constrained	Accelerated	Enhanced
Chickamauga Lock	X	X	X
Kentucky Lock	X	X	X
Monongahela Lock	X	X	X
Montgomery Lock	X	X	X
Mississippi Lock 25		X	X
LaGrange Lock			X

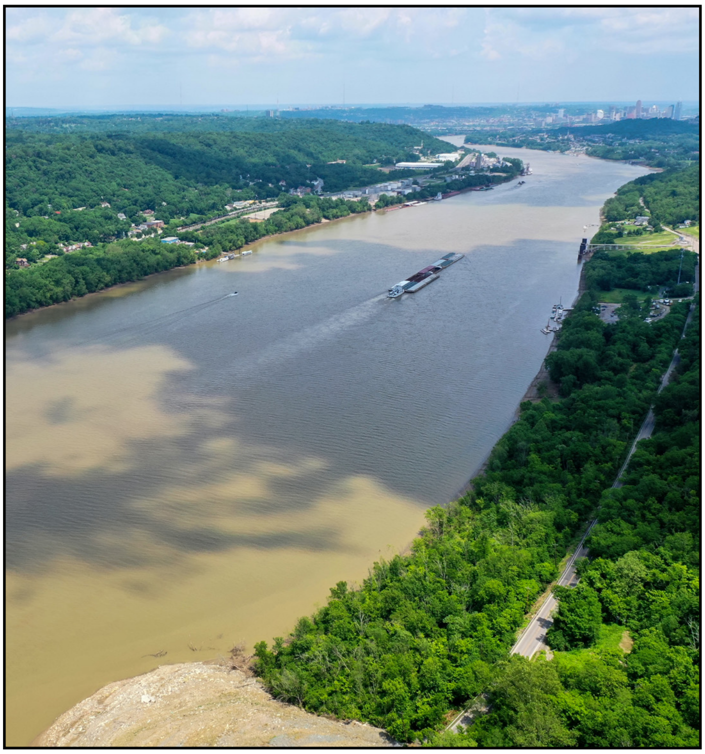
Table 5.3: Economic Impact of Investment by CIS Scenario, Metric, and Impact Type
Source: USDOT Volpe Center, IMPLAN

Metric	Impact Type	Constrained	Accelerated	Enhanced
Jobs	Direct	277	866	1,062
	Indirect	1,165	3,647	4,471
	Induced	695	2,175	2,666
	Total	**2,137**	**6,688**	**8,199**
GDP (Million)	Direct	$61.45	$192.26	$235.70
	Indirect	$132.01	$413.07	$506.41
	Induced	$77.22	$241.65	$296.25
	Total	**$270.68**	**$846.97**	**$1,038.37**
Output (Million)	Direct	$226.78	$709.50	$869.83
	Indirect	$262.92	$822.74	$1,008.67
	Induced	$135.58	$424.25	$520.12
	Total	**$625.28**	**$1,956.49**	**$2,398.62**

scenario analyzed. The most significant change in economic impact occurs between the Constrained and Accelerated scenarios, primarily due to the inclusion of the Mississippi River Lock 25 expansion – which is expected to induce the most barge traffic of any lock analyzed.

In general, the expansions of the LaGrange Lock, Kentucky Lock, and Mississippi Lock 25 projects generate greater gross economic benefits than other improvements. This is because these three projects involve the greatest change in capacity, due to the construction of new 1,200-foot locks to replace existing 600-foot locks. Other projects in the analysis typically involve the construction of smaller lock chambers ranging from 360 to 600 feet. Additionally, LaGrange Lock, Kentucky Lock, and Mississippi Lock 25 currently experience significant operational inefficiencies due to high traffic and double lockages. Double lockages are caused by the standard 15-barge tow exceeding the length of the existing lock, which requires it to be split into two segments to pass through the lock. The construction of extended 1,200-foot locks will eliminate the need for double lockages, substantially improving the efficiency and throughput of waterways that traverse these locks, and in some cases enabling use of an auxiliary lock if the main lock is closed.

Although economic impacts differ over the 20-year CIS study period, all of the CIS scenarios ultimately lead to the completion of the same set of projects. Of the three scenarios analyzed, the Enhanced scenario represents the quickest way to complete all projects by the end of the study period. Slower investment schedules delay the completion of each project, thus delaying their associated economic impacts, while increasing overall project costs due to prolonged construction timelines, the need for



Source: Adobe Stock

Table 5.4: Total Contributions of Inland Waterway Transportation Services Industry Before and After Completion of CIS Lock Expansion Projects

Source: USDOT Volpe Center, IMPLAN

Economic Contribution Type	Jobs	GDP (Millions)	Output (Millions)
Current Economic Impact of Inland Waterway Transportation Services Industry	211,583	$29,894.13	$64,720.13
Additional Economic Impact from Lock Expansion	8,199	$1,038.37	$2,398.62
Total Economic Impact of Inland Waterway Transportation Services Industry after Lock Expansion	219,782	$30,932.50	$67,118.75

multiple contracts, possible redesign based on new requirements or technology availability, or other factors.

By the end of the 20-year CIS study period, all previously described lock expansions are completed regardless of scenario. Completing this set of projects would support the creation of over 8,000 jobs, contribute more than $1.0 billion in additional GDP annually, and generate over $2.3 billion in annual economic output.[37] Table 5.4 provides the total economic contributions of the inland waterways transportation services industry before and after completion of CIS lock expansion projects.

This analysis demonstrates that timely and sustained investment in key infrastructure projects on inland waterways can generate substantial economic benefits, supporting thousands of jobs and contributing billions to GDP and national output. Delays in funding or construction not only postpone these gains but also increase long-term costs and risk eroding the competitive advantage of the inland waterway network. As freight demand continues to grow and infrastructure ages, increasing investment is essential to preserve freight transportation efficiency and freight contributions to economic value.

Disruption Scenario

Without timely investment, the inland waterway network faces increasing risks of failure due to aging infrastructure, natural events, or other issues. These vulnerabilities can lead to unplanned outages and disruptions, threatening the reliability of inland waterways transportation. A recurring theme in this report's stakeholder outreach efforts was the importance of waterway reliability and the significant negative impacts of system disruptions. The causes of these disruptions vary. Some can be anticipated and planned for, such as scheduled lock maintenance, while others are unexpected, like some weather-related events or unscheduled lock maintenance. Depending on the nature of the disruption, there may be delays in moving agricultural products, or diversions of these products to alternative and potentially more costly modes of transport. Some agricultural products may go entirely unshipped, risking spoilage and economic loss.[38]

The project team developed several disruption scenarios to further explore potential economic, environmental, and other impacts on inland waterways that could result from disruptions. This analysis uses FTOT (described earlier in this section) to analyze the impact of disruptions to typical movements on inland waterways. Two common routes were identified for this analysis. These routes were selected because they see significant annual flows of agricultural commodities between their respective origins and destinations. The two routes are: 1) Scott County, Iowa, to New Orleans, Louisiana; and 2) Whitman County, Washington, to Portland, Oregon.

Route 1: Scott County, Iowa, to New Orleans, Louisiana

Route 1 follows 22,500 tons of soybeans traveling from Scott County, Iowa, to New Orleans, Louisiana. This is a high-volume route for many agricultural commodities due to the presence of significant port infrastructure in Scott County cities such as Davenport, Bettendorf, and Buffalo. According to the WCSC, the most common destination for soybeans traveling along this route is New Orleans.

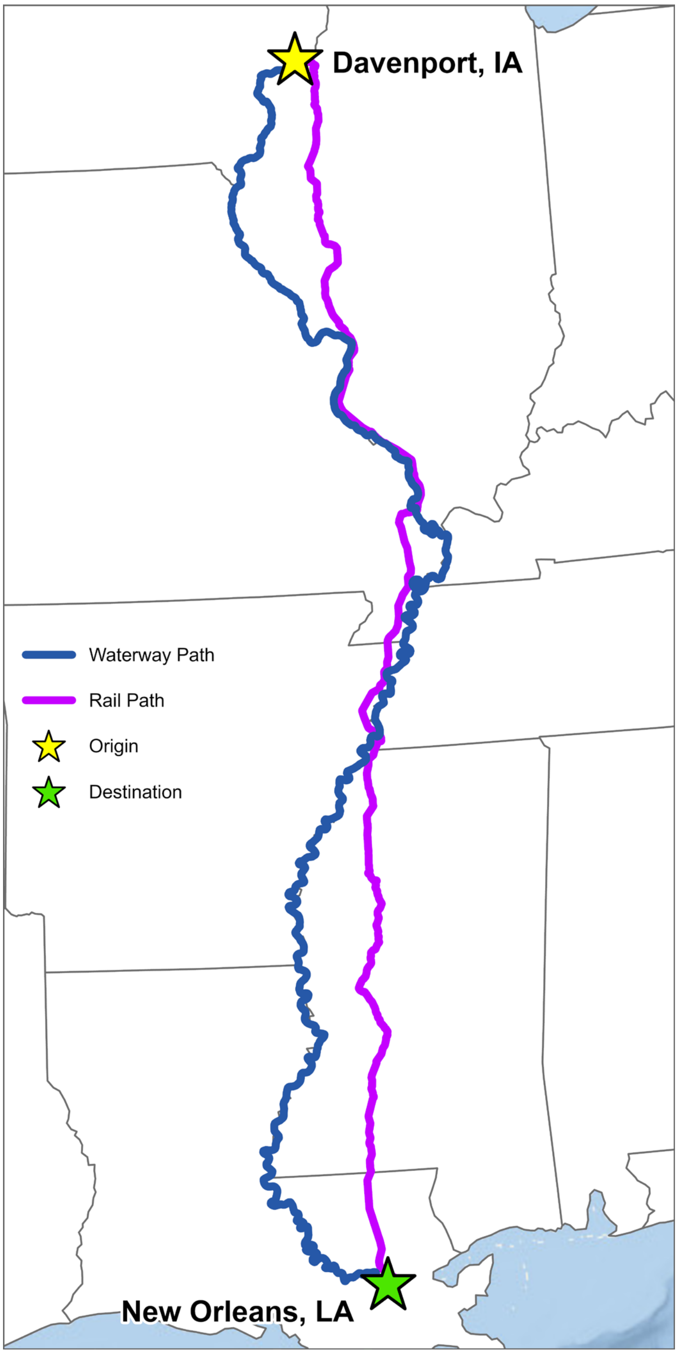
Currently, a single flotilla of 15-barges can carry all 22,500 tons of soybeans in one trip over this route. However, if there is a disruption affecting the waterways of this route, shippers may look to other modes of transportation if they cannot efficiently transport products along the waterways or if they cannot find adequate storage to "wait out" the disruption. To model this disruption scenario, FTOT was used to identify the optimal route for 22,500 tons of soybeans moving from Scott County to New Orleans both with and without access to inland waterways. Figure 5.2 depicts the optimal routes identified under each of these disruption scenarios.

The analysis shows that all 22,500 tons of soybeans would be shipped via rail if waterways could not be accessed due to a disruption event. Table 5.5 outlines metrics for Route 1. It shows that shipping soybeans by rail would be associated with additional transportation costs and additional emissions. It would also be associated with potentially adverse safety outcomes (a statistically higher level of injuries and fatalities).

The Route 1 analysis only shows the difference at the margin between one flotilla's worth of goods that is diverted to rail, assuming rail rates are held constant and rail capacity remains available. In reality, significantly more tonnage moves between Route 1's origin and destination in any given year. A disruption affecting the waterways along Route 1 would increase rail rates as rail capacity becomes constrained by increased demand. In 2022, nearly half a million tons of agricultural commodities—including approximately 340,000 tons of soybeans

Figure 5.2: Route 1 Optimal Routes with and without Access to Inland Waterways

Source: FTOT



and over 120,000 tons of corn—moved over the waterways from Scott County to river terminals in Louisiana. Current rail capacity along that segment is not designed to absorb a high level of diversion from these waterways. A disruption on these waterways for a significant period would exacerbate the economic, safety, and other impacts described in Table 5.5.

Route 2: Whitman County, WA to Portland, OR

Route 2 follows 6,000 tons of wheat moving along inland waterways from Whitman County, Wash-

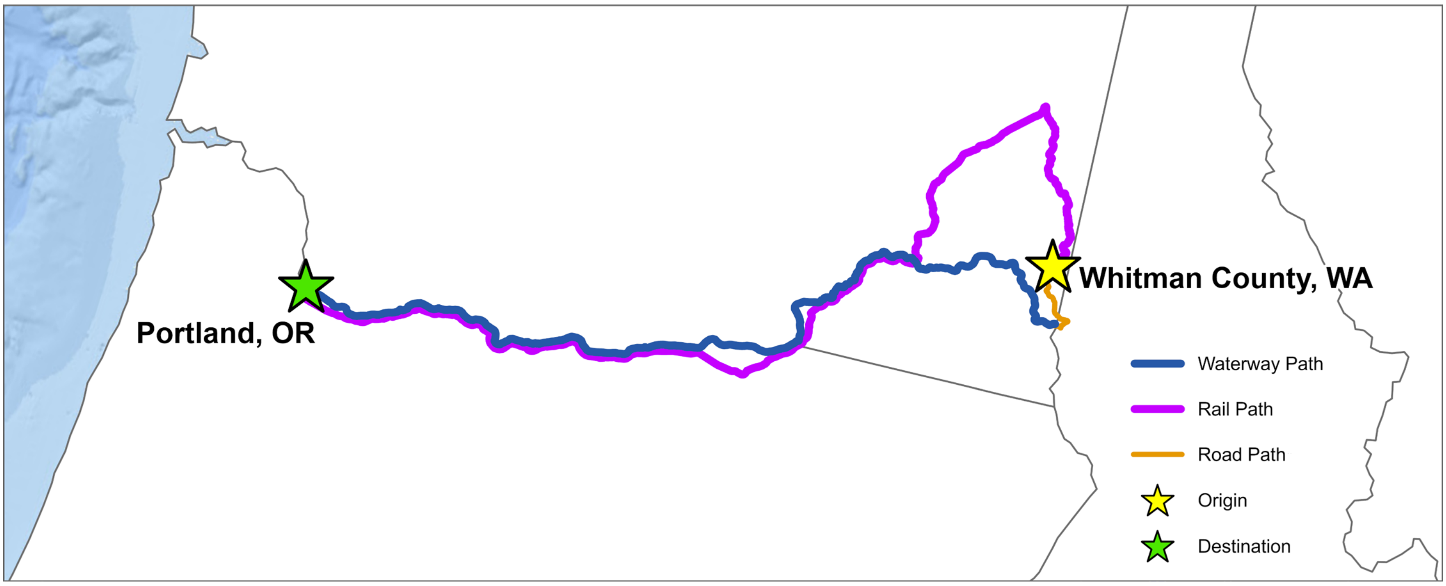
Table 5.5: Scott County, IA, to New Orleans, LA Route Metrics[41]
Source: FTOT

Scott County, IA to New Orleans, LA	Via Inland Waterways	Via Rail
Vehicle Loads	1 flotilla (15 barges)	225 rail cars
Network Miles Traveled	1,305 miles	930 miles
Vehicle-Miles Traveled	1,305 miles	209,301 miles
Ton-Miles Traveled	29,362,500	20,925,000
Transport Cost	$852,258	$911,411
CO_2 (kg)	401,666	409,524
NO_x (kg)	4,064	4,143
CO (kg)	1,049	1,071
PM10 (kg)	98.5	101
Injuries Estimated	0.0013	0.0877
Fatalities Estimated	0.0005	0.0091

ington, to Portland, Oregon.[39] Like Route 1, Route 2 describes a high-volume route for shipping agricultural goods; Whitman County is the largest wheat-producing county in Washington. Whitman County also has access to the Ports of Clarkston and Lewiston, as well as rail routes from Pullman that stretch across the State, allowing for strong multimodal transportation access. Portland receives the most agricultural tonnage from ports in Whitman County compared to other destinations and serves as the point for international exports from the region.

As with the Route 1 analysis, the Route 2 analysis also used FTOT to identify optimal routes between an origin and destination, both with and without access to the inland waterways. When waterways can be accessed, the FTOT analysis found that using waterways would be the lowest-cost method for moving goods from Whitman County to Portland. When a disruption on the waterways makes them unusable, the optimal route would be to use rail for the entire trip. This would involve moving wheat through Spokane, Washington, and eventually to Portland. Figure 5.3 displays these two routes.[40]

Figure 5.3: Route 2 Optimal Routes with and without Access to Inland Waterways
Source: FTOT



As with the Route 1 analysis, the Route 2 analysis found that all 6,000 tons of wheat would be shipped via rail if waterways could not be accessed due to a disruption event. Table 5.6 outlines the differences at the margin between trips via inland waterways or via rail.

Similar trends seen in the Route 1 analysis can be observed in the shift from water to rail in the Route 2 analysis. The only exception is that in the Route 2 analysis, the path traveled via waterways is shorter than the path traveled via rail. The Route 2 analysis focuses on the impact of diverting only a single flotilla's worth of goods to rail, but there are broader implications from this scenario given the amount of tonnage that flows along this route in reality. In 2022 alone, more than 150,000 tons of agricultural commodities were transported from Whitman County to export terminals on the western side of the State via the inland waterways.

The Route 1 and Route 2 disruption scenarios underscore the critical importance of maintaining a resilient and reliable inland waterway system. When disruptions impact key segments of this network, freight must utilize more expensive modes of transportation, resulting in increased transportation costs, increased emissions, and added strain on alternative modes and transportation infrastructure. These ripple effects extend beyond the transportation sector, impacting producers, consumers, and the broader economy. Ensuring the resilience and reliability of inland waterways is essential to preserve economic efficiency. It is also vital to maintain the global competitiveness of U.S. agricultural exports by ensuring producers and shippers can continue to source and transport goods at competitive prices.

Table 5.6: Whitman County, WA, to Portland, OR, Route Metrics

Source: FTOT

Whitman County, WA – Portland, OR	Via Inland Waterways	Via Rail
Vehicle Loads	1 flotilla (4 barges)	60 rail cars
Network Miles Traveled	354 miles	441 miles
Vehicle-Miles Traveled	354 miles	26,540 miles
Ton-Miles Traveled	2,124,000	2,646,000
Transport Cost	$95,354	$115,290
CO2 (kg)	29,098	51,083
NOx (kg)	294.4	524
CO (kg)	76	135
PM10 (kg)	7	13
Injuries Estimated	0.00011	0.01221
Fatalities Estimated	0.00003	0.00128

Section 5 Endnotes

26 For a description of FTOT and its inputs, see Appendix A. A public version of FTOT is available at https://github.com/VolpeUSDOT/FTOT-Public

27 Note that all projects are located on the Mississippi River System. In general, the Columbia-Snake River is much newer and tends to close for a few weeks spring for preventative maintenance and smaller projects.

28 The Next Lock A, B, and C projects are hypothetical lock improvements that have not yet been identified by USACE but will have funding set aside in certain investment scenarios.

29 The specific locks expected to be improved under the Next Lock A, B, and C projects were not identified at the time of writing this report; therefore they could not be included in the analysis.

30 At the time of this report's writing, construction of some projects outlined in the CIS have been started while other projects are in the design phase.
31 It was assumed barge operators could absorb the increased demand for barges without increasing prices. Because of this, and the constant utilization of the system, barge prices are expected to remain the same before and after lock expansion.
32 Utilization refers the ratio of traffic volume to capacity. In this case, capacity increases, which induces increases in barge traffic until the previous utilization level is reached.
33 Source: https://www.iwr.usace.army.mil/About/Technical-Centers/WCSC-Waterborne-Commerce-Statistics-Center/
34 Sources: https://www.ams.usda.gov/sites/default/files/media/GTRFigure10Table9.xlsx
35 Sources: https://www.ams.usda.gov/sites/default/files/media/GTRTable11.xlsx
36 For a more detailed description of this methodology, see Appendix A.
37 GDP and economic output are generated on an annual basis and can be considered cumulative over a defined period. Employment is not cumulative over a period. For example, over a 5 – year period the enhanced scenario would generate over $5 billion in additional GDP and over $11 billion in economic output but will only create 8,000 jobs (not 40,000).
38 Impacts of 2019 UMR Flooding Barge Movements_Fahie_1.pdf
39 6,000 tons were analyzed as four-barge tows are standard on the Snake and Columbia Rivers, as opposed to 15-barge tows on the Mississippi River. Source: Barging Through – Columbia Rural Electric Association
40 FTOT determines precise routing origins using county population centers, selecting Pullman, WA's centroid as the origin for this route. Initial road transport from this point to waterways is required but excluded from cost and emissions calculations to focus comparison on the primary modes: rail and water.
41 Transportation cost data for this analysis come from the Bureau of Transportation Statistics (BTS). Source: Average Freight Revenue per Ton-Mile | Bureau of Transportation Statistics. Emissions and safety data sourced from TTI 2022 FINAL Report 2001-2019 1.pdf

Section 6 Endnotes

Source: Adobe Stock

Section 6

Export Market Analysis

Soybean Market Overview

The U.S. inland waterway system plays a critical role in supporting agricultural exports and sustaining the Nation's competitive position in global markets. This extensive network provides a high-capacity, low-cost transportation system for bulk commodities, such as soybeans, and links major interior production hubs to coastal export terminals. As a result of this system, the U.S. maintains a strong market presence in global agricultural commodity markets.

Among the 185 agricultural commodities tracked by USDA's Foreign Agricultural Service, soybeans have led U.S. export sales since at least 2000.[42] In 2024, they accounted for 15 percent of total U.S. agricultural export value, followed by corn at 10 percent. While many States contribute to the production of soybeans, those in the Midwest dominate in terms of exports. For example, Iowa, Illinois, and Minnesota accounted for nearly 40 percent of total U.S. soybean export sales in 2023.[43]

Barge, rail, and truck transportation modes compete with (and complement) one another in moving soybeans and soybean products from farms to inland elevators, processors, and ultimately to coastal export terminals. While trucks typically handle first-mile and last-mile movements for these products, rail and waterways are responsible for most of the long-haul ton-mileage within the U.S. Historically, barges traversing inland waterways have carried the largest share of soybean export tonnage compared with rail and truck.[44] Between 2005 and 2022, on average, barges accounted for more than 49 percent of soybean export movements, substantially more than either rail or truck shares.[45]

A significant share of soybean barge traffic flows along the Mississippi and Illinois Rivers, which link major production areas in the Midwest with the Gulf of America, where soybeans are loaded onto ocean vessels bound for international markets. Soybeans from the Midwest region are also routed on railways to other coastal or river ports, such as those in Seattle, Washington, or Portland, Oregon. These routes are commonly used for soybeans produced in North and South Dakota. During periods of disruption along the Mississippi River, or when ocean freight rates in the Pacific Northwest (PNW) are more favorable than those at Gulf of America ports,[46] soybeans grown in the Midwest region may be routed westward on rail cars to barge terminals on ports along the Columbia River such as the Ports of Seattle and Portland.

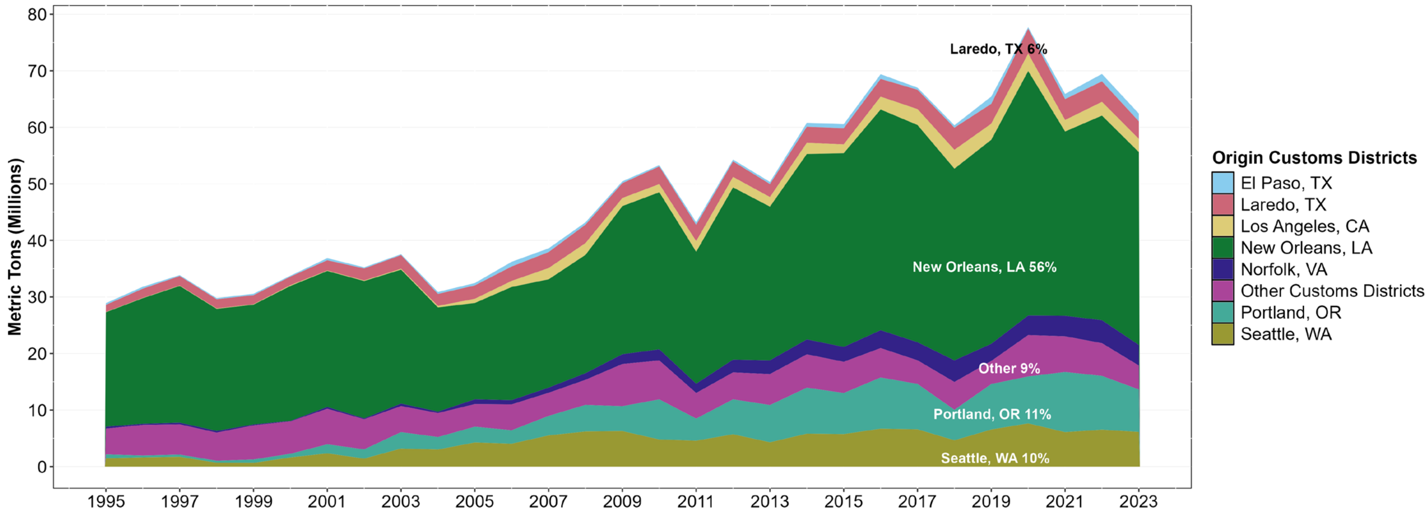
Multiple factors shape freight routing decisions. These include domestic and international demand, relative transportation costs across modes, and overall logistics efficiency. Additionally, competition from other agricultural commodities, such as corn and wheat—which utilize the same barge types as soybeans—as well as non-agricultural shipments such as petroleum and aggregates—which compete for limited river system capacity—can influence the share of soybean exports moving via the Mississippi River system.

Although export volumes fluctuate seasonally and the distribution of tonnage across coastal ports has shifted over time, the New Orleans Port Region remains the dominant gateway for soybean exports.[47] As shown in Figure 6.1, 56 percent of U.S. soybean export tonnage departed from New Or-

Source: Adobe Stock

Figure 6.1: U.S Soybean Exports: Origin Customs Districts (1995-2023)[50]

Source: USDA



leans in 2023, with a large share of this tonnage (50 percent) being delivered to China. The importance of the New Orleans Port Region reflects both its direct barge access from the Midwest and its proximity to the Panama Canal.

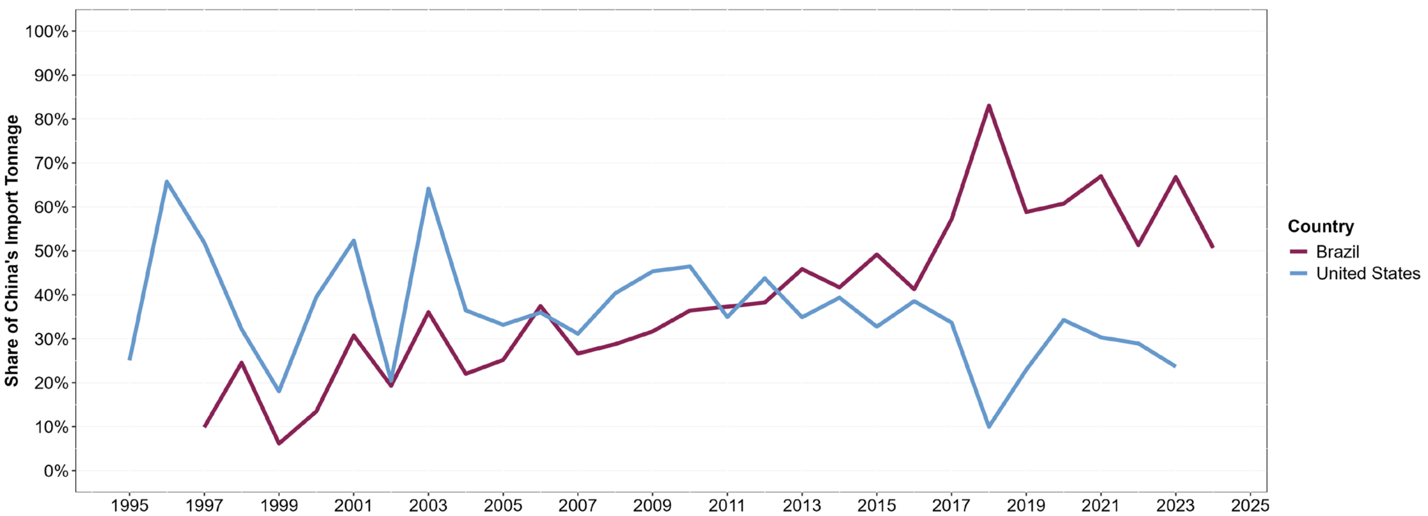
The global soybean export market is dominated by the U.S. and Brazil, with China accounting for the majority of purchases. In 2023, China imported over 70 million metric tons of soybeans from Brazil, roughly 70 percent of Brazil's total soybean export tonnage and 26 million metric tons from the U.S., representing approximately half of all U.S. soybean export tonnage. Together, the U.S. and Brazil accounted for nearly 90 percent of China's soybean import tonnage.[48] Figure 6.2 shows that Brazil has steadily increased its market share of China's soybean imports since the mid-2000s, remaining above the U.S. in tonnage share since 2013.[49]

Brazil's increasing market share has been fueled in part by several competitive advantages, including favorable exchange rates, trade relationships and policies, expanded acreage, and targeted infrastructure improvements. Ongoing investments in Brazilian export corridors, including highway, waterway, and rail systems, along with concurrent improvements in port infrastructure have improved Brazilian logistics efficiency.

To remain globally competitive in the soybean export market (particularly in light of Brazil's logistical

Figure 6.2: U.S and Brazil Share of China's Soybean Import Tonnage (1995-2023)[51]

Source: USDA



improvements), the U.S. must continue to improve efficiencies in transportation infrastructure. Strategic investments, such as the modernization of the inland waterway system, are expected to support U.S. export network logistics in keeping pace with international supply chain developments and help U.S. soybeans remain competitive in global markets.

Source: Adobe Stock

Soybean Export Cost Analysis Scenarios

Macroeconomic conditions and trade policies drive China's demand for U.S. and Brazilian soybeans. These forces directly influence the U.S.'s competitive position in global soybean markets and underscore the importance of inland waterways in shaping the U.S.'s marketing edge. These forces also influence transactions between farmers, elevator operators, and exporters. Understanding these forces within the context of shifting macroeconomic dynamics and changing terms of trade is essential for examining trends in soybean marketing potential in both countries.

Over the past decade, soybean export growth from both the U.S. and Brazil to China has resulted from China's growing demand for livestock—mostly pork—and animal feed. Pork production in China depends heavily on feed inputs derived from crushed soybeans, such as soybean meal. As incomes in China have increased, Chinese consumer preferences have shifted from lower-cost staple foods to more protein-rich diets, fueling expansion in China's soybean-crushing industry. Today, China is the world's largest soybean importer, accounting for over 60 percent of total soybean import tonnage in 2023.[52] Macroeconomic conditions within China—such as monetary and fiscal policy shifts that affect exchange rates, or trade policies that influence import prices—have far-reaching implications for the global soybean market.

If macroeconomic conditions and trade policies have longer-lasting market impacts, farmers may adapt by switching to more profitable crops or selling land for alternative uses. Elevator operators might respond by storing soybeans longer in anticipation of favorable prices or prioritizing crops like corn, which has an overlapping export window. Similarly, exporters and shippers may choose alternative routes or buyers. Changes in the behavior of farmers and downstream delivery systems can affect demand for barge, rail, and truck transportation services and influence the flow of agricultural commodities across various shipping routes and transportation modes. Changes in shipping patterns can in turn impact domestic markets such as altering freight rates or shifting the availability of storage and logistics resources. Additionally, inputs critical to soybean production that rely on the same transportation corridors (e.g., fertilizer), may also face similar supply or cost disruptions, triggering further downstream effects on agricultural markets.

Besides macroeconomics and trade policies there are also external variables such as weather conditions that play an important role in shaping soybean routing, pricing and consequently, the volume of exports. For example, low river water levels can impact shipping costs and routing, while rainfall levels can impact agricultural product moisture content and yield. These factors can impact supplies, storage and handling costs, and the overall attractiveness of soybean products to importers.

The price and routing of soybean exports is also impacted by storage capabilities such as the availability of on-farm storage and storage facilities located at port terminals. In the United States, the prevalence of adequate on-farm storage, efficient transportation routes linking farms to storage facilities, and a more favorable climate for soybean storage collectively provide U.S. farmers and exporters with marketing flexibility.[53]

Taken together, these macroeconomic forces, trade policies, external variables, and transportation network availability shape the relative cost, efficiency, and competitiveness of U.S. and Brazilian soybean export logistics. Understanding how these forces interact and shape the supply chain system is essential to better evaluate these countries' positions in the global soybean trade.

U.S. and Brazil: Soybean Shipping Cost Comparison

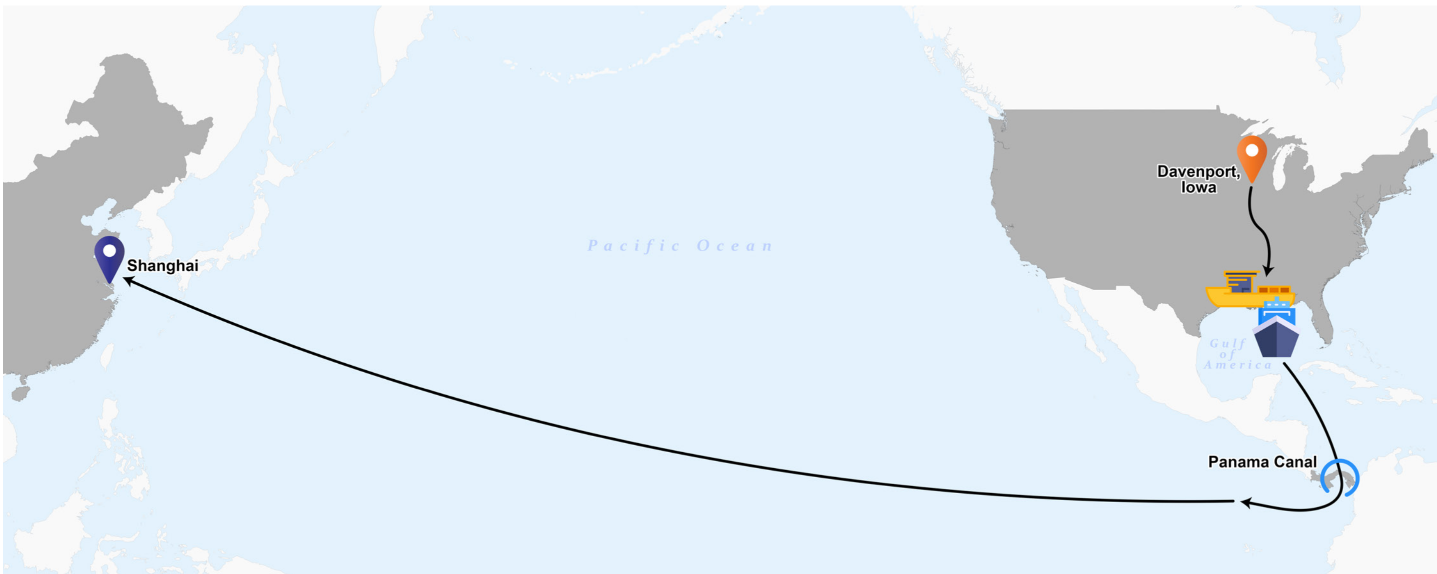
Soybean production and shipping costs can be organized into three broad categories: farm value/cost, inland transportation costs, and ocean freight costs. Farm value reflects the farm gate price (prices farmers receive for soybeans) and accounts for costs related to planting, harvesting, and initial handling. Inland transportation costs represent the expense of moving soybeans from initial storage and distribution centers to export terminals. Ocean freight rates refer to the cost of shipping soybeans from export terminals to overseas destinations. The combined total of these costs helps to illuminate relative prices faced by Chinese importers for soybeans grown in the U.S. and Brazil.[54,55]

In Brazil and the U.S., costs for producing and shipping soybeans can vary considerably over time and depending on production regions and export terminal locations. Given data ability, in this section, the analysis focuses on examining soybean cost structures based on presumed origin cities in Brazil and the U.S. that represent the most typical soybean-producing regions, destinations that reflect the most common importing terminal locations, and quarterly data corresponding to peak soybean exporting periods in each country.

As previously noted, Illinois, Iowa, and Minnesota consistently rank among the top soybean-exporting States in both sales and volume. This regional dominance is due to its high production volumes and access to efficient transport networks, particularly inland waterways (namely the Mississippi and Illinois Rivers). In 2023, Illinois, Iowa, and Minnesota accounted for 16 percent, 13 percent, and 8

Figure 6.3: Example of Common U.S Soybean Export Shipping Route: Davenport, Iowa, to Shanghai, China

Source: USDOT Volpe Center



percent of total U.S. soybean production, respectively. USDA provides data on export cost indicators from two major origin points—Davenport, Iowa, and Minneapolis, Minnesota—to key international destinations such as Shanghai, China, and Hamburg, Germany. For this analysis, the Davenport-to-Shanghai route was selected to represent U.S. export costs due to Iowa's substantial share of soybean export sales and Davenport's proximity to low-cost barge transport. As depicted in Figure 6.3, soybeans shipped from Davenport bound for China typically travel by barge down the Mississippi River to the Gulf of America, where they are loaded onto ocean vessels. These vessels traverse the Panama Canal before crossing the Pacific Ocean to Shanghai. Export costs for this route are averaged over the third and fourth quarters to reflect the typical period of peak soybean shipping activity in the U.S.

In Brazil, over one quarter of the country's 2023 soybean production originated from the state of Mato Grosso. Mato Grosso also accounted for over 20 percent of Brazil's soybean export tonnage to China—the highest share of any Brazilian state. Within Mato Grosso, the municipality of Sorriso was the top producer, contributing more soybean export tonnage than any other municipality in Brazil.[56] Historically, exports from Sorriso and other municipalities in Mato Grosso relied on trucking or rail transport to southern Brazilian ports such as the Port of Santos. Recently, however, there has been a significant shift toward northern export-corridors. Given Sorriso's prominence in Brazilian national production, this analysis uses the Sorriso-to-Shanghai corridor as the representative Brazilian export route. As depicted in Figure 6.4, soybeans shipped from Sorriso bound to China typically travel by truck or rail to the Port of Santos. These are then loaded onto ocean vessels, which proceed eastward across the Atlantic Ocean and around the Cape of Good Hope, then across the Indian Ocean to Shanghai. Brazilian soybean export costs are averaged over the first and second quarters to reflect typical costs incurred during peak exporting months (typically February through August for the first and second harvests).

Figure 6.5 compares trends in the per-metric ton landed cost for soybeans exported along the routes depicted in Figure 6.3 and Figure 6.4 from 2012 to 2023. The landed cost of soybeans represents the total cost of producing soybeans and shipping them to China. In the U.S. and Brazil, the farm value of soybeans—which reflects production costs including storage and handling—has consistently accounted for the largest share of landed costs over this period. For these specific

Figure 6.4: Example of Common Brazil Soybean Export Shipping Route: Sorriso, Brazil, to Shanghai, China

Source: USDOT Volpe Center

routes and exporting windows, however, Brazil has often had a modest production cost advantage, as reflected in lower per-metric ton farm values between 2012 and 2023. For soybeans exported to Shanghai, per-metric ton inland transportation costs have been lower for product originating in Davenport than for those shipped from Sorriso, both on a per-metric ton basis and as a share of landed costs. This disparity is primarily driven by Brazil's heavy reliance on trucks to transport soybeans over long distances to southern ports, which have historically handled the majority of Brazil's soybean exports. In Brazil, ongoing investments in existing and new transportation infrastructure have improved access between export terminals and major production regions and expanded capacity at high-volume ports. These developments have started to erode the U.S.'s inland transportation cost advantage for soybeans (and potentially other crops), as Brazil's inland transportation costs have gradually declined. Conversely, ocean shipping costs per metric ton are relatively similar for shipments originating from both locations. In China, import prices reflect production and transport cost differentials between Brazil and the U.S., and macroeconomic conditions and trade policies.

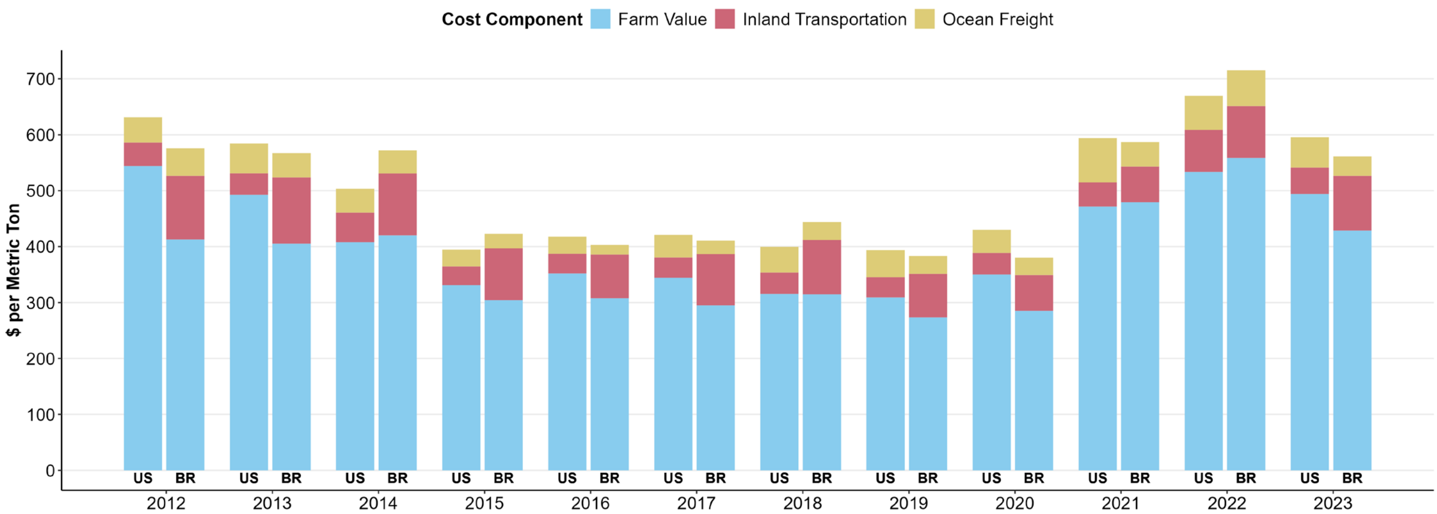
Source: Adobe Stock

Production Costs

In 2022, fertilizer, chemical inputs, land, and labor comprised the majority of soybean production costs in Brazil and the U.S. The costs of these inputs significantly influence the landed cost of soybeans and prices paid by importers. Fertilizer inputs typically include phosphorus and potassium, while chemical inputs generally include insecticides, fungicides, and other crop-protection chemicals. Land costs reflect the opportunity cost of using land for soybean production rather than for alternative uses, such as renting it for other agricultural or commercial purposes. Similarly, labor

Figure 6.5: Export Cost Comparison: U.S. and Brazil[57]

Source: USDA



costs represent the value of farmers' labor compensation they might have earned through other employment if not engaged in farming.

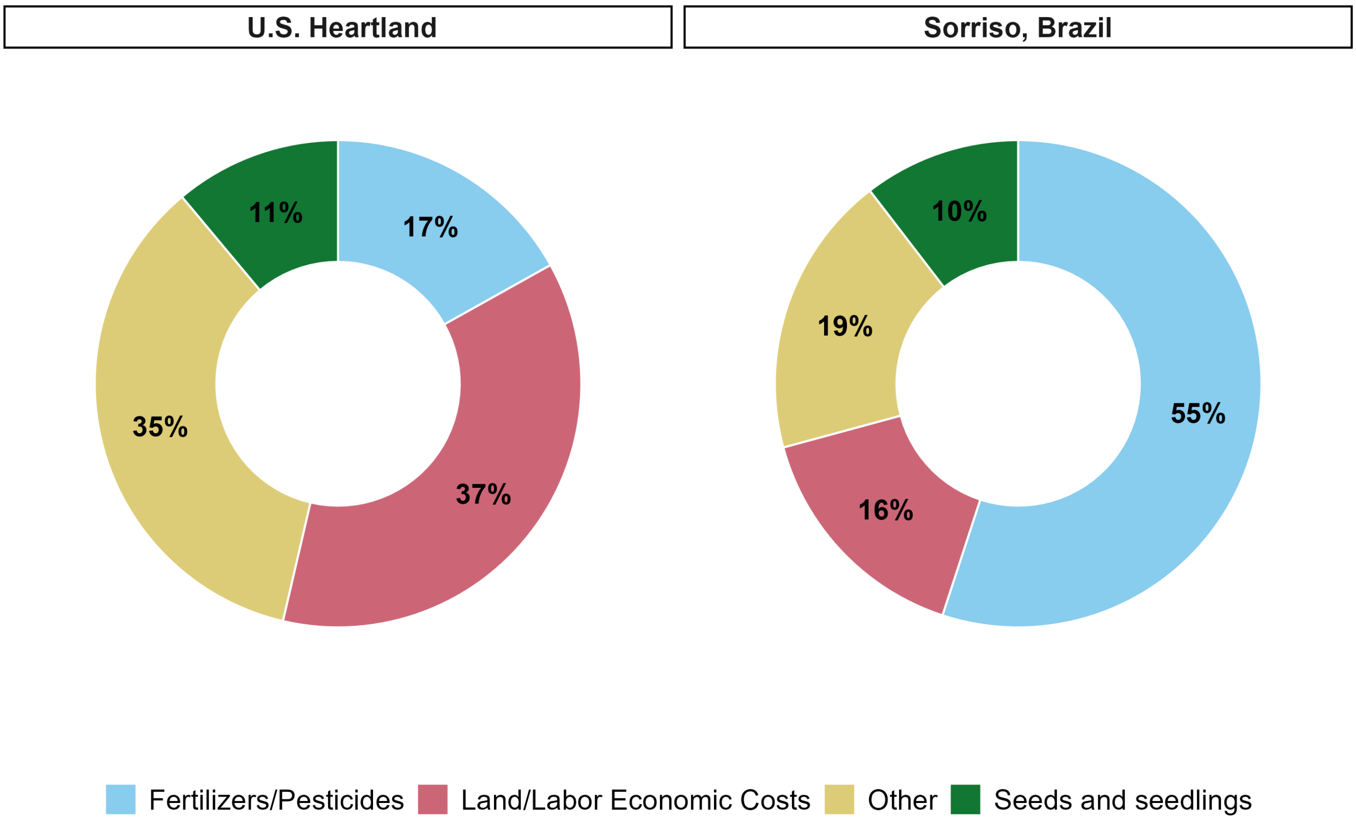
The National Supply Company of Brazil (CONAB) provides annual estimates of production costs for soybean-producing municipalities. In this analysis, input cost shares presented for Brazil represent 2022 averages for genetically modified and conventional soybeans grown in Sorriso. USDA publishes estimates of average annual soybean production costs for select regions, including the U.S. Heartland region, which includes key soybean-producing States such as Illinois and Iowa. Although not all cost categories can be directly mapped across the two datasets, key cost components such as fertilizers, chemicals, and land and labor opportunity costs are reported and comparable. Figure 6.6 presents only cost components that are defined consistently across both datasets. All other costs—such as irrigation, machinery maintenance, and fuel—are assigned to the "Other" category. While Figure 6.5 above shows that farm-gate prices for soybeans originating in Davenport and Sorriso are relatively similar, Figure 6.6 highlights differences in the share of per-metric ton production costs in 2022 attributable to key inputs. In general, fertilizer and chemical inputs make up a larger share of total production costs in Brazil than in the U.S. (55 percent versus 17 percent). Conversely, economic costs related to land and labor account for a greater share of production costs in the U.S. (37 percent compared to 16 percent in Brazil).

The higher fertilizer and chemical costs in Brazil may reflect the country's greater reliance on imported inputs, inefficiencies in domestic infrastructure, and long distances between ports and farms, especially in Sorriso, located in Brazil's north-central region. On the other hand, land and labor costs account for a larger share of U.S. production costs due to higher prevailing wages and land values.[58]

Overall, input costs play a critical role in shaping the price competitiveness of soybean exports from the U.S. and Brazil. Brazil's continued investment in expanding and modernizing its infrastructure

Figure 6.6: Production Cost Components: U.S. and Brazil[59]

Source: USDA



Source: Adobe Stock

and transportation corridors may improve the efficiency of input delivery to farms, potentially reducing overall production costs relative to the U.S. In response, the U.S. must also continue to improve its own infrastructure—particularly its inland waterways—to maintain its competitive position in global soybean markets.

Transportation Costs

U.S. competitiveness in the global soybean market (particularly relative to Brazil) is heavily influenced by the efficiency of its inland transportation systems. Figure 6.7 compares per-metric ton inland transportation costs for soybeans exported from Sorriso and Davenport to Shanghai between 2012 and 2023.

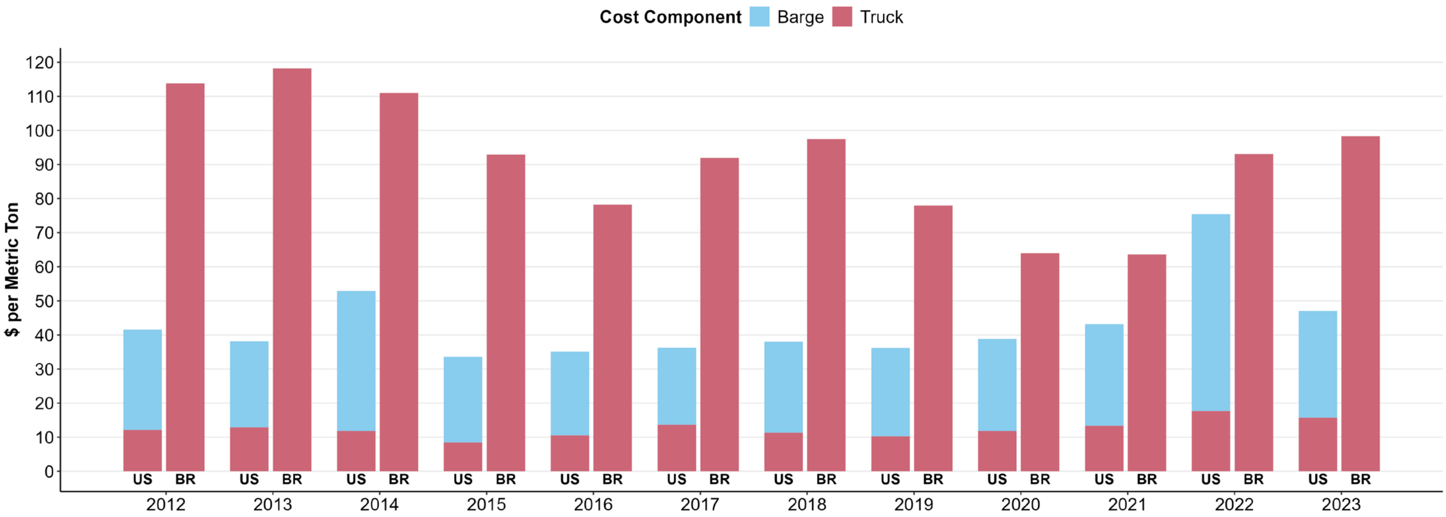
For soybean exports moving from Davenport to Shanghai, the analysis assumes that waterways are the primary long-haul transport mode, based on USDA cost indicators. While some shipments may travel by rail to the Gulf Coast or Pacific Northwest, barge transport remains the predominant mode during the peak soybean exporting season. Trucking is primarily used for short-haul movements between farms, grain elevators, transport hubs, and export terminals. Between 2012 and 2023, trucking consistently accounted for between one-third and one-fourth of total per-metric ton inland transportation costs in the U.S.

In contrast, soybean shipments from Sorriso, Brazil, have historically relied heavily on truck or rail transport, reflecting the dominance of road-based logistics in the state of Mato Grosso. Traditionally, soybeans exported from farms in Mato Grosso are trucked more than 1,000 miles to southern ports such as the Port of Santos (1,190 miles from Sorriso), the Port of Paranaguá (1,262 miles from Sorriso), and occasionally even further south to the Ports of Rio Grande or São Francisco do Sul. As of 2023, the southern ports in Paranaguá, Santos, and Rio Grande collectively handled over half of Brazil's soybean export tonnage.[60] A considerable share of soybeans originating in Mato Grosso travel to rail terminals at Rondonópolis and Rio Verde (roughly 600 miles south of Sorriso), where they are transferred to rail cars and hauled over 1,000 miles to Santos. Since 2018, over 50 percent of annual soybean movements to the Port of Santos were transported on railways. The share of soybean exports shipped from Sorriso to the Port of Santos using exclusively truck transport compared to shipments using a combined truck-rail mode varies based on the relative transportation costs of each mode, the demand for soybeans across producing regions, and the availability and capacity of transportation infrastructure. Figure 6.7 presents costs for shipments relying solely on truck transport and does not account for the costs associated with rail transport from the Rondonópolis rail terminal to the Port of Santos, after soybeans are shipped on trucks from Sorriso to Rondonópolis. While truck transport has handled the largest share of soybean movements in Brazil between 2012 and 2023, rail transport has accounted for over half of soybean shipments received at the Port of Santos since 2017. Between 2018 and 2023, the cost of shipping a metric ton of soybeans from Sorriso to the Port of Santos using a combination of rail and truck modes has been between 11 to 19 percent lower than shipments relying solely on truck transport along this route.[61]

In recent years, a growing share of Brazil's soybean exports has shifted toward the so-called Northern Arc ports, such as the Ports of Barcarena and Vila do Conde in the state of Pará. Traditionally, soy-

Figure 6.7: Soybean Inland Transportation Costs: U.S. and Brazil[73]

Source: USDA



beans from Sorriso were trucked close to 1,000 miles to reach these ports. However, the 2019 completion of the final segment of the BR-163 highway has reduced reliance on trucking, allowing trucks to travel just under 600 miles to the inland river port of Miritituba. From there, soybeans are transported approximately 150 miles by barge along the Tapajós River to coastal ports such as Santarém.

These developments reflect an underlying trend toward increased use of waterway and railway transport to move soybeans from inland production regions to export terminals. Between 2019 and 2023, the estimated share of total Brazilian soybean exports utilizing waterways grew from 8 percent to 19 percent.[62] During the same period, soybean exports transported by both rail and truck reached record levels. However, the proportion of exports moved by rail did not increase due to limited capacity amid rising demand. As a result, a greater share of soybean exports was transported by truck. If not for the growth of barge transportation—particularly in the northern region of the country—dependence on trucking would have intensified even more. According to USDA, barge rates in Brazil can be up to 60% lower than truck rates depending on the volumes hauled and the terms of contracts signed between the barge company and shippers.[63] Investments in new and existing multimodal routes could facilitate increased use of cost-effective barge transportation on Brazil's inland waterways.

Despite these improvements, per-metric ton inland transportation costs for soybeans originating in Sorriso remain higher than those from Davenport, primarily due to Brazil's continued reliance on trucking. However, by 2023, transportation costs from Sorriso had declined relative to 2012, likely reflecting improved efficiency from infrastructure investments in Brazil such as the BR-163 highway, the expanded use of river ports in the Northern Arc, and ongoing investment in rail corridors. These changes have enhanced Brazil's export competitiveness by reducing dependence on long-haul trucking and increasing usage of northern ports and lower-cost barge transport. This analysis examines soybean export costs for selected routes in the U.S. and Brazil that represent typical export paths and transportation modes. In Brazil, trucking has handled the highest share of soybean movements to major ports between 2012 and 2023, consistently accounting for around half of soybean export movements over this time period.[64] Therefore, Figure 5 and Figure 7 present costs based solely on truck transport, excluding barge and rail transportation costs, and do not account for the share of soybean exports moved by these alternative modes. However, a recent study reports that between 2010 and 2023, barge transportation market shares for shipping soybeans rose from 8 percent to 12 percent. Additionally, rail market shares increased from 20 percent to 22 percent.[65]

Brazilian Export Infrastructure Improvements

Brazil continues to invest heavily in its transportation infrastructure—expanding and upgrading railways, highways, waterways, and port terminals. These developments, combined with sustained demand from China and the geographic expansion of soybean cultivation, may reshape soybean export routes and improve the efficiency of inland transportation corridors that link production regions to export terminals.

According to a USDA- and Luiz de Queiroz College of Agriculture (ESALQ-LOG) -supported analysis of Brazil's soybean export modal shares, trucking continues to dominate—but its role is slowly declining. For soybeans exported through the Port of Santos, trucks accounted for approximately 43% of inland transportation in 2023, down from 48% in 2010. Other ports such as São Luís, Paranaguá, and Rio Grande saw even steeper declines in truck share during this period. However, notable gains in rail modal shares occurred only at the Port of Santos, where rail use rose by around 5 percentage points between 2010 and 2023.[66] This shift reflects both mounting pressures on Brazil's trucking industry—exacerbated by increasing global demand—and the relatively efficient rail connection between Mato Grosso and Santos via the Rondonópolis terminal.

Over the last decade, Brazil has advanced several major infrastructure projects and policies aimed at improving the logistics efficiency of grain and oilseed exports:

- In 2011, the Brazilian government introduced new rail regulation. The new law states that Brazilian railroads are required to sell to other railroads the rights to use idle capacity if they are not using the rail tracks at full capacity. This was a major step to increase railway use within the next 15 years. This law has a significant impact on the Brazilian grain and soybean exports route to China by facilitating access to the southern ports of Santos, Paranaguá, and Rio Grande.[67]
- The Railways Law (2021): Allowed private-sector development of railways via an authorization process, encouraging new investment in freight transport.[68]
- Ferrogrão (EF-170 Grain Railway): A proposed 580-mile rail line connecting Sinop (Mato Grosso) to the Port of Miritituba along the Tapajós River in the state of Pará. Completion of this proposed project would shift soybean and corn exports from road to barge by linking directly to northern waterway systems.[69]
- North–South Railway (EF-151): In 2019, a major Brazilian logistics company won a 30-year concession to develop the long-planned railway stretching 955 miles to integrate the states of Tocantins, Goiás, Minas Gerais, and São Paulo and improve access to the northeastern port of Itaquí-Sâo Luis, Maranhão and the southern Port of Santos.[70] By 2022, key segments from São Paulo to Goiás and Rio Verde to Ouro Verde had been completed, including a critical 422-mile stretch between Estrela d'Oeste and São Simão, which began operations in 2021.

Source: Adobe Stock

- New Rail Terminals: Completed the North-South (EF-151) in 2023, including the construction of a rail terminal in Rio Verde, Goiás, which is expected to have capacity to handle 11 million metric tons of grain and soybean meal per year shipped from Goiás and eastern Mato Grosso. The railroad integrates the northeastern port of Itaquí-Sâo Luis, Maranhão, and the southern port of Santos, São Paulo.[71]
- Private Port Terminals: Following the Ports Regulatory Framework (2013), Brazil saw a surge in privately operated terminals outside traditional public ports. Today, these terminals handle over half of the country's export volume. In 2022, ANTAQ, a federal regulatory agency in Brazil responsible for overseeing and regulating the waterway transportation sector approved a new master plan for the Port of Paranaguá and a zoning plan for Antonina, signaling continued investment in port infrastructure.[72]

Beyond transportation upgrades, Brazil's continued expansion of soybean cultivation into states closer to export terminals—such as Maranhão, Tocantins, Piauí, Bahia, and northern Mato Grosso. This regional shift shortens farm-to-port distances and facilitates better access to imported inputs like phosphate and potassium fertilizers, which arrive through northern ports and are distributed inland. Such improvements may further reduce costs and enhance Brazil's competitiveness in global soybean markets.

While Brazil generally benefits from lower per-unit soybean production costs, the U.S. maintains a relative advantage in inland transportation, particularly in moving soybeans from production regions to export terminals via its efficient inland waterway system. Ocean freight rates remain relatively comparable between the two countries, making inland logistics a critical factor in sustaining U.S. competitiveness in the global soybean trade, especially in key markets like China.

However, Brazil's continued investments in infrastructure—such as expanding road networks and improving barge access through to northern ports—are steadily reducing its inland transportation costs and narrowing the gap with the U.S. To preserve and strengthen its competitive edge in soybean trade, the U.S. must continue to improve by modernizing its inland transportation system, with a focus on addressing aging waterway infrastructure. Enhancing the reliability, capacity, and resilience of inland waterways systems is essential to ensure that U.S. soybeans remain cost-competitive in global markets in the years ahead.

42 Sourced from USDA, Foreign Agricultural Service. Global Agricultural Trade System, U.S. Census Bureau Trade Data. 2024. https://apps.fas.usda.gov/gats/
43 Sourced from USDA, Economic Research Service. State Exports, Cash Receipts Estimates. 2023. https://www.ers.usda.gov/data-products/state-agricultural-trade-data
44 Tonnage refers to metric tons in this section of the report.
45 Sourced from USDA, Agricultural Marketing Service. Transportation of U.S. Grains, A Modal Share Analysis. 2024. 2025, https://agtransport.usda.gov/dataset/Modal-Share-Analysis-Data/59m9-gjrx/about_data
46 Sourced from USDA, Agricultural Marketing Service. Soybean Transportation Profile. 2017. www.ams.usda.gov/sites/default/files/media/Soybean%20Transportation%20Profile.pdf
47 The New Orleans Port Region includes ports situated along the Mississippi River from Baton Rouge to Myrtle Grove, LA such as the Ports of Baton Rouge, Darrow, Gramercy, South Louisiana, New Orleans, and Myrtle Grove.
48 "Soybeans" excludes soybean oil and soybean meal.
49 Soybeans are defined under BICO (HS-10) product grouping and include the following soybean product types "whether or not broken, except seeds for sowing", "seed of kind used as oil stock", "whether or not broken, except seeds", and "not elsewhere specified or indicated".
50 Source: USDA, Foreign Agricultural Service. Global Agricultural Trade System, U.S. Census Bureau Trade Data. 2023. Retrieved on January 25, 2025, from https://apps.fas.usda.gov/gats/. Notes: "Other Customs Districts" includes all other coastal port districts in the U.S. Percentage in chart represents each district's share of export tonnage in that is greater than 5% of the total metric tons exported in 2023.
51 Sources: U.S. export and China import tonnage sourced from USDA, Foreign Agricultural Service. Production, Supply and Distribution: Oilseeds. 2024. https://apps.fas.usda.gov/psdonline; Brazil export tonnage sourced from Ministério da Economia. Comex Stat: Foreign trade statistics. 2024. https://comexstat.mdic.gov.br/en/home. Notes: For China and the U.S., "Year" represents the typical soybean marketing year (September to August). For Brazil, "Year" represents the calendar year (January to December).
52 Sourced from USDA, Foreign Agricultural Service. Production, Supply and Distribution: Oilseeds. https://apps.fas.usda.gov/psdonline; Brazil. "Soybeans" excludes soybean oil and soybean meal.

53 Péra, T. Guilherme. Logiĺstica do Agronegócio: Oportunidades e Desafios.2025 Retreived in from https://esalqlog.esalq.usp.br/upload/kceditor/files/Log%C3%ADstica%20e%20infraestrutura%20do%20agroneg%C3%B3cio%20brasileiro%20li%C3%A7%C3%B5es%20aprendidas%20e%20oportunidades%20para%20enfrentar%20o%20desafio%20do%20escoamento.pdf

54 The USDA regularly publishes data on these cost indicators, providing quarterly estimates for select city-to-city origin-destination pairs. This data is accessible through USDA's Open Ag Transport data platform at https://agtransport.usda.gov/Exports/U-S-vs-Brazil-Soybean-Transportation-Costs/g9w7-d2kh/about_data

55 In this analysis all cost estimates are expressed in U.S. dollars per metric ton unless otherwise noted.

56 State and city-level export data sourced from Ministério da Economia. Comex Stat: Foreign trade statistics: Exports by City. ://comexstat.mdic.gov.br/en/municipio

57 Source: USDA, Agricultural Marketing Service. U.S. vs Brazil Soybean Transportation Costs. 2024. https://agtransport.usda.gov/Exports/U-S-vs-Brazil-Soybean-Transportation-Costs/g9w7-d2kh/about_data. Notes: Cost Index reflects Quarter 1 and Quarter 2 averages for Brazil and Quarter 3 and Quarter 4 averages for the U.S. Brazil costs represent soybeans shipped from Sorriso to the Port of Santos and ultimately to Shanghai.

58 Differences in the opportunity cost of land between Brazil and the U.S. may reflect differences in the methodology used between CONAB's and USDA's production cost data. CONAB data values the opportunity cost of land as half the annual savings yield rate, based on the price practiced in the region for the sale of one hectare of land (accounting for technology used in the production process associated with a specific region), devoid of improvements and facilities, suitable for the crop in question. The result is then multiplied by the percentage, raised on a panel of experts (e.g., producers, unions, research organizations) of the productive area located on owned land (not leased) and divided by the number of harvests carried out during the year in the region covered by the production cost. USDA data values the opportunity cost of land according to the average cash rental rate for land producing the commodity in the particular area.
Differences in the opportunity cost of labor between Brazil and the U.S. may also reflect differences in CONAB's and USDA's methodologies. In CONAB's methodology, the opportunity cost of permanent labor (such as farm administrators) on corporate farms is calculated by dividing the total local salary for the months worked over the crop cycle by the farm's area, while family labor is valued at the local minimum rural wage, regardless of whether it is paid; in contrast, USDA values the opportunity cost of unpaid labor (including family and operator labor) using estimates of off-farm wages that farm operators could earn, directly measuring hours worked through the Agricultural Resource Management Survey.

59 Sources: Brazil production costs sourced from CONAB. Agricultural Production, Production Costs, Historical Series. 2024. https://portaldeinformacoes.conab.gov.br/custos-de-producao-se.html; U.S. production costs sourced from USDA, Economic Research Service. Commodity Cost and Returns. 2024. Retrieved on November 15, 2024, https://www.ers.usda.gov/data-products/commodity-costs-and-returns

60 CONAB. Anuário Agrologístico. Volume 1. 2024. https://www.gov.br/conab/pt-br/acesso-a-informacao/institucional/publicacoes/outras-publicacoes/anuario-agrologistico.pdf/view.

61 USDA, Agricultural Marketing Service. Brazil Soybean Transportation Guide 2023. Retrieved July 7, 2023, from https://www.ams.usda.gov/sites/default/files/media/BrazilSoybeanTransportationGuide2023.pdf.

62 CONAB. Anuário Agrologístico. Volume 1. 2024. https://www.gov.br/conab/pt-br/acesso-a-informacao/institucional/publicacoes/outras-publicacoes/anuario-agrologistico.pdf/view.

63 Salin, Delmy. USDA, Agricultural Marketing Service. Soybean Transportation Guide: Brazil 2023. https://www.ams.usda.gov/sites/default/files/media/BrazilSoybeanTransportationGuide2023.pdf

64 ESALQ-LOG. University of São Paulo, Luiz de Queiroz College of Agriculture. Modal Share Report 2024: Brazil's Modal Shares for Corn and Soybeans. Retrieved January 25, 2025, from https://esalqlog.esalq.usp.br/upload/kceditor/files/Modal-Share-Report-2024-final.pdf.

65 ESALQ-LOG. University of São Paulo, Luiz de Queiroz College of Agriculture. Modal Share Report 2024: Brazil's Modal Shares for Corn and Soybeans. Retrieved January 25, 2025, from https://esalqlog.esalq.usp.br/upload/kceditor/files/Modal-Share-Report-2024-final.pdf.

66 ESALQ-LOG. University of São Paulo, Luiz de Queiroz College of Agriculture. Modal Share Report 2024: Brazil's Modal Shares for Corn and Soybeans. Retrieved January 25, 2025, from https://esalqlog.esalq.usp.br/upload/kceditor/files/Modal-Share-Report-2024-final.pdf.

67 Salin, Delmy L. and Agapi Somwaru. USDA, Agricultural Marketing Service. Eroding U.S. Soybean Competitiveness and Market Shares: What Is the Road Ahead?. February 2015. Retrieved June 24, 2025, from https://www.ams.usda.gov/sites/default/files/media/02-2015%20%20Eroding%20U.S.%20Soybean%20Competitiveness%20and%20Market%20Shares%20What%20Is%20the%20Road%20Ahead.pdf

68 Salin, Delmy L. USDA, Agricultural Marketing Service. Brazil Soybean Transportation: 2021 Overview. Published February 2022. https://www.ams.usda.gov/sites/default/files/media/BrazilOverview2021.pdf

69 Agência Nacional de Transportes Terrestres (ANTT). Ferrogrão – EF-170. https://www.gov.br/antt/pt-br/assuntos/ferrovias/novos-projetos-ferroviarios/ferrograo-ef-170

70 Salin, Delmy L. USDA, Agricultural Marketing Service. Brazil Soybean Transportation: Guide 2020. https://www.ams.usda.gov/sites/default/files/media/BrazilSoybeanTransportationGuide2020.pdf

71 Salin, Delmy L. USDA, Agricultural Marketing Service. Soybean Transportation Guide: Brazil 2022. https://www.ams.usda.gov/sites/default/files/media/BrazilSoybeanTransportationGuide2022.pdf.

72 ANTAQ PAR14 – Seção A – Apresentação Rev03. January 2024. Retrieved May 15, 2024, from http://web.antaq.gov.br/Sistemas/WebServiceLeilao/DocumentoUpload/Audiencia%20160/PAR14%20-%20Se%C3%A7%C3%A3o%20A%20-%20Apresenta%C3%A7%C3%A3o%20Rev03.pdf

73 Cost Index reflects Quarter 1 and Quarter 2 averages for Brazil and Q3 and Quarter 4 averages for the U.S.; For Brazil, this data excludes barge and rail costs as there are no published rail tariff or barge rates According to USDA, barge and rail rates can be approximately 60 percent and 30 percent lower than truck rates, respectively—depending on volumes hauled and the terms of contracts signed between the railroad company and shippers."
Source: USDA, Agricultural Marketing Service. U.S. vs Brazil Soybean Transportation Costs. https://agtransport.usda.gov/Exports/U-S-vs-Brazil-Soybean-Transportation-Costs/g9w7-d2kh/about_data,
Salin, Delmy L. USDA, Agricultural Marketing Service. Brazil Soybean Transportation: First Quarter 2024. Published May 2024. https://www.ams.usda.gov/sites/default/files/media/Brazil_Quarter1_2024.pdf

Section 7

Conclusion

Source: Adobe Stock

The U.S. inland waterway system plays a vital role in the national freight network, particularly in supporting the cost-effective, safe, reliable, and efficient movement of bulk agricultural commodities. This report has demonstrated the wide-reaching economic contributions of inland waterways. These contributions include direct increases to employment in the inland waterway transportation services industry and the Nation's overall economic output as well as indirect benefits to agricultural and other industries that rely on waterborne transport to remain globally competitive.

Stakeholder feedback confirmed that there is widespread recognition of the U.S. inland waterway system's value, as well as shared concerns about impacts from disruptions and consequences of underinvestment. Stakeholders emphasized the importance of strengthening the system's reliability to maintain global market access and supporting local and national economies.

The analysis presented here incorporated new commodities, additional States, and the most recent data and modeling techniques available at the time of writing. Key findings surfaced here include the following: 1) the inland waterway transportation services industry supports more than 200,000 jobs and contributes nearly $30 billion in GDP annually; and 2) agricultural exports that depend on the inland waterways contribute another $17 billion in GDP and support over 120,000 jobs across the analyzed States. These figures underscore the critical economic value of maintaining and enhancing U.S. inland waterways.

Scenario analysis revealed that investment in key infrastructure projects, such as those outlined in the USACE CIS, could have substantial economic impacts by supporting thousands of additional jobs and generating billions in GDP. Conversely, disruptions to the system can impose substantial costs on shippers, while increasing environmental impacts and safety risks.

Finally, the report highlighted that the U.S. currently has a comparative advantage in the domestic transportation of several key agricultural exports due to the cost-effectiveness of barge transportation. However, this advantage is not guaranteed. Competing countries are making strategic investments in their own infrastructure. If the U.S. fails to adequately invest in its inland waterway system, it risks ceding market share in this competitive industry.

U.S. inland waterways are a critical, strategic national asset. In their current state, they significantly contribute to the U.S economy and help ensure national competitiveness on the global stage. Without investment, the advantages provided by these important assets will be eroded. Disruptions on the waterways could increase along with increases in negative impacts seen from these disruptions. Moreover, the competitiveness of U.S agricultural goods will decline. Additional investment and targeted investment for projects that offer the most strategic benefit will mitigate these risks and provide opportunities to enhance economic growth.

Appendix A

Methodology and Assumptions

Data Sources

Waterborne Commerce Statistics Center (WCSC)

The USACE WCSC collects data on tonnage of commodities shipped via U.S. waterways. This data, organized by origin-destination pairs, is collected throughout the year. The aggregated and anonymized data is made publicly available online at WCSC Waterborne Commerce Statistics Center. For this analysis, USDA provided the project team with disaggregated versions of the data. Data from 2022 were used for the Volpe team's analysis of Economic Contributions, while data from 2016 – 2022 were used in the Volpe team's Scenarios analysis.

Agricultural Census

The Agricultural Census collects data on various aspects of the agricultural sector at multiple geographic- and industry- levels. For this study, the project team used state-level sales and production data to estimate the composition of each state's farming industry, and the share of particular agricultural commodities exported via inland waterways. For this report, data from 2022 were used for the Volpe team's analysis of Economic Contributions and in the Volpe team's State Profiles.

Barge Rates

USDA provided the Volpe team with barge rate data for select origin-destination pairs along the Mississippi, Ohio, Illinois, MKARNS, and Columbia-Snake river systems. These rates were sometimes given as a flat cost per ton, while in other cases, they were provided as base rates requiring additional percent-tariff data for calculation.[74]

Export Sales

USDA's Foreign Agricultural Service (FAS) publishes annual data on current and historical soybean export sales at both the national- and state- levels, based on estimates from cash receipts. The Volpe team accessed this data through the Global Agricultural Trade System (GATS) query tool, which sources its information from the U.S. Census Bureau's Trade Data. For this report, data from 2000 – 2024 were used for the Volpe team's Export market analysis.

Export and Import Volumes: U.S. and China

USDA FAS publishes the Production Supply and Distribution: Oilseeds dataset which provides annual data on soybean import and export volumes for both the U.S. and China. Data from 1995 – 2023 were used for the Export market analysis.

Export and Import Volumes: Brazil

Brazil's Ministry of Economics provides monthly data on national- and state-level soybean export volumes through its COMEX Stat Foreign Trade Statistics platform. The Volpe team used the publicly available dataset. Data from 2000 – 2023 were used for the Export market analysis.

U.S. Production Cost Data

USDA's Economic Research Service (ERS) provides historical and current estimates of soybean production costs in the U.S. These estimates—available through the Commodity Costs and Returns dataset—capture the full range of expenses incurred by producers, including those borne by farm operators, landlords, contractors, and contractees. These data are derived from the Agricultural Resource Management Survey (ARMS) and supplemented with price data from the National Agricultural Statistics Service (NASS). The

Volpe team accessed the publicly available dataset. This report uses 2022 data for the Export market analysis.

Brazil Production Cost Data

The Brazilian National Supply Company (CONAB) publishes annual estimates of per-unit soybean production costs for major soybean-producing municipalities across Brazil. These estimates are based on a survey modeled after USDA's ARMS. The Volpe team accessed this data via CONAB's website and reclassified the cost categories to align with those in USDA's Commodity Costs and Returns dataset. 2022 data were used for the Export market analysis.

Export Cost Data

USDA provides quarterly estimates of the total landed cost of shipping one ton of soybeans from select origin points in both the U.S. and Brazil to destinations in Hamburg, Germany, and Shanghai, China. These costs are broken down into categories including farm value, ocean shipping, truck transportation, and rail transportation. The Volpe team accessed this data through the U.S. vs Brazil Soybean Transportation Cost Dataset.

Modeling Software

To analyze the economic contributions of the inland waterway system and the logistical impacts of system disruption, two main modeling tools were employed in this study. These tools are designed to capture different aspects of the waterway network and its interactions with the broader economy.

Specifically, this study utilized:

- **IMPLAN** for estimating the current economic contributions of the inland waterway industry and the agricultural commodity sectors that use the waterway system to transport goods for export. It was additionally used for modeling the expected economic impact of additional spending on the inland waterways induced by improving the capacity of the system.
- **Freight Transportation Optimization Tool (FTOT)** to simulate multimodal freight movements and quantify the operational and environmental impacts of potential disruptions to the inland waterway system.

Each tool provides a complementary perspective: IMPLAN translates changes in freight spending into broader economic impacts, while FTOT models how goods physically move through the transportation network under different scenarios. Together, these tools offer a comprehensive framework for evaluating how investments in inland waterway infrastructure influence both transportation efficiency and regional economic activity. Additional details on each model are presented below.

a. IMPLAN

IMPLAN is an economic impact model designed to perform national- and state-level Input-Output (I-O) analyses. An I-O analysis connects industry, household, and government sectors through buy-sell relationships, so that a change in economic activity in one sector supports a ripple of economic affects throughout the economy. IMPLAN uses annual data for mapping the buy-sell relationships, which allows users to estimate how economic changes may impact state-, or regional-level economies. Inputs are sourced from a range of Federal datasets and are harmonized into a consistent industry classification system and standardized to a common reference year.[75] These datasets can provide information about an economy of interest (e.g., State) including industry data, commodity data, household spending data, and area demographics. There are also some user-defined specifications, which can help to further tailor the model.

IMPLAN reports on four key economic indicators:

- **Output** – Output is more commonly known as revenue or sales. It is the total value of an industry in a calendar year plus net inventory change and includes employee compensation, proprietor income, taxes on production and imports, other property income, and intermediate inputs. It represents the sum total of value added and the value of intermediate inputs, and therefore will always be higher than GDP which only includes value adding activities.
- **Value Added** – Value Added is the difference between output and the cost of the intermediate inputs. It measures an industry's contribution to GDP and includes labor income, proprietor income, employee compensation, other property income, and taxes on production and imports. In IMPLAN, GDP is synonymous with value added.[76]
- **Labor Income** – Labor Income is the combined cost of total payroll paid to employees and payments received by self-employed individuals and/or unincorporated businesses in a given year. This income is the sum of employee compensation and proprietor income.
- **Employment** – Employment in IMPLAN aligns with the Bureau of Economic Analysis Regional Economic Accounts and Bureau of Labor Statistics Census of Employment and Wages data – a full-time/part-time annual average. In other words, one job that lasts 12 months is equivalent to two jobs lasting 6 months, or 3 jobs lasting four months each. Additionally, a person can hold more than one job, so the job count does not necessarily align with the count of employed persons.

Based on these economic indicators, IMPLAN estimates the ripple effects of a given economic activity on other industries and geographies; the total economic effect is the sum of the direct effect, the indirect effect, and the induced effect.

- **Direct Effects** – Direct Effects are the changes that occur directly from the activity or policy being analyzed. These effects may reflect a change in economic activity, or quantify the impact of existing economic activity at a certain level.
- **Indirect Effects** – Indirect Effects are the changes that occur from business-to-business purchases in the region that stem from the initial industry purchases (the direct effects). Labor Income and Household Income events do not generate indirect effects.
- **Induced Effects** – Induced Effects are the changes that occur from labor income being spent in the specified industries and those impacted through the supply chain in the specified region.

For example, an increase in demand for soybeans will generate more jobs, output, and value-adding activity (GDP) in the soybean industry; these can be considered the direct effects of this change in demand. To produce these soybeans, inputs are required from intermediate industries such as fertilizer, truck transportation services, etc.; the output, jobs, and other impacts generated from these intermediate industries are considered the indirect effects. All of these industries provide income to their employees and proprietors. The spending of this income on household goods and services such as health care services, or restaurants, generates additional economic activity; this activity is considered the induced effects.[77]

For more information on IMPLAN, see How IMPLAN Works.

b. FTOT

The Freight Transportation Optimization Tool (FTOT) is an analytical modeling platform that was developed by the U.S. Department of Transportation's Volpe National Transportation Systems Center. FTOT is designed to evaluate multimodal freight movements, and to assess the economic and environmental impacts of various freight transportation scenarios. The tool enables detailed simulation of commodity flows across the U.S. transportation system, encompassing truck, rail, barge, and pipeline modes.

FTOT operates by integrating data on freight supply chains, transportation infrastructure, operational capacities, and cost structures. Users define the supply of commodities, demand locations, available transportation modes, and system capacity constraints. The tool then applies an optimization algorithm to identify the most efficient and cost-effective transportation routes, while also calculating associated metrics such as travel distance, time, costs, and emissions.

FTOT is particularly useful for scenario analysis, allowing stakeholders to model the impacts of infrastructure investments, supply chain disruptions, and modal shifts. It can simulate how capacity limitations, cost changes, or demand fluctuations affect freight movements at local, regional, and national scales. For this study, FTOT was used to estimate the impacts of disruptions to the inland waterway system.

Methodology

I. Contribution of Agricultural Exports Shipped via Inland Waterways

To estimate the economic contributions of agricultural exports transported via inland waterways, multiple data sources were integrated to determine the share of each state's agricultural production that utilizes the waterway transportation network. The process involved three key steps: estimating export tonnage, calculating export shares, and mapping these shares to IMPLAN industries.

Step 1: Estimating Export Tonnage

The first step was to estimate the total tonnage of each commodity exported via inland waterways from each state using WCSC trip data. To do this, EP^i_L, an export percentage, of commodity *i* at location *L*, was assigned to each export location on the inland waterway system for each commodity, calculated as:

$$= \frac{T^i_{\mathrm{exp},L}}{T^i_{\mathrm{in},L}}$$

Where $T^i{}_{\mathrm{in},L}$ is the tons of commodity *i* received at location *L*, and $T^i{}_{\mathrm{exp},L}$ is the tons of commodity *i* exported at location *L*. This percentage was then applied to the tonnage of each incoming shipment to estimate the tonnage of each shipment that was likely exported. This was calculated as:

$$T^i_{\mathrm{ship,exp},O,L} = \mathrm{EP}^i_L \cdot T^i_{\mathrm{ship},O,L}$$

Where $T^i_{\mathrm{ship,exp},O,L}$ is the tonnage of each shipment of commodity *i* being received by location *L* coming from origin state *O*. The tonnage from all trips arriving at each export location was then grouped by each shipment's origin state, *O*, and the total estimated export tonnage was summed for each commodity *i*. The final sum represents the total tons of commodity *i* exported from each state. However, this estimate is likely conservative as it does not account for commodity transfers between export locations via coastwise movements or other transportation modes.

$$T^i_{\exp,O} = \sum_L \sum_{\text{ship}} T^i_{\text{ship},\exp,O,L}$$

Step 2: Calculating Export Shares

Next, the total tonnage exported for each commodity *i* was converted into a percentage of the state's total production. Agricultural census data was used to estimate the total production of each commodity *i* in each state. The export share S^i_o for each state o was calculated as:

$$S^i_o = \frac{T^i_{\exp,o}}{T^i_{\text{prod},o}}$$

This ratio represents the share of each state's production that was transported via inland waterways for export.

Step 3: Mapping to IMPLAN Industries

To align these shares with the IMPLAN economic model, the commodity-specific export shares needed to be aggregated into broader industry categories. IMPLAN defines two relevant agricultural industries: Oilseed Farming and Grain Farming. To translate commodity-specific shares into industry-level shares, we used Agricultural Census data to estimate the contribution of each commodity to the total sales of each commodity's respective greater farming industry in each state.[78]

$$W^i_O = \frac{D^i_o}{D^{\text{grain}}_o}$$

The final IMPLAN industry-level export share IS_s for each state and commodity was calculated as:

$$IS^i_o = W^i_O \times S^i_o$$

This approach converts commodity-specific export shares into an estimate of the portion of each state's grain and oilseed farming industry that relies on inland waterways for export. By following this methodology, we derived a more precise estimate of how much agricultural exports of specific commodities via inland waterways contribute to state-level economies and broader industry classifications in IMPLAN. IS^i_o was used directly as an input to IMPLAN in an industry contribution scenario, and assigned to either the Oilseed Farming or Grain Farming IMPLAN industry, depending on the crop in question.

II. Economic Impacts of Additional Investment

To estimate the economic impacts of additional investment in inland waterways, the proposed investments were converted to a change in demand for water transportation services and measured in IMPLAN. The process involved estimating additional barge traffic expected to be induced as a result of investment, and then converting that traffic into new expenditures on waterway services to be input into IMPLAN.

Step 1: Estimating New Tonnage Shipped Via Waterways

This process began by estimating the additional barge traffic expected to be induced as a result of each project's completion. Each investment in the inland waterway system considered in this report centered around the expansion of a lock's chamber. Increasing the size of a lock chamber increases the number of barges that can traverse the lock in a single lockage. Currently, at many locations it is common for a flotilla to require multiple lockages when there are more barges in-tow than can be moved through the chamber in a single lockage. For example, in 2020 there were 2,051 flotillas that passed through the LaGrange lock requiring 2,443 lockages. This is caused by the fact that the LaGrange lock is 600 feet in length, and therefore can accommodate at most 9 barges in a three-by-three formation, but flotillas on the Illinois River are commonly comprised of 15 barges in a five-by-three formation. These flotillas therefore require more than one lockage to get all barges through the lock.[79] The number of lockages is considered utilization (the ratio of vessel traffic to lock capacity) of the system at a certain capacity.

After lock expansion, there will no longer be a need to perform multiple lockages, as the chamber will be lengthened to a sufficient size to accommodate the largest flotillas. Therefore, if traffic does not increase, the number of lockages would decrease and utilization of the system would fall. To estimate the change in tonnage resulting from these improvements, it was assumed that traffic will increase until the utilization of the system returns to the pre-expansion level. Using LaGrange Lock as an example, it was assumed that the lock can only perform 2,443 lockages in a given year, but instead of only being able to accommodate 2,051 flotillas, the lock can now accommodate 2,443 flotillas as double lockages will no longer be required.

The number of lockages and flotillas was averaged out for years 2016 through 2020 for each lock analyzed.[80] The difference between the number of lockages and the number of flotillas at each location was assumed to represent the increase in flotillas expected from each lock improvement. This increase in flotillas was then converted to an increase in tonnage based on the average tonnage per flotilla at each project location.

$$\Delta T_l = (L_l - F_l) \cdot T_F$$

Where L_l and F_l show are the average lockages and average flotillas passing through each lock, respectively. ΔT_l is the additional tonnage moving through each lock after improvement.

Certain traffic may transfer from other transportation modes, while some could result from new demand for U.S. agricultural products driven by enhanced competitiveness due to lower-cost transportation options. However, this analysis excludes such second-order effects and focuses exclusively on the impacts of increased investment in inland waterway transportation services.

Step 2: Converting New Tonnage to Expenditures on Water Transportation Services

Once the induced tonnage resulting from each lock capacity improvement was estimated (using the method described above), this increase was used to calculate the corresponding increase in expenditures on inland waterway transportation services. This represents the change in demand for barge transportation attributable to infrastructure improvements.

Because barge shipping costs vary by origin location and seasonality, a spatial and temporal allocation was required. Custom shapefiles were developed to identify the set of trips in the WCSC data that likely utilized each improved lock. For each lock, the relevant trips were extracted, and the distribution of origin locations and shipment timing (by week) was jointly estimated.

The previously calculated induced tonnage increase was then allocated across origin-location-week reflecting where and in which week the additional tonnage would be shipped. Using barge rate data that also varies by origin and week of the year, the induced expenditures were computed by multiplying the allocated tonnage with the corresponding barge rates.[81] These expenditures were then summed to estimate the total increase in spending on inland waterway services associated with each lock improvement.

$$E_l = \sum_{w \in W_l} \sum_{o \in O_l} (\Delta_l T \cdot P_{l,o,w} \cdot R_{o,w})$$

ΔT_l is the new tonnage at lock l and is multiplied by the proportion, *P*, of trips originating at each location *o*, in each week, *w*, and the rate *R*, at each origin location in each week. This generates the estimated new expenditures on inland waterway transportation services at each origin in each week. These expenditures are then summed over every origin location in every week to calculate the total expenditures, *E*, as a result of improvement.

E_l is considered the new demand for water transportation services as a result of each lock improvement. This is used as an input into the IMPLAN model to estimate the direct, indirect, and induced impacts of this change in demand.

III. Disruption Analysis

In order to estimate the impacts of a disruption to inland waterway networks, appropriate inputs to FTOT needed to be identified or estimated to reasonably capture the effects of shipping goods between origin - destination pairs under varying levels of transportation access. This section identifies how FTOT inputs were developed.

Origin – Destination Pairs

Illustrative trip origin and destination locations were selected based on observed WCSC data, stakeholder interviews, and the potential to experience disruption. Whitman and Scott County are both areas with significant amounts of agricultural production and have easy access to both rail and waterway transportation. They also are significantly upstream on their respective waterways, and therefore are commonly impacted by any disruptions downstream. When used as inputs into FTOT, the model identifies the centroid of the most populated place in a county to use as the precise origin location; in this particular case, origin locations are located in Davenport, IA, and Pullman, WA.

Destination locations were selected primarily based on the WCSC data. Once origin locations were selected, the most common destinations for shipments of each commodity of interest were estimated using WCSC data. These locations were reviewed, and a destination point was selected for each trip.

Input Data

Cost and emission input data comes from a variety of sources including the Texas Transportation Institute and the BTS. Inputs were evaluated based on their representation of trips taken on the inland waterway system, and their ability to be compared across modes and scenarios.

Cost inputs for the Volpe team's disruption scenarios used FTOT's default parameters, which are sourced from the BTS. These values are representative of all trips moving dry-bulk goods on the inland waterways and all trips utilizing dry hopper cars via rail. While these values may not reflect the exact rates faced at each origin location, they are representative of the system as a whole and are comparable between modes; using actual rates for one mode and generalized rates for another could bias results otherwise.[82]

Emission and safety factor inputs come from a Texas Transportation Institute report to the U.S. National Waterways Foundation.[83] This report developed emission and safety factors for multiple modes including barge, rail, and truck using similar methodologies for each mode. Emission factors were then fed into FTOT as parameters, while safety factors were applied to the final estimates of vehicle-miles traveled based on the results of FTOT. All other parameters used default FTOT inputs available in their documentation.

Appendix A Endnotes

74 For many U.S. waterways, barge rates are determined using two components: a base rate and a percent-tariff. The base rate is a fixed cost per ton that remains constant over time for each waterway segment. The percent-tariff is a market-driven percentage applied to the base rate, fluctuating based on demand for barge transportation. Each week, the rate shippers pay is calculated by applying that week's percent-tariff for the specific waterway to the corresponding base rate.

75 The industry classification system used in IMPLAN closely mirrors the North American Industry Classification System (NAICS).

76 "GDP" is used in place of value-added.

77 For more information, a public version of FTOT and FTOT documentation is available at https://github.com/VolpeUSDOT/FTOT-Public

78 In most cases states did not have significant sales of oilseeds outside of soybean sales. When this was the case W_O^i was determined as equal to 1.

79 The current capacity of a flotilla is constrained by other characteristics of the waterway being traversed rather than the capacity of locks, therefore we do not expect the size of barge tows to increase as a result of increases in lock capacity.

80 2019 was excluded from the Volpe team's analyses of the LaGrange and Lock 25 expansion projects due to flooding events on the Upper Mississippi River, and Illinois River in that year.

81 It was assumed that barge operators can accommodate the higher demand without raising prices. Consequently, with consistent system utilization, barge rates are projected to remain unchanged following the lock expansion.

82 Note that although FTOT was used to capture the impacts of a disruption to the waterway network, we assumed that the disruption would not change freight costs. This is plausible when a low volume of tonnage is diverted to other modes, however, if a more substantial volume was diverted then freight rates may increase due to the reduced supply of transportation services.

83 Source: nationalwaterwaysfoundation.org/file/28/TTI 2022 FINAL Report 2001-2019 1.pdf

Appendix B

Total Contributions from State Commodity Production for Exports

Table B.1: Total Contributions from State Commodity Production for Exports
Source: IMPLAN

State	Commodity	Jobs	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Alabama	Corn	4	0.2	0.4	0.7
	Soybeans	19	2.8	4.9	5.8
	Wheat	196	12.4	18.9	39.3
Arkansas	Corn	2,014	89.3	137.9	374.1
	Rice	501	22.2	34.3	93.1
	Soybeans	5,133	490.5	1,137.7	1,585.5
	Wheat	512	22.7	35.0	95.0
Idaho	Wheat	875	50.1	114.8	238.7
Illinois	Corn	14,882	1,049.2	1,895.0	4,282.0
	Soybeans	14,872	1,853.0	4,006.0	6,157.1
	Wheat	960	67.7	122.3	276.3
Indiana	Corn	3,498	210.2	368.8	858.2
	Sorghum Grains	6	0.3	0.6	1.4
	Soybeans	2,096	220.8	501.5	763.9
	Wheat	126	7.6	13.3	31.0
Iowa	Corn	675	40.3	80.9	237.6
	Soybeans	3,781	365.2	973.7	1,901.7
	Wheat	9	0.5	1.0	3.1
Kansas	Corn	7	0.4	0.7	2.0
Kentucky	Corn	5,388	211.1	335.9	802.6
	Soybeans	2,478	199.9	476.3	627.5
	Wheat	1,056	41.4	65.9	157.4
Louisiana	Corn	1,362	64.0	102.8	333.7
	Rice	689	32.4	52.0	168.9
	Sorghum Grains	91	4.3	6.9	22.3
	Soybeans	1,200	104.9	261.4	446.5
	Wheat	149	7.0	11.3	36.6
Minnesota	Corn	1,815	101.0	189.7	506.8
	Soybeans	1,808	162.9	447.8	774.2
	Wheat	29	1.6	3.0	8.0
Mississippi	Corn	2,528	107.0	136.7	455.9
	Rice	325	13.8	17.6	58.6
	Soybeans	6,722	547.2	970.1	1,768.0
	Wheat	250	10.6	13.5	45.1

State	Commodity	Jobs	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Missouri	Corn	11,142	409.1	739.8	2,081.1
	Rice	697	25.6	46.3	130.1
	Sorghum Grains	2.02	0.1	0.1	0.4
	Soybeans	9,693	550.9	1,578.3	2,603.9
	Wheat	1,650	60.6	109.6	308.3
Nebraska	Corn	5	0.3	0.6	1.6
	Soybeans	21	2.3	4.8	10.0
Ohio	Corn	1,805	77.5	138.9	353.8
	Soybeans	2,038	145.5	341.6	579.5
	Wheat	81	3.5	6.3	15.9
Oklahoma	Soybeans	1,215	63.4	118.3	298.4
	Wheat	2,417	92.3	86.0	439.2
Oregon	Soybeans	449	23.6	206.5	245.0
	Wheat	1,858	89.9	180.8	389.6
Tennessee	Corn	1,662	41.8	70.7	208.1
	Soybeans	4,621	157.0	484.4	839.9
	Wheat	1,446	36.4	61.5	181.0
Washington	Corn	16	0.9	2.0	3.9
	Wheat	4,255	251.9	528.0	1,033.7
Wisconsin	Corn	883	42.0	83.6	179.9
	Soybeans	732	59.7	235.5	283.1
	Wheat	6	0.3	0.6	1.2

Appendix C

Individual State Profiles

Overview

The report evaluated economic contributions from agricultural industries that rely on inland waterways to export their commodities internationally. Selected States along inland waterways were analyzed following the methodology outlined in Appendix A. This report provided the sum total of economic contributions across all selected States for each selected commodity, while this Appendix focuses on economic contributions from agricultural industries for each State.

Each State profile contains the following features:

1. A map showing the U.S., with the State of interest highlighted along with the inland waterways considered in this report.
2. The distribution of sales from the State's farming industry by commodity.
3. The total tonnage and distribution of goods loaded on the inland waterway in each State.
4. The distribution of agricultural goods loaded on the inland waterway in each State (a subset of the total tonnage loaded on the inland waterways).
5. The percentage of each commodity produced in the State that is loaded on inland waterways.
6. The tonnage of each commodity exported via inland waterways from each State .
7. The economic contributions (jobs, labor income, GDP, output) accrued by each State from the subset of each commodity industry exporting goods via inland waterways.
8. The industries most impacted by agricultural industries that export goods on inland waterways.

Profile FAQs

Why are certain waterways bolded in each State's map?

The bolded waterways reflect the waterways most commonly used to bring agricultural goods to export. Non-bolded waterways are those that may be used for domestic shipments of agricultural or non-agricultural goods.

Are agricultural commodities included in the distribution of all goods shipped on the inland waterways?

Yes. Two separate figures are used to showcase the distribution of goods shipped on the inland waterways from each State. The first shows a breakdown of all goods loaded on the inland waterways in the State of interest, while the second highlights only the agricultural goods being shipped on the inland waterways from each State. Note that for some States certain commodities were omitted or grouped together to protect proprietary shipping data or for visualization purposes.

How were the commodities of interest picked for each State?

Five commodities were considered for each State: corn, soybeans, wheat, sorghum grain, and rice. However, not all commodities are produced in significant volumes in each State or shipped on the inland waterways of a particular State. For these State profiles, only the commodity industries whose exports via the inland waterways contribute at least 50 jobs to the State's economy were included.

Why do some profiles show that some States ship more of certain commodities than they produce?

In some cases, agricultural goods from one State can be loaded on the waterways at a dock located in another State. This can cause the volume of certain commodities loaded on the inland waterways of a State to be greater than the State's production of that commodity. To avoid omitting the contributions of these agricultural industries, the Volpe team included their contributions in the results. In these cases, the contributions can be assumed to be for the State of interest and neighboring States.

Why are industries seemingly unrelated to agriculture listed as impacted industries?

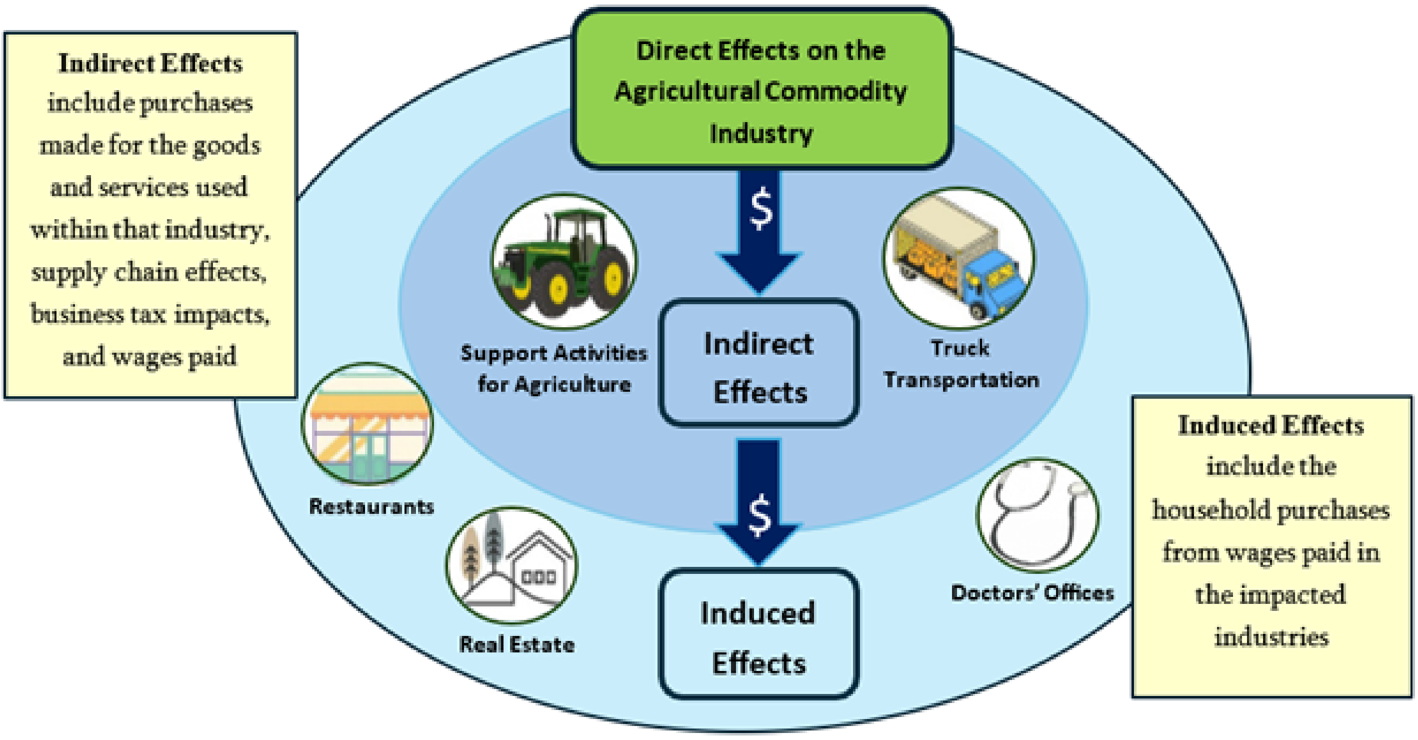
The total contributions of each agricultural industry are the sum of the direct effects from the industry being analyzed (grain farming, oilseed farming, etc.), the indirect effects from intermediate industries that provide inputs to the industry being analyzed (support activities for agriculture and forestry, truck transportation, etc.), and induced effects from the spending of income provided by the industry being analyzed and its intermediate industries on household goods and services (hospitals, full-service restaurants, etc.). Figure C.1 provides a visual representation of these differences.

Why are Oregon, Washington, and Idaho grouped into one state profile?

Due to the limited number of operators on the Columbia-Snake River, shipping data from Pacific Northwest states was aggregated to maintain confidentiality. Figures representing agricultural sales and goods shipped on the inland waterways reflect a composite profile of the three states. However, economic impacts calculated using IMPLAN are still reported by individual state.

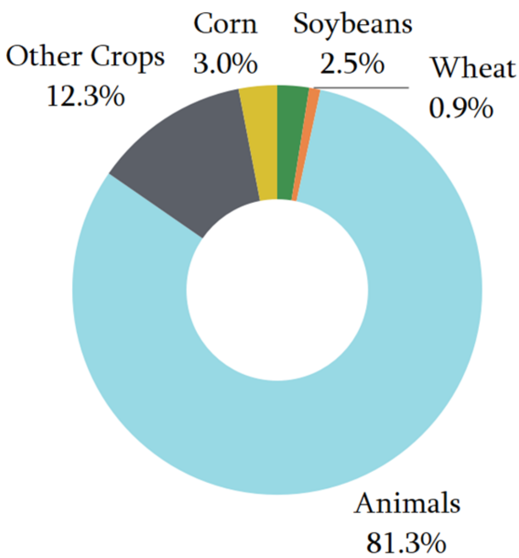
Figure C.1: Direct, Indirect and Induced Effects

Source: IMPLAN



Alabama

Composition of Alabama's Agricultural Industry by Sales



Alabama is connected to several rivers in the inland waterway network, including the Tennessee River and the Lower Mississippi River. Agricultural commodities make up 8% of commodities shipped on Alabama's inland waterways.

Distribution of Commodity Types Shipped on Alabama's Inland Waterways

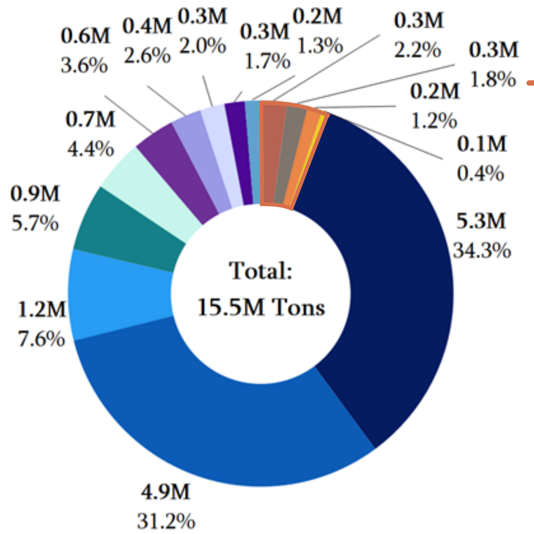
Agricultural Commodities Shipped

- Oilseeds (incl. Soybeans)
- Other Agricultural Products
- Wheat
- Corn

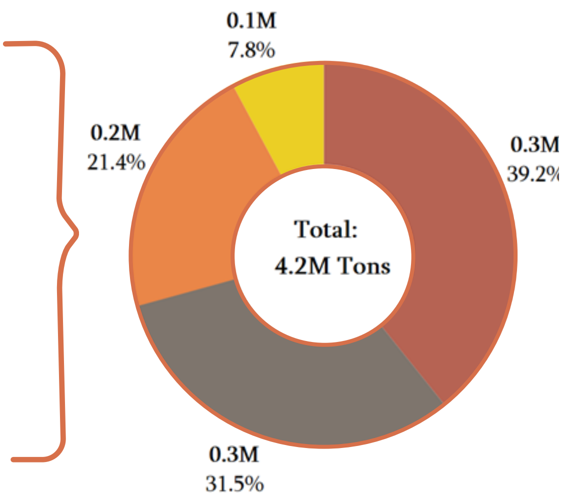
Non-Agricultural Commodities Shipped

- Coal,Lignite & Coal Coke
- Iron & Steel Products
- Other Chemicals and Related Products
- Petroleum Products
- Fuel Oils & Lubricants
- Soils & Aggregates
- Crude Petroleum
- Gasoline & Aviation Fuels
- Other Non-Agricultural Products
- Iron Ore/Iron & Steel Waste

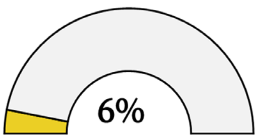
All Commodity Types



Agricultural Commodities

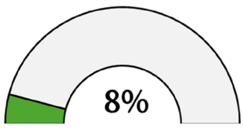


Inland Waterway Shipments as Share of Total In-State Production and Economic Impacts



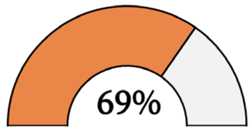
Corn Export Impacts

<0.1M tons exported via inland waterways
<100 jobs
$<0.2M in output
$<0.4M in GDP
$<1M in labor income



Soybeans Export Impacts

<0.1M tons exported via inland waterways
<100 jobs
$6M in output
$5M in GDP
$3M in labor income



Wheat Export Impacts

<0.1M tons exported via inland waterways
<1K jobs
$39M in output
$19M in GDP
$12M in labor income

Alabama: Top Industries Impacted by Key Crops

Corn

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	2	<$1	<$1	<$1
Support activities for agriculture and forestry	1	<$1	<$1	<$1
Other real estate	0	<$1	<$1	<$1
Full-service restaurants	0	<$1	<$1	<$1
Limited-service restaurants	0	<$1	<$1	<$1

Soybeans

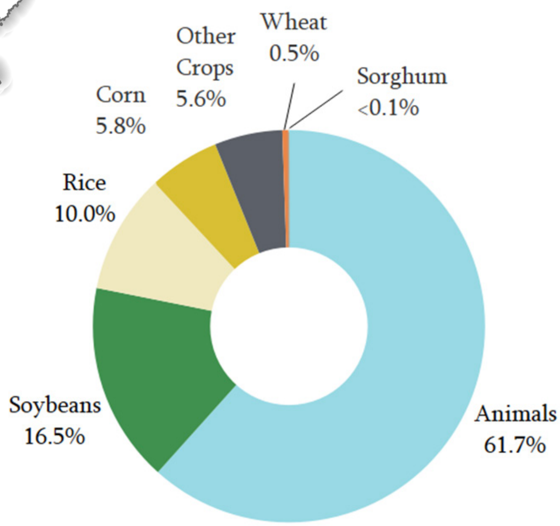
Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Oilseed farming	8	<$1	$4	$4
Limited-service restaurants	1	<$1	<$1	<$1
Full-service restaurants	1	<$1	<$1	<$1
Offices of physicians	0	<$1	<$1	<$1
Other real estate	0	<$1	<$1	<$1

Wheat

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	88	<$1	$10	$22
Support activities for agriculture and forestry	34	$1	$1	$2
Other real estate	12	<$1	$1	$2
Full-service restaurants	3	<$1	<$1	<$1
Limited-service restaurants	3	<$1	<$1	<$1

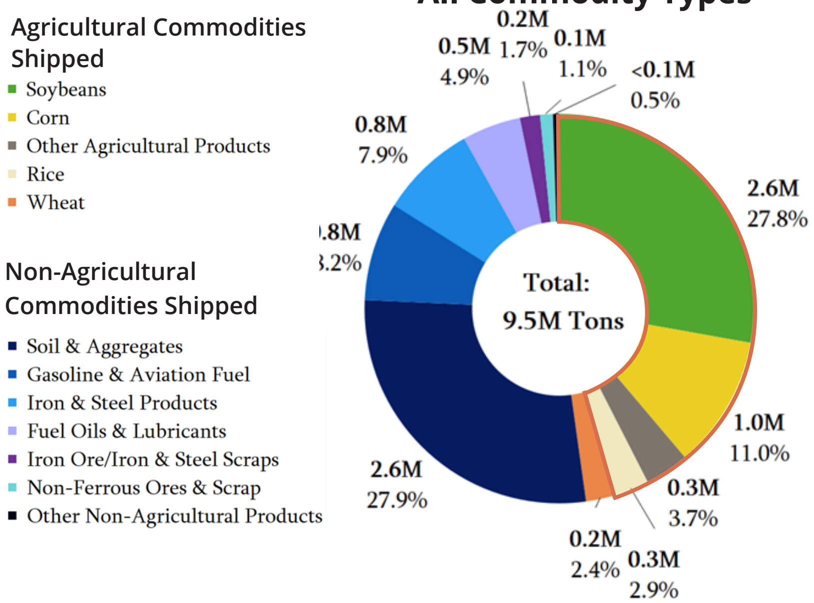
Arkansas

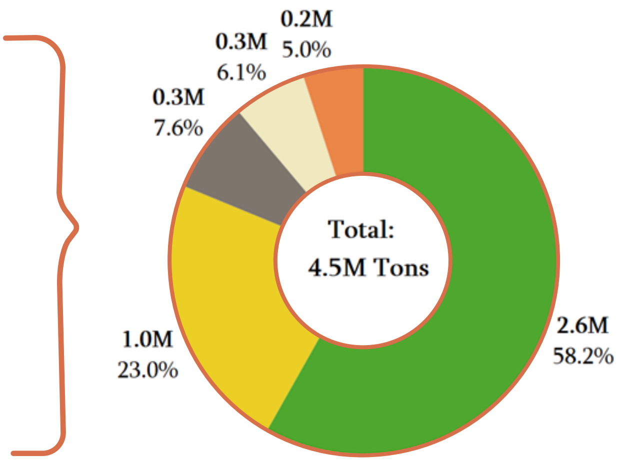
Composition of Arkansas' Agricultural Industry by Sales



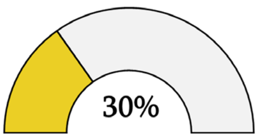
Arkansas is connected to several rivers in the inland waterway network, including the MKARNS, and the Lower Mississippi River. Agricultural commodities make up 45% of commodities shipped on Arkansas's inland waterways.

Distribution of Commodity Types Shipped on Arkansas' Inland Waterways



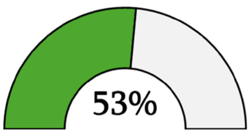


Inland Waterway Shipments as Share of Total In-State Production and Economic Impacts



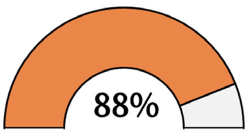
Corn Export Impacts

0.9M tons exported via inland waterways
2k jobs
$374M in output
$138M in GDP
$89M in labor income



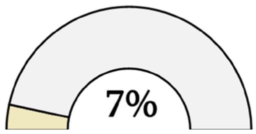
Soybeans Export Impacts

2.3M tons exported via inland waterways
5.1k jobs
$1.6B in output
$1.1B in GDP
$491M in labor income



Wheat Export Impacts

0.2M tons exported via inland waterways
<1k jobs
$95M in output
$35M in GDP
$23M in labor income



Rice Export Impacts

0.2M tons exported via inland waterways
<1k jobs
$93M in output
$34M in GDP
$22M in labor income

Arkansas: Top Industries Impacted by Key Crops

Corn

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	977	$7	$53	$209
Support activities for agriculture and forestry	335	$11	$13	$15
Other real estate	142	$1	$12	$29
Wholesale - Other nondurable goods merchant wholesalers	34	$3	$7	$14
Full-service restaurants	25	$1	$1	$2

Soybeans

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Oilseed farming	2,319	$1	$897	$1,134
Support activities for agriculture and forestry	436	$15	$17	$20
Other real estate	231	$2	$19	$48
All other crop farming	106	<$1	$1	$2
Limited-service restaurants	103	$2	$4	$10

Wheat

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	248	$2	$13	$53
Support activities for agriculture and forestry	85	$3	$3	$4
Other real estate	36	<$1	$3	$7
Wholesale - Other nondurable goods merchant wholesalers	9	$1	$2	$4
Full-service restaurants	6	<$1	<$1	$1

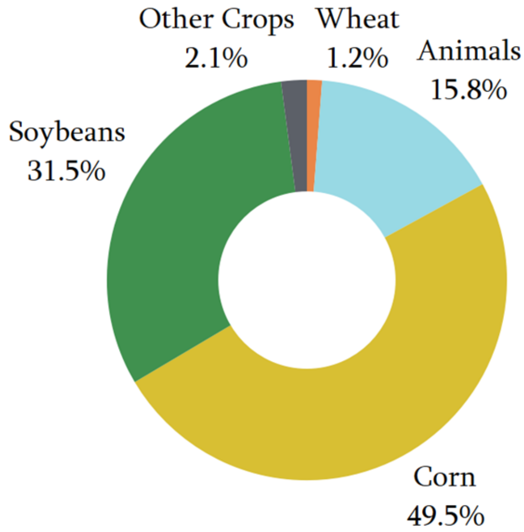
Arkansas: Top Industries Impacted by Key Crops

Rice

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	243	$2	$13	$52
Support activities for agriculture and forestry	83	$3	$3	$4
Other real estate	35	<$1	$3	$7
Wholesale - Other nondurable goods merchant wholesalers	8	$1	$2	$3
Full-service restaurants	6	<$1	<$1	$1

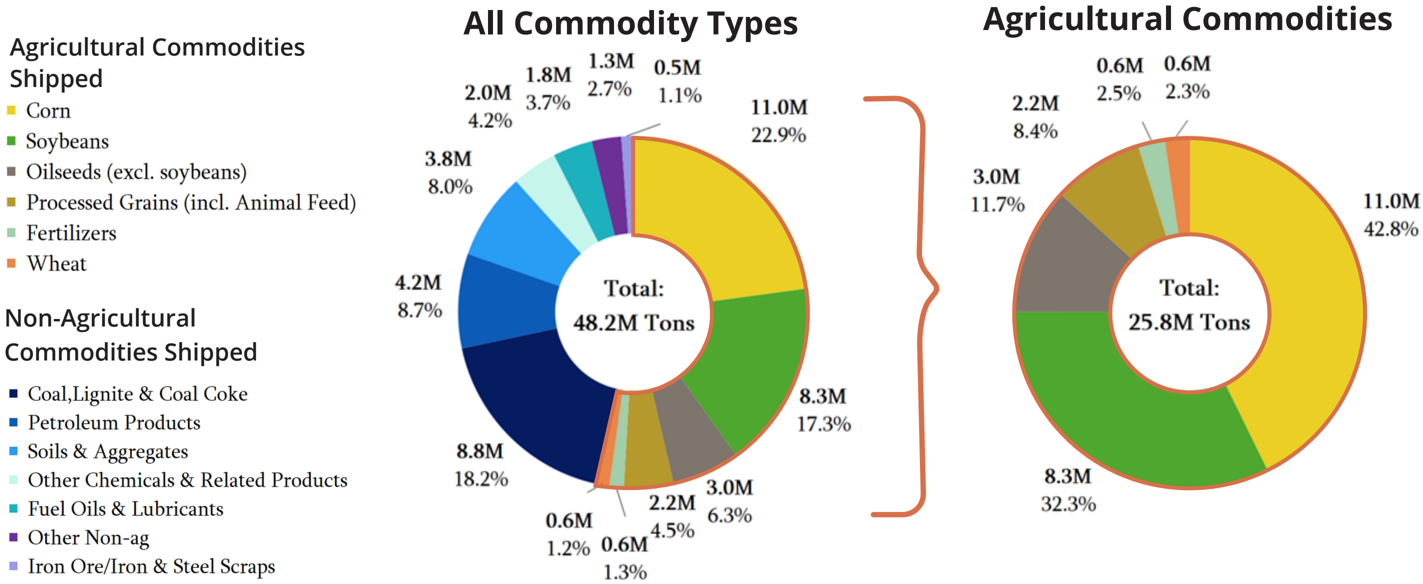
Illinois

Composition of Illinois's Agricultural Industry by Sales

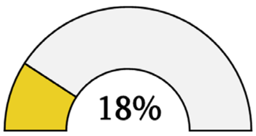


Illinois is connected to several rivers in the inland waterway network, including the Illinois River, the Ohio River, and the Upper Mississippi River. Agricultural commodities make up 52% of commodities shipped on Illinois' inland waterways.

Distribution of Commodity Types Shipped on Illinois' Inland Waterways

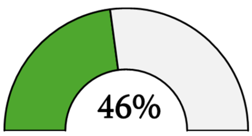


Inland Waterway Shipments as Share of Total In-State Production and Economic Impacts



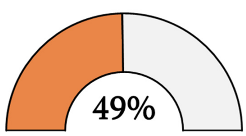
Corn Export Impacts

9.3M tons exported via inland waterways
14.9k jobs
$4.3B in output
$1.9B in GDP
$1B in labor income



Soybeans Export Impacts

7.2M tons exported via inland waterways
14.9k jobs
$6.2B in output
$4B in GDP
$1.9B in labor income



Wheat Export Impacts

0.5M tons exported via inland waterways
1,000 jobs
$276M in output
$122M in GDP
$68M in labor income

Illinois: Top Industries Impacted by Key Crops

Corn

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	6,413	$96	$827	$2,375
Other real estate	1,361	$28	$161	$331
Support activities for agriculture and forestry	1,111	$35	$64	$70
Wholesale - Other nondurable goods merchant wholesalers	341	$35	$90	$155
Full-service restaurants	246	$8	$14	$25

Soybeans

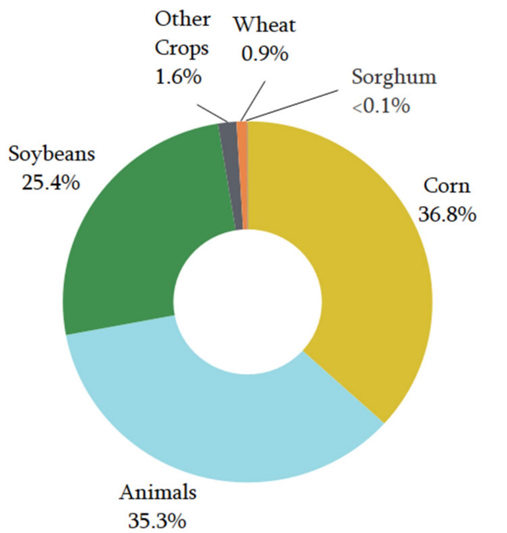
Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Oilseed farming	4,699	$6	$2,765	$3,993
Other real estate	1,081	$23	$128	$263
Support activities for agriculture and forestry	751	$24	$43	$47
Hospitals	361	$35	$44	$77
Full-service restaurants	355	$11	$20	$36

Wheat

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	414	$6	$53	$153
Other real estate	88	$2	$10	$21
Support activities for agriculture and forestry	72	$2	$4	$5
Wholesale - Other nondurable goods merchant wholesalers	22	$2	$6	$10
Full-service restaurants	16	$1	$1	$2

Indiana

Composition of Indiana's Agricultural Industry by Sales

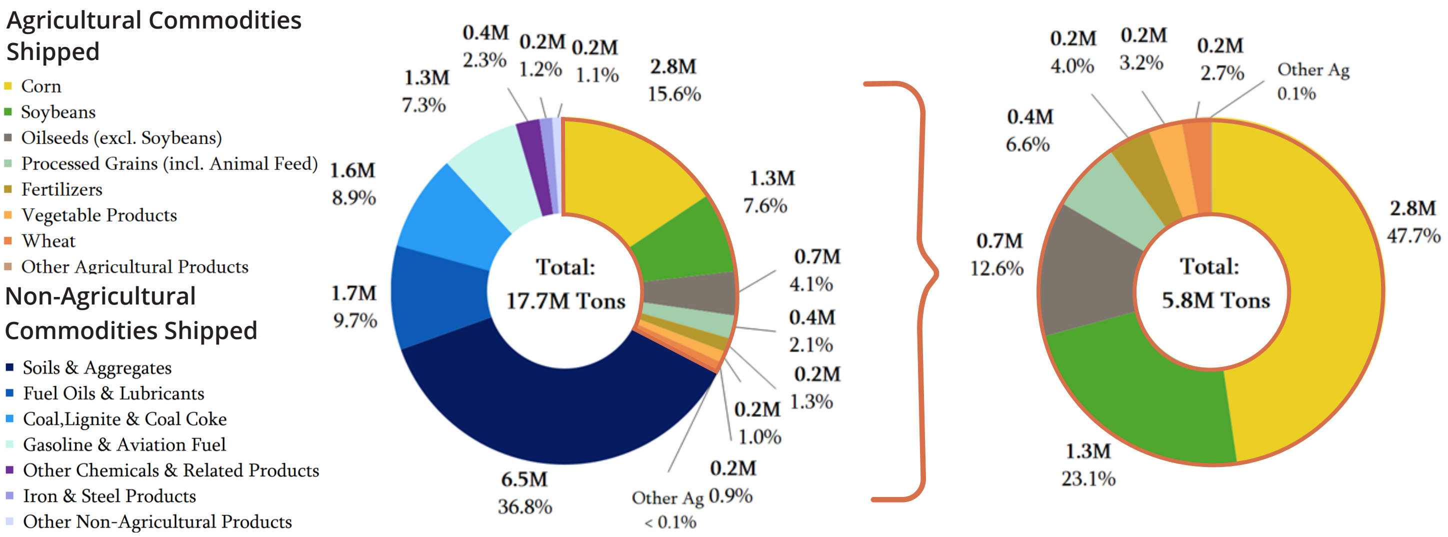


Indiana is connected to several rivers in the inland waterway network, including the Ohio River, and the Lower Mississippi River. Agricultural commodities make up 31% of commodities shipped on Indiana's inland waterways.

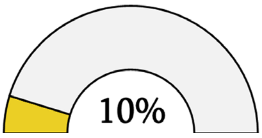
Distribution of Commodity Types Shipped on Indiana's Inland Waterways

All Commodity Types

Agricultural Commodities



Inland Waterway Shipments as Share of Total In-State Production and Economic Impacts



Corn Export Impacts

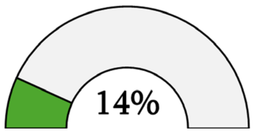
2.2M tons exported via inland waterways

3.5k jobs

$858M in output

$369M in GDP

$210M in labor income



Soybeans Export Impacts

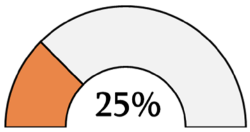
1M tons exported via inland waterways

2.1k jobs

$764M in output

$502M in GDP

$221M in labor income



Wheat Export Impacts

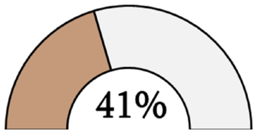
0.5M tons exported via inland waterways

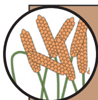
<1k jobs

$31M in output

$13M in GDP

$8M in labor income





Sorghum Export Impacts

<0.1M tons exported via inland waterways

<100 jobs

$1M in output

$1M in GDP

$<1M in labor income

Indiana: Top Industries Impacted by Key Crops

Corn

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	1,687	$19	$170	$499
Support activities for agriculture and forestry	393	$10	$18	$20
Other real estate	240	$3	$38	$68
Wholesale - Other nondurable goods merchant wholesalers	66	$5	$12	$25
Full-service restaurants	58	$1	$2	$5

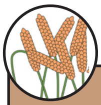
Soybeans

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Oilseed farming	824	$1	$366	$522
Other real estate	160	$4	$7	$8
Support activities for agriculture and forestry	114	$2	$18	$32
Hospitals	53	$5	$6	$11
Full-service restaurants	51	$1	$2	$4

Wheat

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	61	$1	$6	$18
Support activities for agriculture and forestry	14	<$1	$1	$1
Other real estate	9	<$1	$1	$2
Wholesale - Other nondurable goods merchant wholesalers	2	<$1	<$1	$1
Full-service restaurants	2	<$1	<$1	<$1

Indiana: Top Industries Impacted by Key Crops

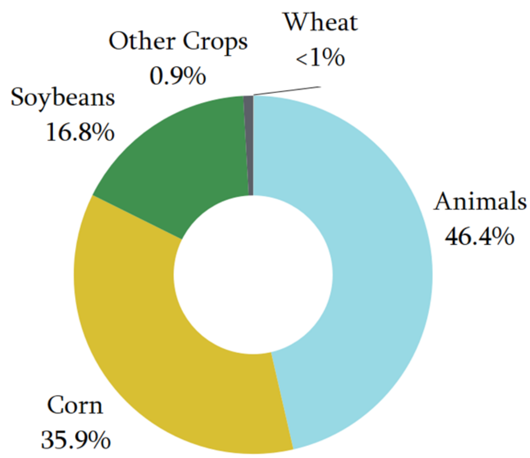


Sorghum

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	3	$0	$0	$1
Support activities for agriculture and forestry	1	<$1	<$1	<$1
Other real estate	0	<$1	<$1	<$1
Wholesale - Other nondurable goods merchant wholesalers	0	<$1	<$1	<$1
Full-service restaurants	0	<$1	<$1	<$1

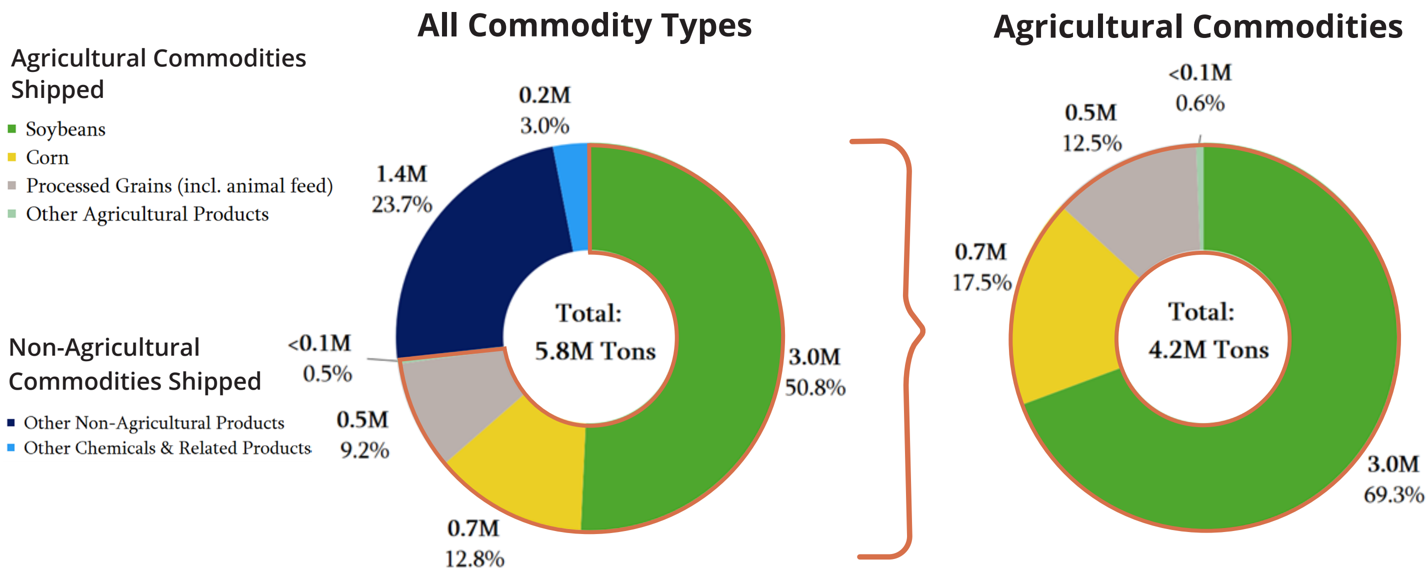
Iowa

Composition of Iowa's Agricultural Industry by Sales

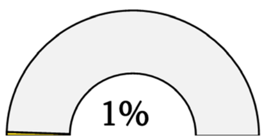


Iowa is connected to several rivers in the inland waterway network, including the Upper Mississippi River and the Lower Mississippi River. Agricultural commodities make up 73% of commodities shipped on Iowa's inland waterways.

Distribution of Commodity Types Shipped on Iowa's Inland Waterways

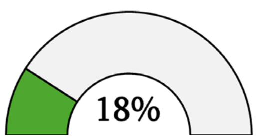


Inland Waterway Shipments as Share of Total In-State Production and Economic Impacts



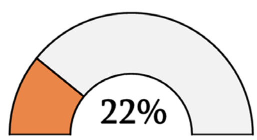
Corn Export Impacts

0.6M tons exported via inland waterways
<1k jobs
$238M in output
$81M in GDP
$40M in labor income



Soybeans Export Impacts

2.5M tons exported via inland waterways
3.8k jobs
$1.9B in output
$974M in GDP
$365M in labor income



Wheat Export Impacts

<0.1M tons exported via inland waterways
<100 jobs
$3M in output
$1M in GDP
$1M in labor income

Iowa: Top Industries Impacted by Key Crops

Corn

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	227	$4	$34	$145
Support activities for agriculture and forestry	84	$2	$4	$5
Other real estate	78	$1	$5	$15
Wholesale - Other nondurable goods merchant wholesalers	27	$2	$5	$11
Full-service restaurants	12	<$1	<$1	$1

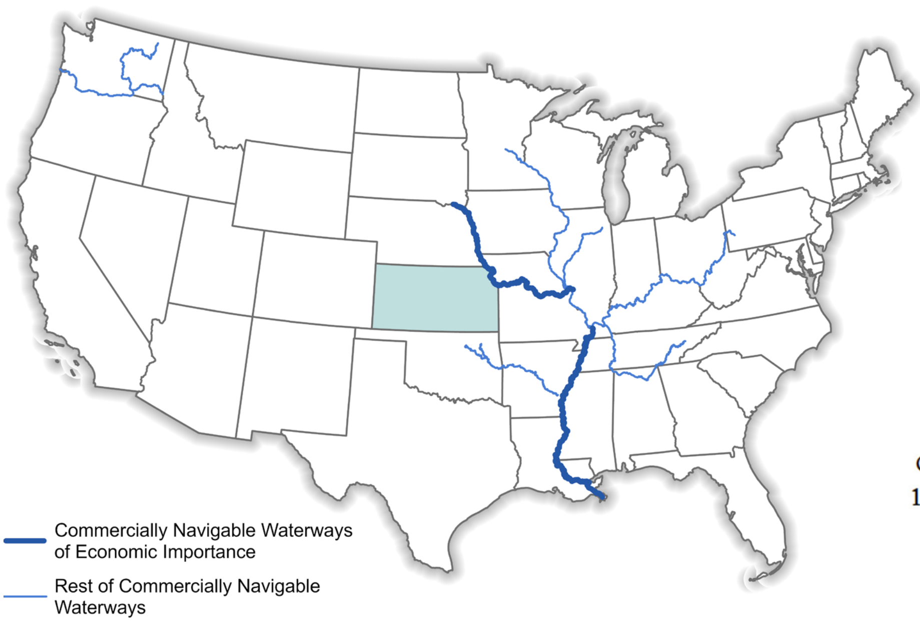
Soybeans

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Oilseed farming	816	$1	$674	$1,316
Other real estate	420	$4	$29	$81
Support activities for agriculture and forestry	418	$11	$21	$23
Wholesale - Other nondurable goods merchant wholesalers	117	$11	$23	$46
Full-service restaurants	89	$2	$3	$7

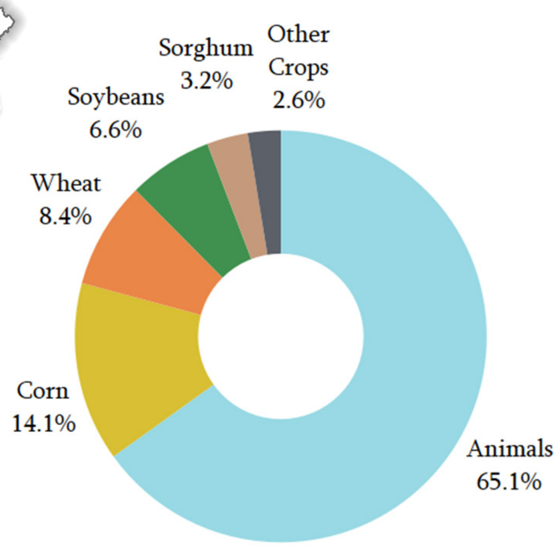
Wheat

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	3	<$1	<$1	$2
Support activities for agriculture and forestry	1	<$1	<$1	<$1
Other real estate	1	<$1	<$1	<$1
Wholesale - Other nondurable goods merchant wholesalers	0	<$1	<$1	<$1
Full-service restaurants	0	<$1	<$1	<$1

Kansas

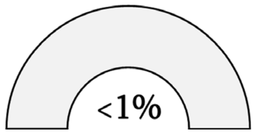


Composition of Kansas' Agricultural Industry by Sales



Kansas is connected to several rivers in the inland waterway network, including the Missouri River and the Lower Mississippi River. Agricultural commodities make up 5% of commodities shipped on Kansas's inland waterways.

Inland Waterway Shipments as Share of Total In-State Production and Economic Impacts

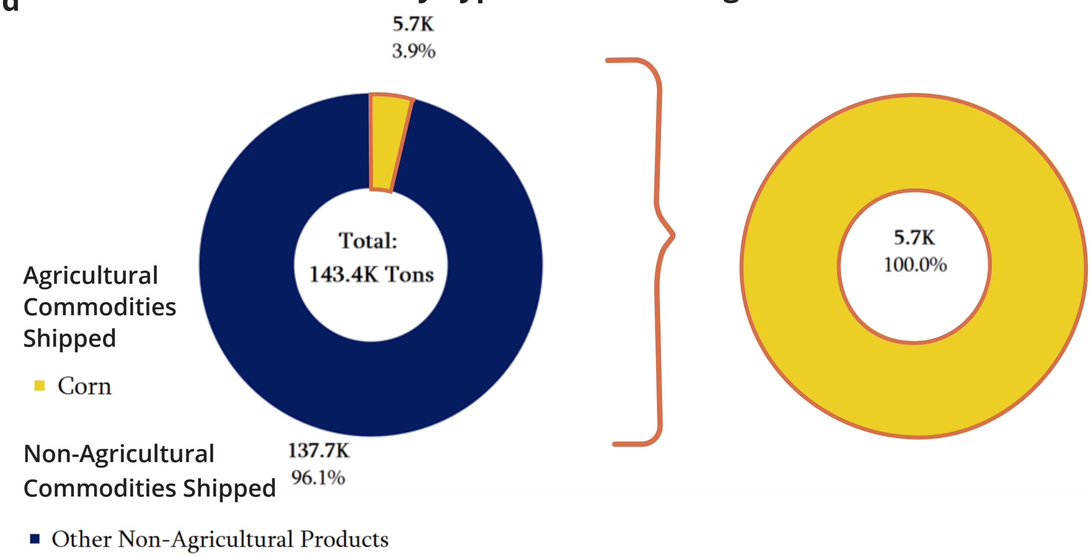


Corn Export Impacts

<0.1M tons exported via inland waterways
<100 jobs
$2M in output
$1M in GDP
$<1M in labor income

Distribution of Commodity Types Shipped on Kansas' Inland Waterways

All Commodity Types | **Agricultural Commodities**

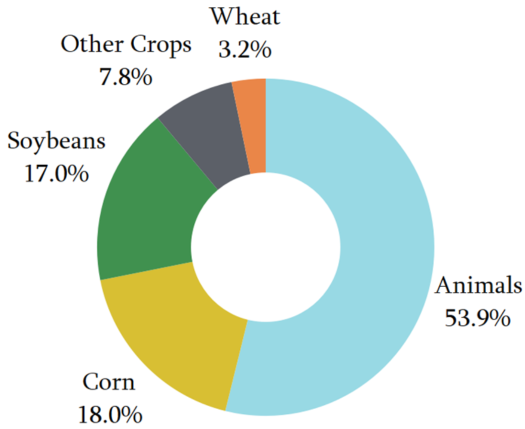


Corn

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	3	<$1	<$1	$1
Support activities for agriculture and forestry	1	<$1	<$1	<$1
Other real estate	1	<$1	<$1	<$1
Wholesale - Other nondurable goods merchant wholesalers	0	<$1	<$1	<$1
Full-service restaurants	0	<$1	<$1	<$1

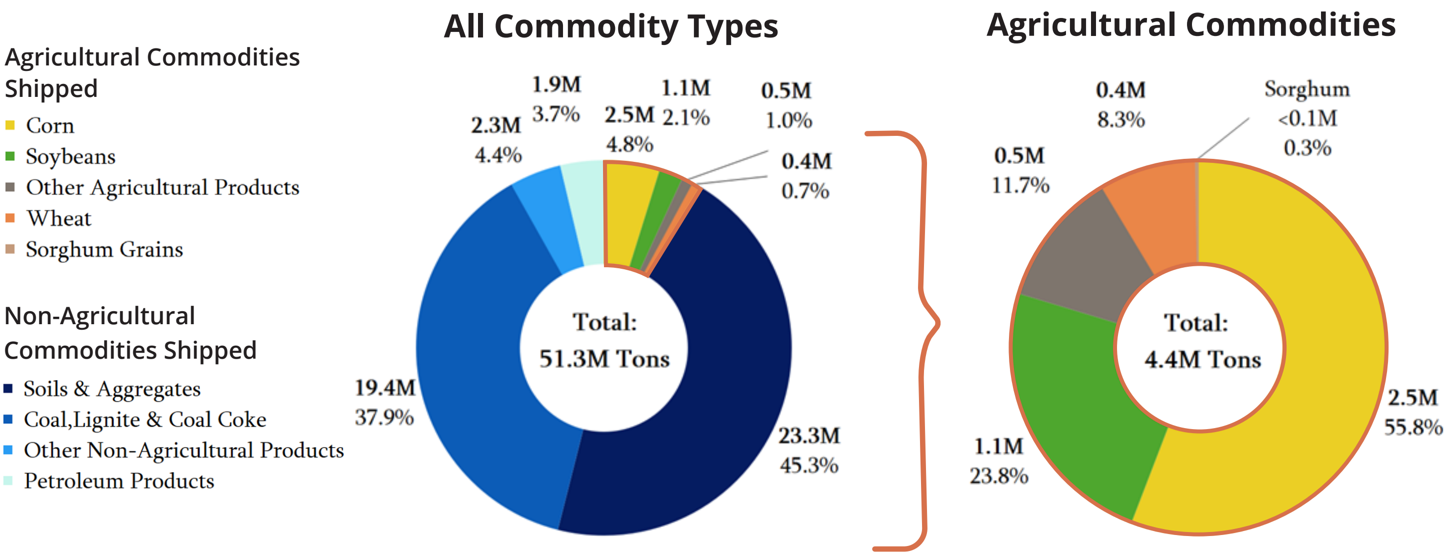
Kentucky

Composition of Kentucky's Agricultural Industry by Sales

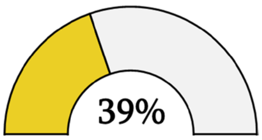


Kentucky is connected to several rivers in the inland waterway network, including the Tennessee River, Ohio River, and the Lower Mississippi River. Agricultural commodities make up 9% of commodities shipped on Kentucky's inland waterways.

Distribution of Commodity Types Shipped on Kentucky's Inland Waterways

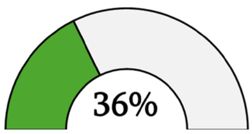


Inland Waterway Shipments as Share of Total In-State Production and Economic Impacts



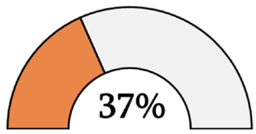
Corn Export Impacts

2M tons exported via inland waterways
5.4k jobs
$803M in output
$336M in GDP
$211M in labor income



Soybeans Export Impacts

0.9M tons exported via inland waterways
2.5k jobs
$628B in output
$476M in GDP
$200M in labor income



Wheat Export Impacts

0.3M tons exported via inland waterways
1.1k jobs
$157M in output
$66M in GDP
$41M in labor income

Kentucky: Top Industries Impacted by Key Crops

Corn

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	3,154	$23	$152	$462
Support activities for agriculture and forestry	720	$27	$31	$35
Other real estate	276	$3	$23	$58
Wholesale - Other nondurable goods merchant wholesalers	65	$5	$13	$25
Full-service restaurants	57	$1	$3	$5

Soybeans

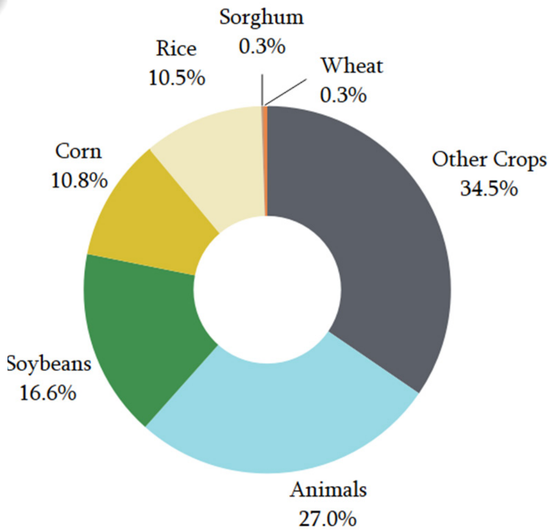
Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Oilseed farming	1,370	$1	$380	$454
Support activities for agriculture and forestry	146	$5	$6	$7
Other real estate	75	$1	$6	$16
All other crop farming	70	<$1	$1	$1
Hospitals	50	$4	$5	$10

Wheat

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	618	$5	$30	$91
Support activities for agriculture and forestry	141	$5	$6	$7
Other real estate	54	$1	$5	$11
Wholesale - Other nondurable goods merchant wholesalers	13	$1	$3	$5
Full-service restaurants	11	<$1	$1	$1

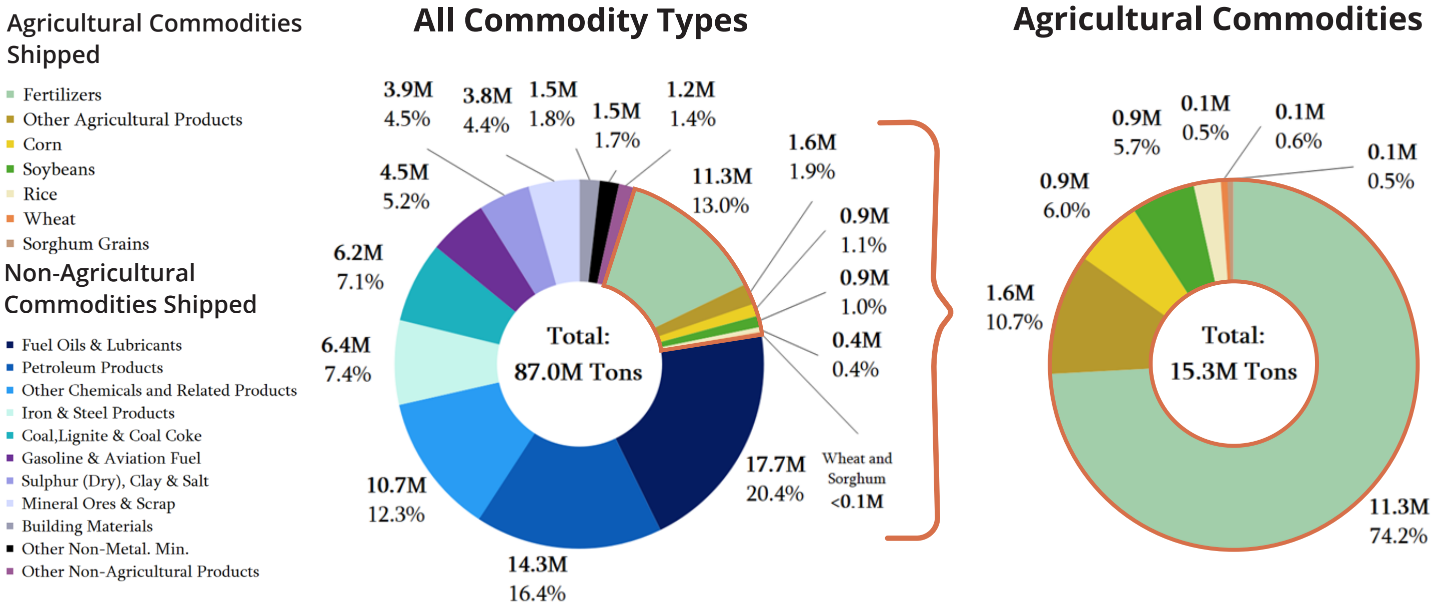
Louisiana

Composition of Louisiana's Agricultural Industry by Sales

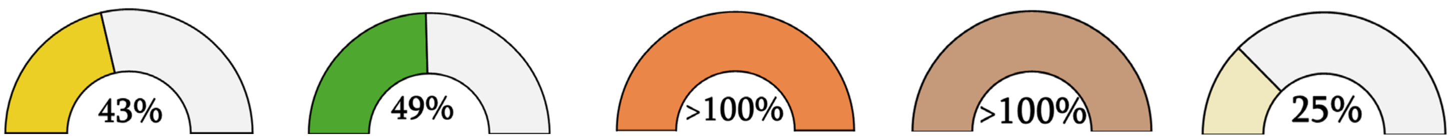


Louisiana is connected to several rivers in the inland waterway network, including the Lower Mississippi River. Agricultural commodities make up 12% of commodities shipped on Louisiana's inland waterways.

Distribution of Commodity Types Shipped on Louisiana's Inland Waterways



Inland Waterway Shipments as Share of Total In-State Production and Economic Impacts



Corn Export Impacts

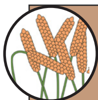
<1M tons exported via inland waterways
1.4k jobs
$334M in output
$103M in GDP
$64M in labor income

Soybeans Export Impacts

<1M tons exported via inland waterways
1.2k jobs
$447M in output
$261M in GDP
$105M in labor income

Wheat Export Impacts

<0.1M tons exported via inland waterways
<1k jobs
$37M in output
$11M in GDP
$7M in labor income



Sorghum Export Impacts

<0.1M tons exported via inland waterways
<100 jobs
$22M in output
$7M in GDP
$4M in labor income

Rice Export Impacts

0.3M tons exported via inland waterways
<1k jobs
$169M in output
$52M in GDP
$32M in labor income

Louisiana: Top Industries Impacted by Key Crops

Corn

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	521	$4	$29	$180
Support activities for agricul-ture and forestry	230	$7	$7	$8
Other real estate	144	$1	$10	$28
Wholesale - Other nondurable goods merchant wholesalers	25	$2	$5	$10
Full-service restaurants	23	$1	$1	$2

Soybeans

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Oilseed farming	357	<$1	$188	$301
Support activities for agriculture and forestry	149	$4	$5	$5
Other real estate	104	$1	$8	$21
All other crop farming	47	<$1	$1	$2
Full-service restaurants	30	$1	$1	$3

Wheat

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	57	<$1	$3	$20
Support activities for agriculture and forestry	25	$1	$1	$1
Other real estate	16	<$1	$1	$3
Wholesale - Other nondurable goods merchant wholesalers	3	<$1	$1	$1
Full-service restaurants	3	<$1	<$1	<$1

Louisiana: Top Industries Impacted by Key Crops

Sorghum

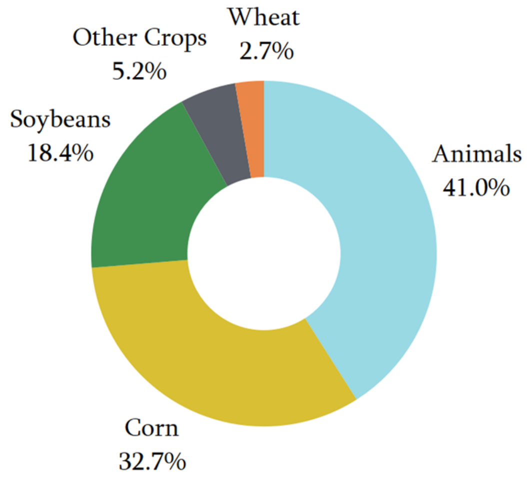
Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	35	<$1	$2	$12
Support activities for agriculture and forestry	15	<$1	<$1	$1
Other real estate	10	<$1	$1	$2
Wholesale - Other nondurable goods merchant wholesalers	2	<$1	<$1	$1
Full-service restaurants	2	<$1	<$1	<$1

Rice

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	264	$2	$15	$91
Support activities for agriculture and forestry	116	$3	$4	$4
Other real estate	73	$1	$5	$14
Wholesale - Other nondurable goods merchant wholesalers	13	$1	$2	$5
Full-service restaurants	12	<$1	<$1	$1

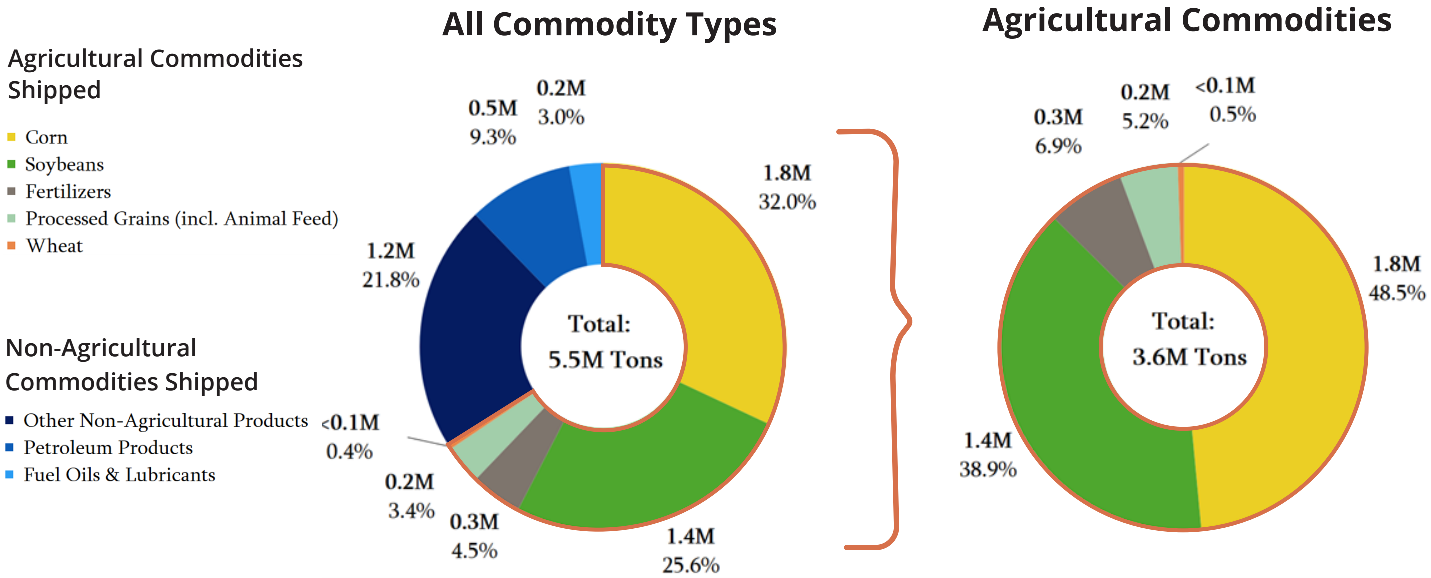
Minnesota

Composition of Minnesota's Agricultural Industry by Sales

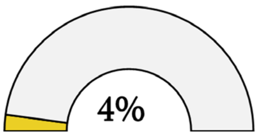


Minnesota is connected to several rivers in the inland waterway network, including the Upper Mississippi River and the Lower Mississippi River. Agricultural commodities make up 66% of commodities shipped on Minnesota's inland waterways.

Distribution of Commodity Types Shipped on Minnesota's Inland Waterways



Inland Waterway Shipments as Share of Total In-State Production and Economic Impacts



Corn Export Impacts

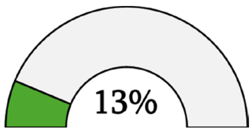
1.3M tons exported via inland waterways

1.8k jobs

$507M in output

$190M in GDP

$101M in labor income



Soybeans Export Impacts

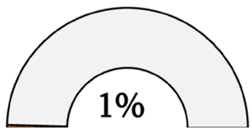
1.1M tons exported via inland waterways

1.8k jobs

$774M in output

$448M in GDP

$200M in labor income



Wheat Export Impacts

<0.1M tons exported via inland waterways

<100 jobs

$8M in output

$3M in GDP

$2M in labor income

Minnesota: Top Industries Impacted by Key Crops

Corn

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	762	$12	$77	$293
Support activities for agriculture and forestry	182	$5	$7	$8
Other real estate	181	$3	$17	$40
Wholesale - Other nondurable goods merchant wholesalers	52	$5	$11	$21
Full-service restaurants	28	$1	$1	$3

Soybeans

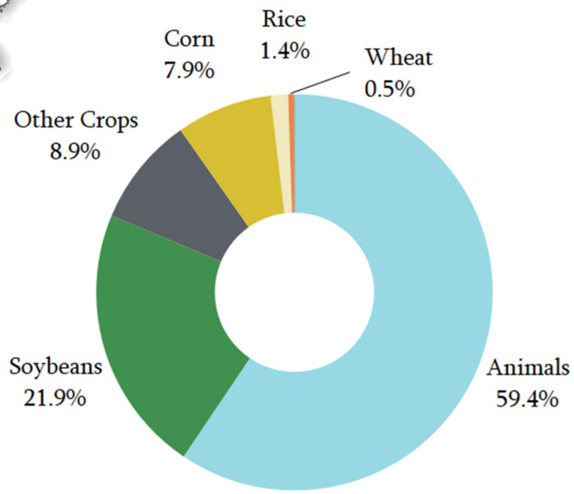
Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Oilseed farming	577	$1	$315	$528
Other real estate	168	$3	$16	$37
Support activities for agriculture and forestry	153	$4	$6	$6
Wholesale - Other nondurable goods merchant wholesalers	38	$4	$8	$16
Full-service restaurants	37	$1	$2	$3

Wheat

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	12	<$1	$1	$5
Support activities for agriculture and forestry	3	<$1	<$1	<$1
Other real estate	3	<$1	<$1	$1
Wholesale - Other nondurable goods merchant wholesalers	1	<$1	<$1	<$1
Full-service restaurants	0	<$1	<$1	<$1

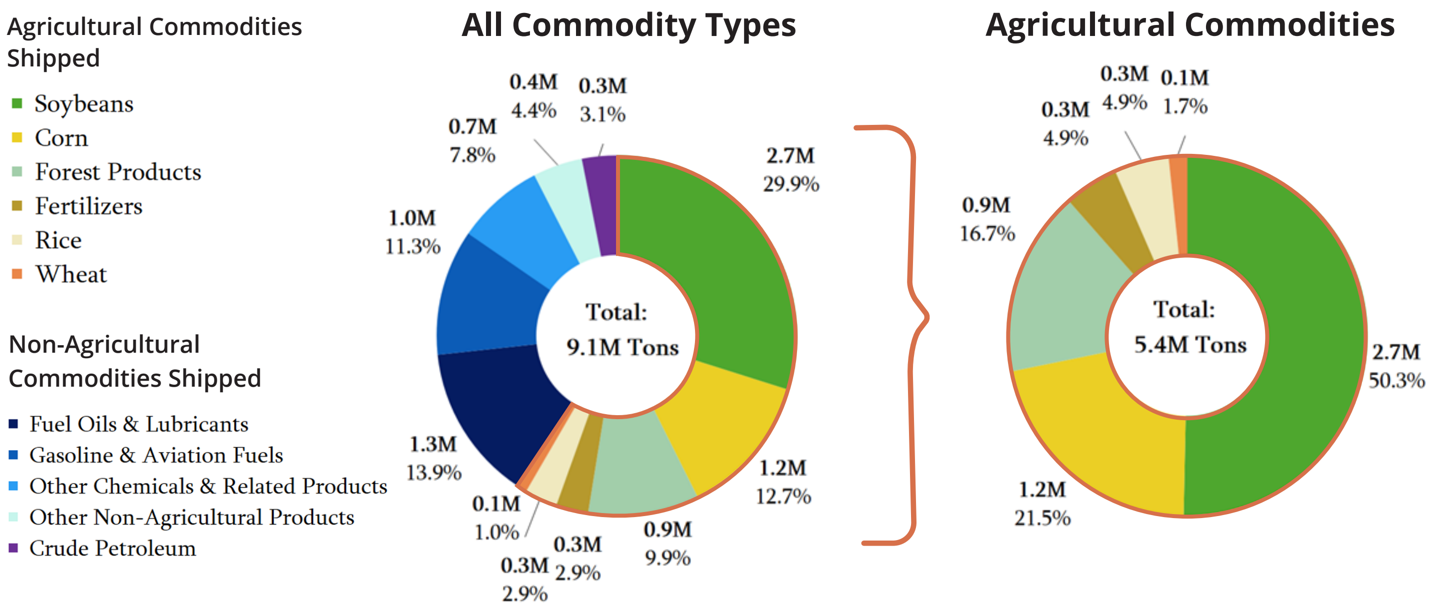
Mississippi

Composition of Mississippi's Agricultural Industry by Sales

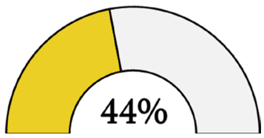


Mississippi is connected to several rivers in the inland waterway network, including the Lower Mississippi River. Agricultural commodities make up 57% of commodities shipped on Mississippi's inland waterways.

Distribution of Commodity Types Shipped on Mississippi's Inland Waterways

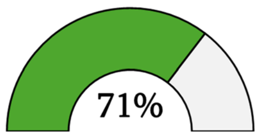


Inland Waterway Shipments as Share of Total In-State Production and Economic Impacts



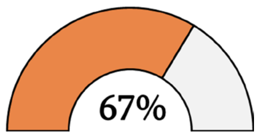
Corn Export Impacts

1M tons exported via inland waterways
2.5k jobs
$456M in output
$137M in GDP
$107M in labor income



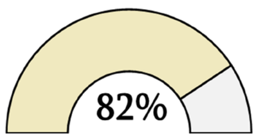
Soybeans Export Impacts

2.4M tons exported via inland waterways
6.7k jobs
$1.8B in output
$970M in GDP
$547M in labor income



Wheat Export Impacts

<0.1M tons exported via inland waterways
<1k jobs
$45M in output
$14M in GDP
$11M in labor income



Rice Export Impacts

<0.1M tons exported via inland waterways
<1k jobs
$59M in output
$18M in GDP
$14M in labor income

Mississippi: Top Industries Impacted by Key Crops

Corn

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	1,176	$7	$38	$248
Support activities for agriculture and forestry	466	$16	$18	$21
Other real estate	173	$1	$14	$35
Full-service restaurants	33	$1	$1	$3
Wholesale - Other nondurable goods merchant wholesalers	31	$2	$5	$11

Soybeans

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Oilseed farming	2,469	$1	$655	$1,127
Support activities for agriculture and forestry	904	$31	$35	$40
Other real estate	383	$3	$30	$78
All other crop farming	294	$1	$3	$6
Limited-service restaurants	139	$2	$5	$13

Wheat

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	117	$1	$4	$25
Support activities for agriculture and forestry	46	$2	$2	$2
Other real estate	17	<$1	$1	$3
Full-service restaurants	3	<$1	<$1	<$1
Wholesale - Other nondurable goods merchant wholesalers	3	<$1	<$1	$1

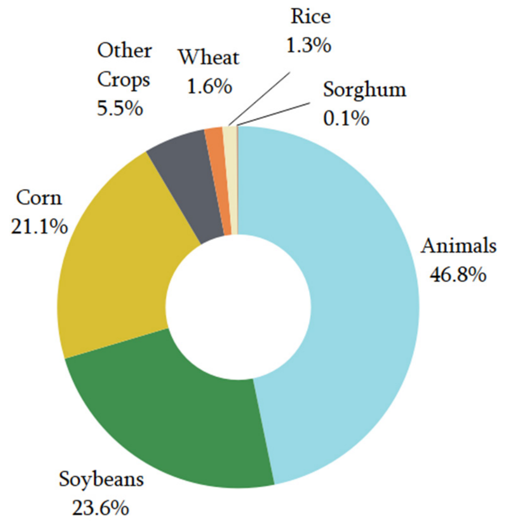
Mississippi: Top Industries Impacted by Key Crops

Rice

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	151	$1	$5	$32
Support activities for agriculture and forestry	60	$2	$2	$3
Other real estate	22	<$1	$2	$5
Full-service restaurants	4	<$1	<$1	<$1
Wholesale - Other nondurable goods merchant wholesalers	4	<$1	$1	$1

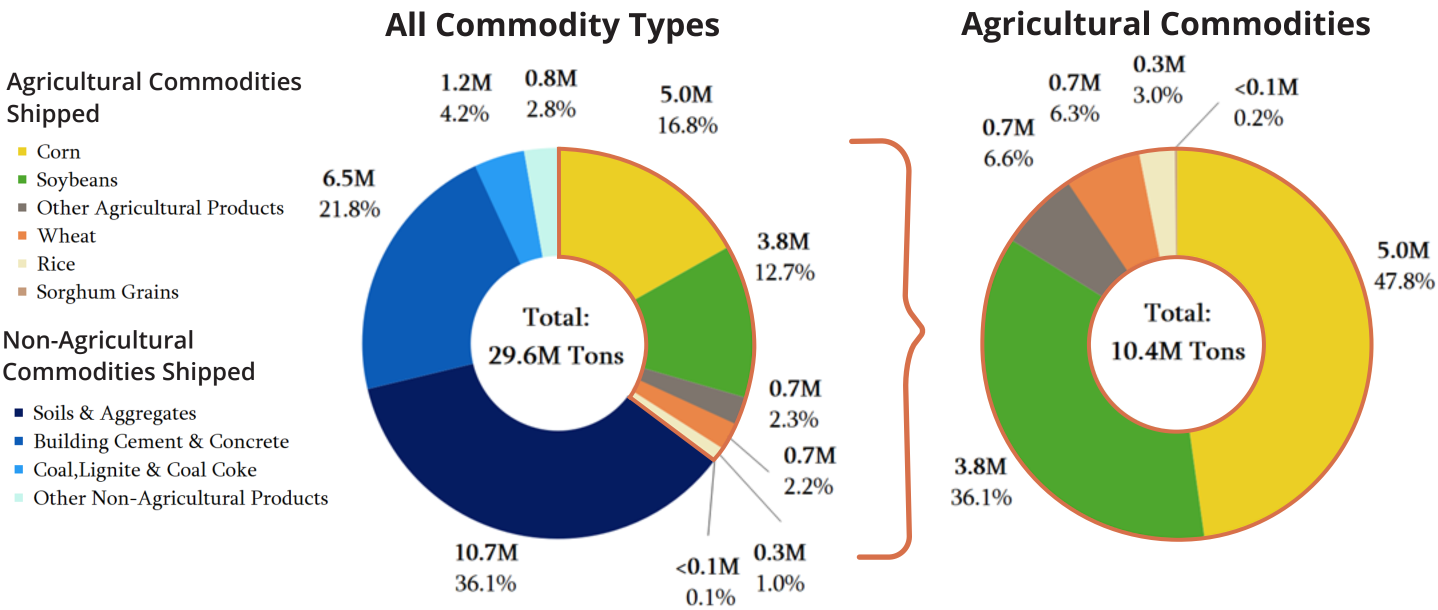
Missouri

Composition of Missouri's Agricultural Industry by Sales

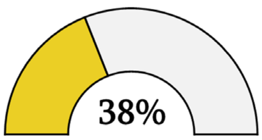


Missouri is connected to several rivers in the inland waterway network, including the Missouri River, the Upper Mississippi River, and the Lower Mississippi River. Agricultural commodities make up 35% of commodities shipped on Missouri's inland waterways.

Distribution of Commodity Types Shipped on Missouri's Inland Waterways

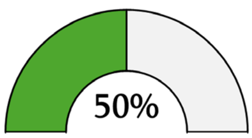


Inland Waterway Shipments as Share of Total In-State Production and Economic Impacts



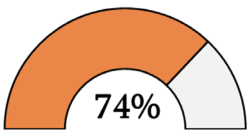
Corn Export Impacts

4.2M tons exported via inland waterways
11.1k jobs
$2.1B in output
$740M in GDP
$409M in labor income



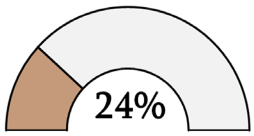
Soybeans Export Impacts

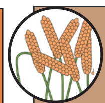
3.2M tons exported via inland waterways
9.7k jobs
$2.6B in output
$1.6B in GDP
$551M in labor income



Wheat Export Impacts

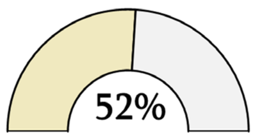
0.5M tons exported via inland waterways
1.7k jobs
$308M in output
$110M in GDP
$61M in labor income





Sorghum Export Impacts

<0.1M tons exported via inland waterways
<100 jobs
$0.4M in output
$0.1M in GDP
$0.1M in labor income



Rice Export Impacts

0.2M tons exported via inland waterways
<1k jobs
$130M in output
$46M in GDP
$26M in labor income

Missouri: Top Industries Impacted by Key Crops

Corn

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	5,710	$43	$257	$1,116
Support activities for agriculture and forestry	1,455	$38	$48	$56
Other real estate	858	$11	$59	$166
Wholesale - Other nondurable goods merchant wholesalers	224	$18	$43	$86
Full-service restaurants	136	$4	$6	$12

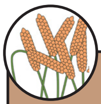
Soybeans

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Oilseed farming	4,779	$3	$1,145	$1,763
Support activities for agriculture and forestry	898	$24	$30	$34
Other real estate	591	$8	$40	$114
All other crop farming	297	$1	$2	$6
Full-service restaurants	148	$4	$6	$13

Wheat

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	846	$6	$38	$165
Support activities for agriculture and forestry	216	$6	$7	$8
Other real estate	127	$2	$9	$25
Wholesale - Other nondurable goods merchant wholesalers	33	$3	$6	$13
Full-service restaurants	20	$1	$1	$2

Missouri: Top Industries Impacted by Key Crops



Sorghum

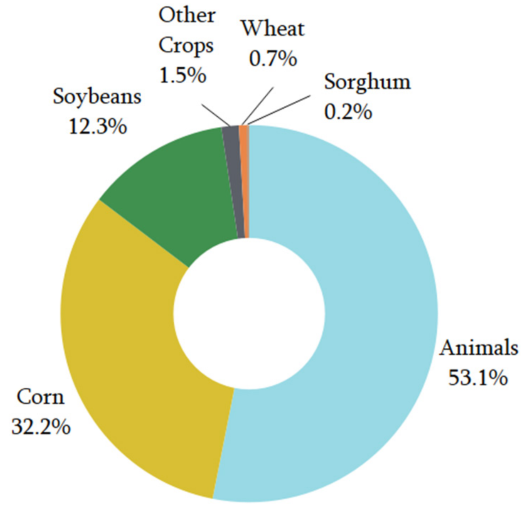
Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	1	<$1	<$1	<$1
Support activities for agriculture and forestry	0	<$1	<$1	<$1
Other real estate	0	<$1	<$1	<$1
Wholesale - Other nondurable goods merchant wholesalers	0	<$1	<$1	<$1
Full-service restaurants	0	<$1	<$1	<$1

Rice

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	357	$3	$16	$70
Support activities for agriculture and forestry	91	$2	$3	$3
Other real estate	54	$1	$4	$10
Wholesale - Other nondurable goods merchant wholesalers	14	$1	$3	$5
Full-service restaurants	8	<$1	<$1	$1

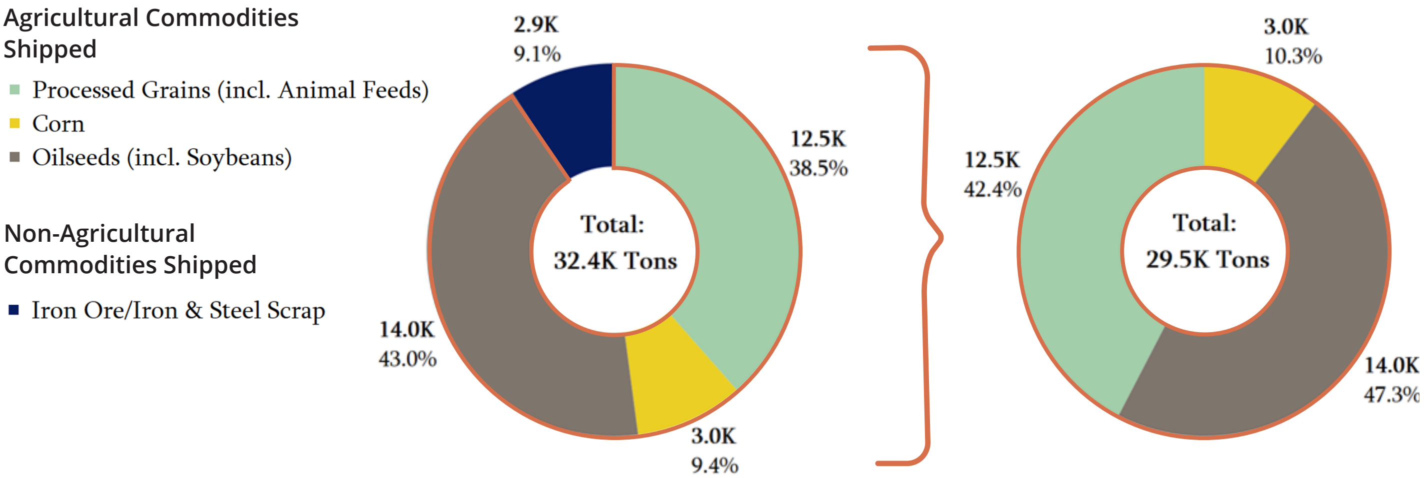
Nebraska

Composition of Nebraska's Agricultural Industry by Sales

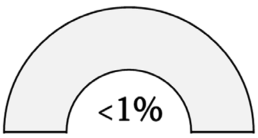


Nebraska is connected to several rivers in the inland waterway network, including the Missouri River and the Lower Mississippi River. Agricultural commodities make up 100% of commodities shipped on Nebraska's inland waterways.

Distribution of Commodity Types Shipped on Nebraska's Inland Waterways



Inland Waterway Shipments as Share of Total In-State Production and Economic Impacts



Corn Export Impacts

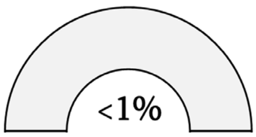
<0.1M tons exported via inland waterways

<100 jobs

$1.6M in output

$0.6M in GDP

$0.3M in labor income



Soybeans Export Impacts

<0.1M tons exported via inland waterways

<100 jobs

$10M in output

$5M in GDP

$2M in labor income

* Due to limited agricultural traffic on the Missouri River, Nebraska's results were based on average shipping volumes from 2020 to 2022

Nebraska: Top Industries Impacted by Key Crops

Corn

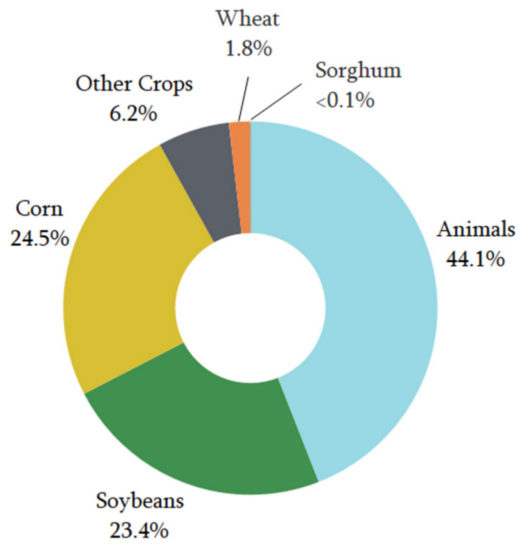
Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	2	<$1	<$1	$1
Support activities for agriculture and forestry	1	<$1	<$1	<$1
Other real estate	1	<$1	<$1	<$1
Wholesale - Other nondurable goods merchant wholesalers	0	<$1	<$1	<$1
Full-service restaurants	0	<$1	<$1	<$1

Soybeans

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Oilseed farming	3	<$1	$3	$7
Other real estate	3	<$1	<$1	<$1
Support activities for agriculture and forestry	3	<$1	<$1	<$1
Wholesale - Other nondurable goods merchant wholesalers	1	<$1	<$1	<$1
All other crop farming	1	<$1	<$1	<$1

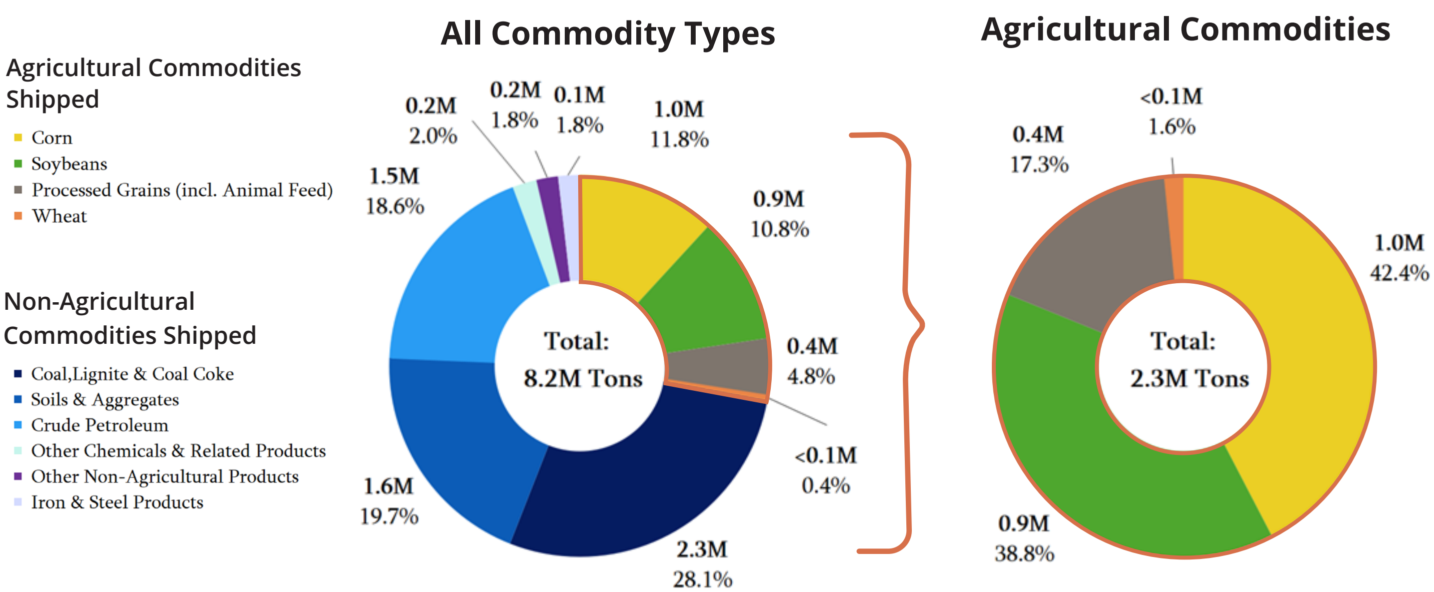
Ohio

Composition of Ohio's Agricultural Industry by Sales

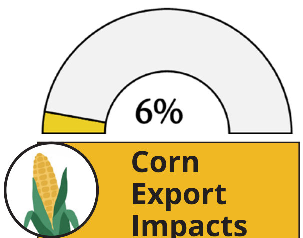


Ohio is connected to several rivers in the inland waterway network, including the Ohio River and the Lower Mississippi River. Agricultural commodities make up 28% of commodities shipped on Ohio's inland waterways.

Distribution of Commodity Types Shipped on Ohio's Inland Waterways



Inland Waterway Shipments as Share of Total In-State Production and Economic Impacts



Corn Export Impacts

0.8M tons exported via inland waterways
1.8k jobs
$354M in output
$139M in GDP
$78M in labor income

Soybeans Export Impacts

0.7M tons exported via inland waterways
2k jobs
$580M in output
$342M in GDP
$146M in labor income

Wheat Export Impacts

<0.1M tons exported via inland waterways
<100 jobs
$16M in output
$6M in GDP
$4M in labor income

Ohio: Top Industries Impacted by Key Crops

Corn

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	926	$10	$53	$193
Support activities for agriculture and forestry	219	$5	$8	$9
Other real estate	126	$2	$10	$26
Wholesale - Other nondurable goods merchant wholesalers	32	$3	$7	$13
Full-service restaurants	24	$1	$1	$2

Soybeans

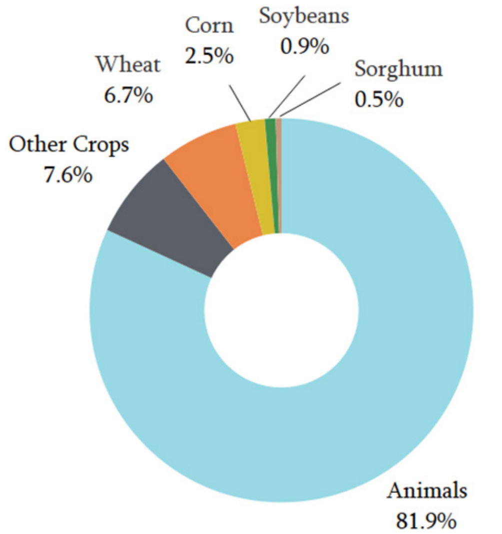
Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Oilseed farming	883	$1	$230	$376
Support activities for agriculture and forestry	194	$5	$7	$8
Other real estate	126	$2	$10	$26
All other crop farming	40	<$1	<$1	$1
Hospitals	39	$3	$4	$8

Wheat

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	3	<$1	<$1	$2
Support activities for agriculture and forestry	1	<$1	<$1	<$1
Other real estate	1	<$1	<$1	<$1
Wholesale - Other nondurable goods merchant wholesalers	0	<$1	<$1	<$1
Full-service restaurants	0	<$1	<$1	<$1

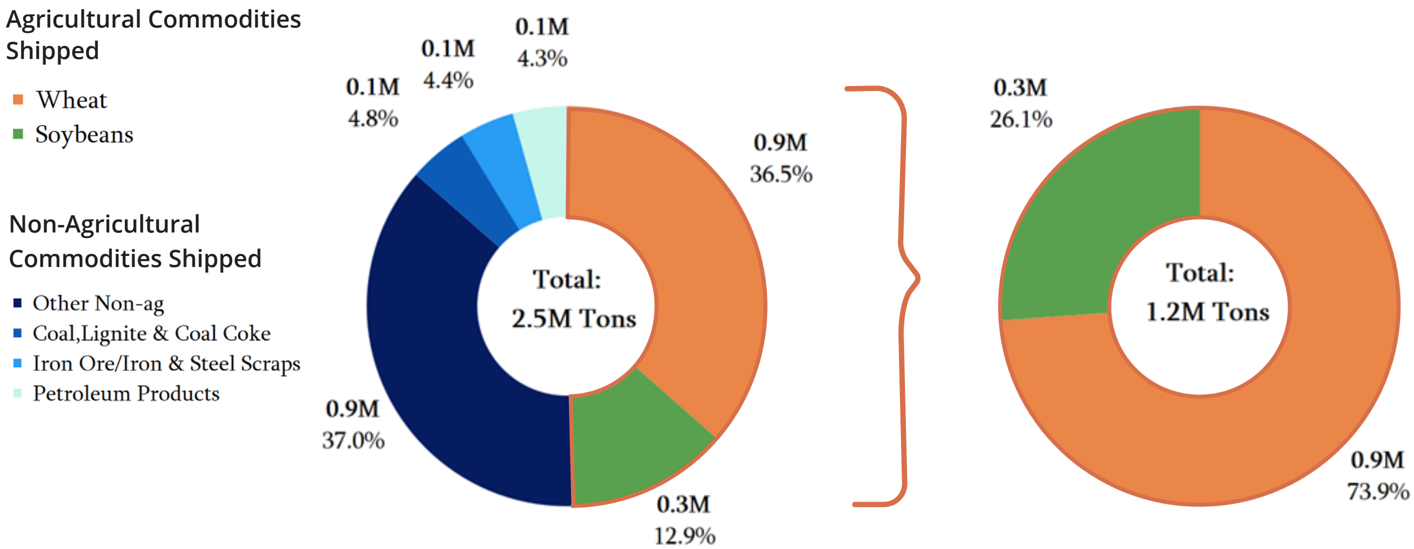
Oklahoma

Composition of Oklahoma's Agricultural Industry by Sales



Oklahoma is connected to several rivers in the inland waterway network, including the MKARNS and the Lower Mississippi River. Agricultural commodities make up 72% of commodities shipped on Oklahoma's inland waterways.

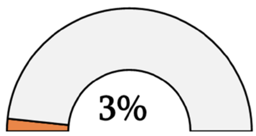
Distribution of Commodity Types Shipped on Oklahoma's Inland Waterways



Inland Waterway Shipments as Share of Total In-State Production and Economic Impacts

Soybeans Export Impacts

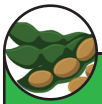
0.3M tons exported via inland waterways
1.2k jobs
$298M in output
$118M in GDP
$63M in labor income



Wheat Export Impacts

0.7M tons exported via inland waterways
2.4K jobs
$439M in output
$86M in GDP
$92M in labor income

Oklahoma: Top Industries Impacted by Key Crops



Soybeans

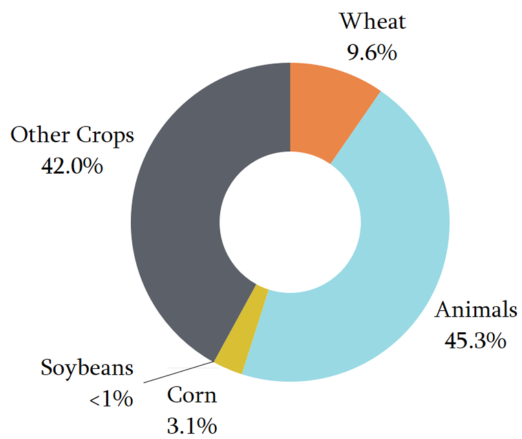
Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Oilseed farming	338	<$1	$56	$170
Support activities for agriculture and forestry	272	$7	$9	$10
Other real estate	102	$1	$7	$20
All other crop farming	72	<$1	<$1	$2
Full-service restaurants	21	<$1	$1	$2

Wheat

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	810	$9	<$1	$192
Support activities for agriculture and forestry	623	$15	$20	$23
Other real estate	219	$2	$15	$42
Wholesale - Other nondurable goods merchant wholesalers	52	$4	$8	$18
Full-service restaurants	35	$1	$2	$3

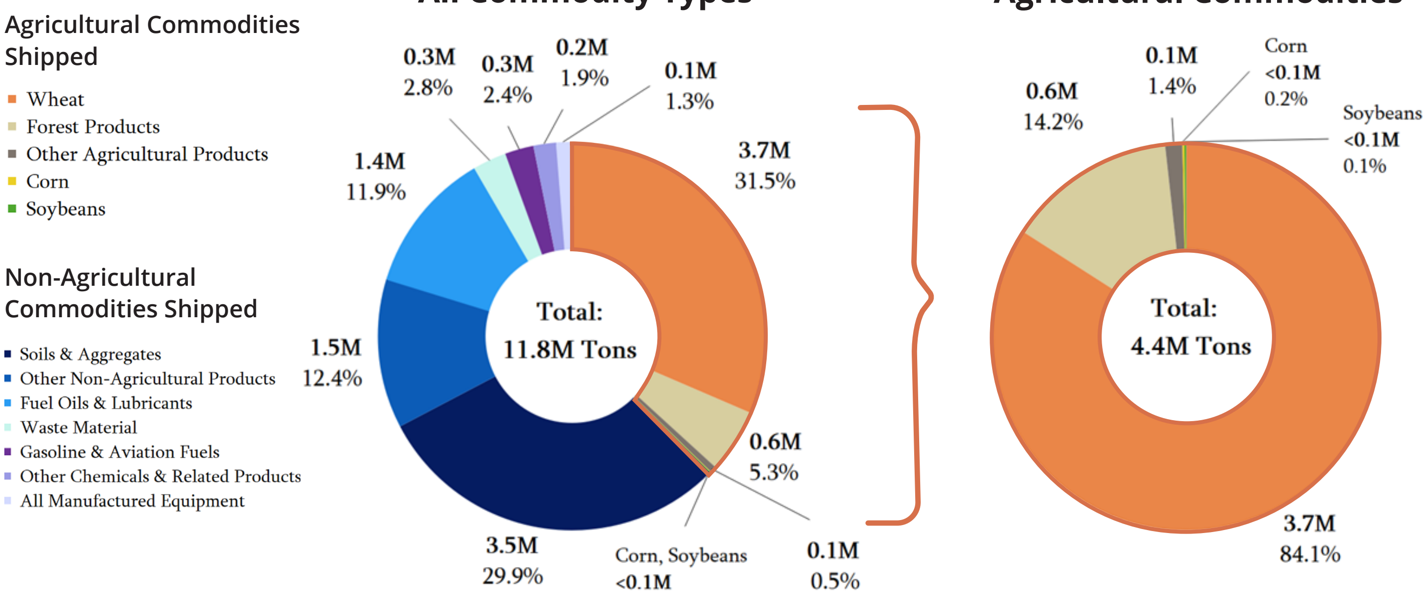
Pacific Northwest (PNW)

Composition of PNW's Agricultural Industry by Sales



The Pacific Northwest is connected to several rivers in the inland waterway network, including the Columbia River and the Snake River. Agricultural commodities make up 62% of commodities shipped on the inland waterways in the Pacific Northwest.

Distribution of Commodity Types Shipped on PNW's Inland Waterways



Inland Waterway Shipments as Share of Total In-State Production and Economic Impacts

Idaho

Wheat Export Impacts
<1k jobs
$239M in output
$115M in GDP
$50M in labor income

Oregon

Soybeans Export Impacts
<1k jobs
$245M in output
$207M in GDP
$24M in labor income

Wheat Export Impacts
1.9K jobs
$390M in output
$181M in GDP
$90M in labor income

Washington

Corn Export Impacts
<1K jobs
$4M in output
$2M in GDP
$1M in labor income

Wheat Export Impacts
4.3k jobs
$1B in output
$528M in GDP
$252M in labor income

Idaho: Top Industries Impacted by Key Crops

Wheat

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	263	$10	$65	$142
Support activities for agriculture and forestry	208	$8	$10	$11
Other real estate	93	$1	$7	$18
Wholesale - Other nondurable goods merchant wholesalers	22	$2	$4	$8
Full-service restaurants	14	<$1	$1	$1

Oregon: Top Industries Impacted by Key Crops

Soybeans

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Oilseed farming	234	$1	$187	$211
Support activities for agriculture and forestry	62	$3	$3	$3
Other real estate	23	<$1	$2	$5
All other crop farming	10	<$1	<$1	<$1
Full-service restaurants	5	<$1	<$1	$1

Wheat

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	778	$22	$82	$215
Support activities for agriculture and forestry	405	$18	$20	$22
Other real estate	137	$2	$15	$32
Wholesale - Other nondurable goods merchant wholesalers	37	$3	$7	$14
Full-service restaurants	22	$1	$1	$2

Washington: Top Industries Impacted by Key Crops

Corn

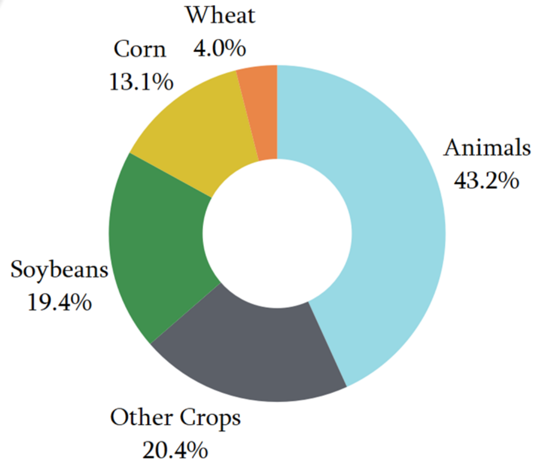
Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	7	<$1	$1	$2
Support activities for agriculture and forestry	4	<$1	<$1	<$1
Other real estate	1	<$1	<$1	<$1
Wholesale - Other nondurable goods merchant wholesalers	0	<$1	<$1	<$1
Full-service restaurants	0	<$1	<$1	<$1

Wheat

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	1,823	$67	$259	$584
Support activities for agriculture and forestry	981	$43	$47	$52
Other real estate	286	$6	$37	$73
Wholesale - Other nondurable goods merchant wholesalers	76	$7	$19	$34
Full-service restaurants	47	$2	$3	$5

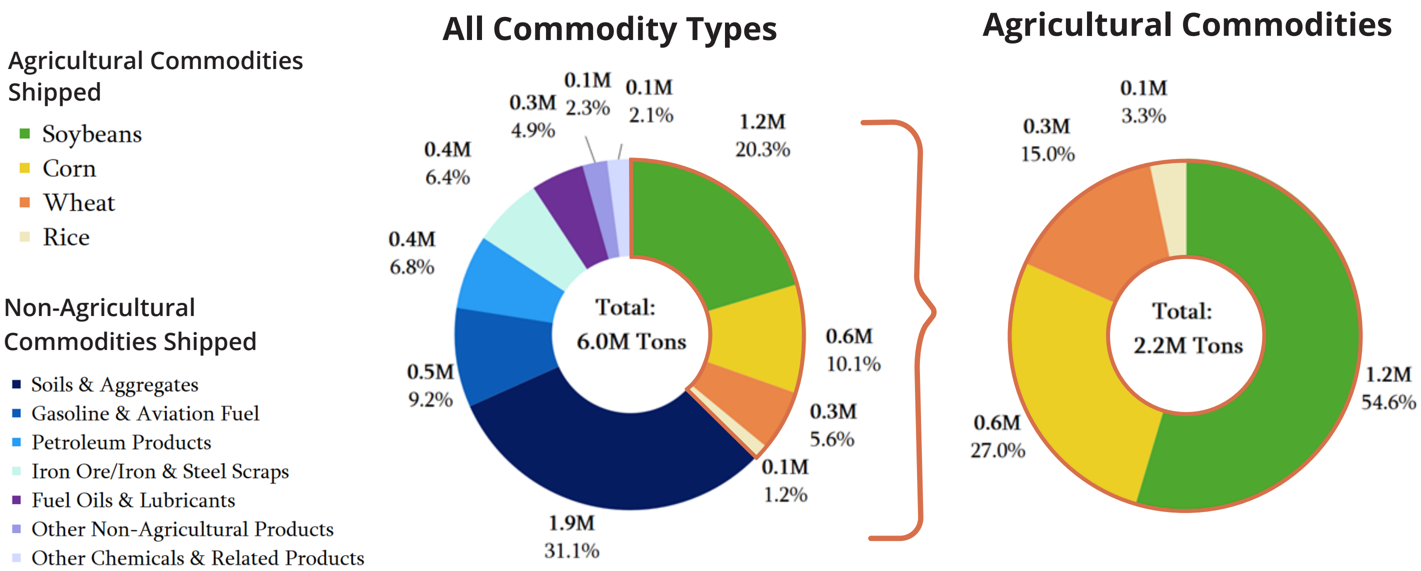
Tennessee

Composition of Tennessee's Agricultural Industry by Sales

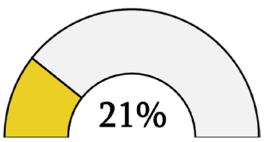


Tennessee is connected to several rivers in the inland waterway network, including the Tennessee River and the Lower Mississippi River. Agricultural commodities make up 37% of commodities shipped on Tennessee's inland waterways.

Distribution of Commodity Types Shipped on Tennessee's Inland Waterways



Inland Waterway Shipments as Share of Total In-State Production and Economic Impacts



Corn Export Impacts

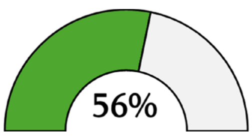
0.4M tons exported via inland waterways

1.7k jobs

$208M in output

$71M in GDP

$42M in labor income



Soybeans Export Impacts

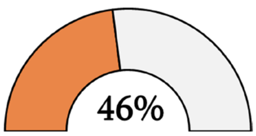
1.1M tons exported via inland waterways

4.6k jobs

$840M in output

$484M in GDP

$157M in labor income



Wheat Export Impacts

0.3M tons exported via inland waterways

1.4K jobs

$181M in output

$62M in GDP

$36M in labor income

Tennessee: Top Industries Impacted by Key Crops

Corn

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	1,057	$4	$17	$109
Support activities for agriculture and forestry	210	$5	$6	$8
Other real estate	86	$1	$8	$19
Wholesale - Other nondurable goods merchant wholesalers	20	$2	$4	$8
Full-service restaurants	13	<$1	$1	$1

Soybeans

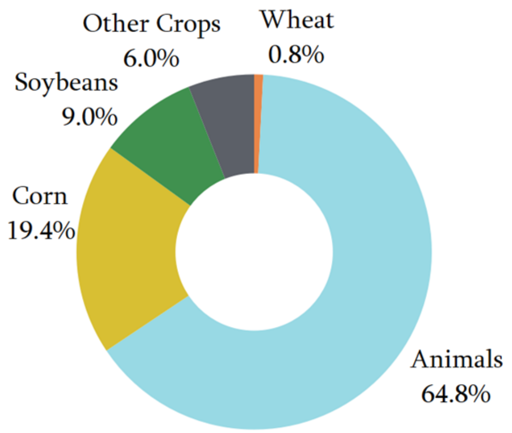
Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Oilseed farming	2,881	$1	$334	$565
Support activities for agriculture and forestry	451	$11	$14	$16
Other real estate	202	$3	$19	$44
All other crop farming	152	<$1	$1	$2
Full-service restaurants	43	$1	$2	$4

Wheat

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	919	$3	$15	$95
Support activities for agriculture and forestry	182	$5	$6	$7
Other real estate	75	$1	$7	$16
Wholesale - Other nondurable goods merchant wholesalers	17	$1	$4	$7
Full-service restaurants	12	<$1	$1	$1

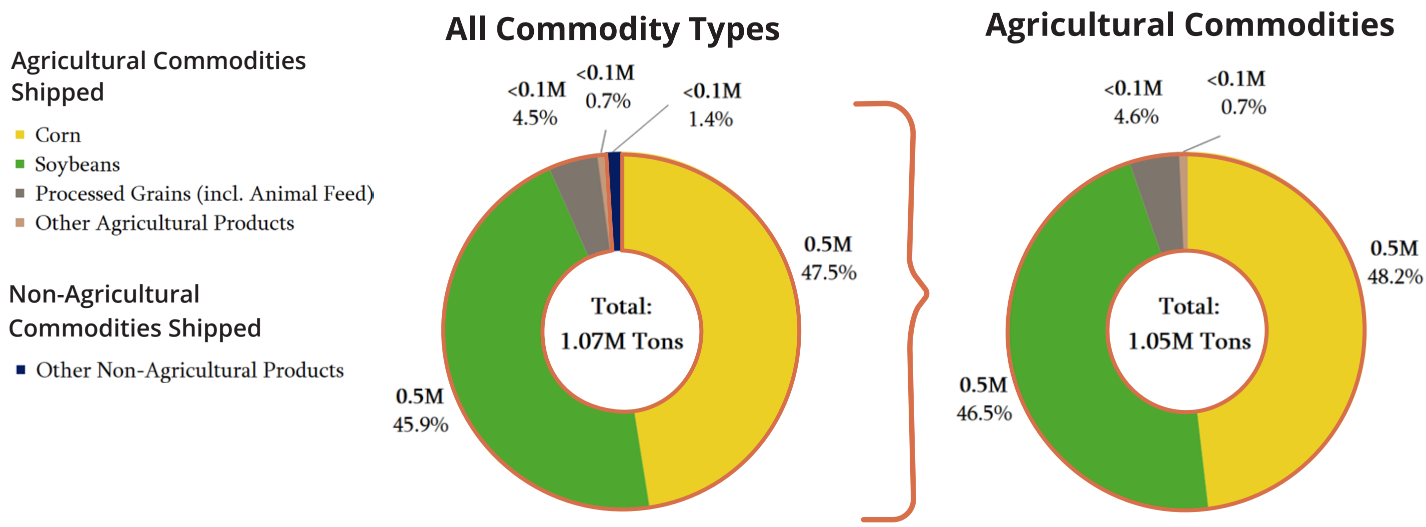
Wisconsin

Composition of Wisconsin's Agricultural Industry by Sales

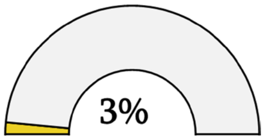


Wisconsin is connected to several rivers in the inland waterway network, including the Upper Mississippi River and the Lower Mississippi River. Agricultural commodities make up 99% of commodities shipped on Wisconsin's inland waterways.

Distribution of Commodity Types Shipped on Wisconsin's Inland Waterways



Inland Waterway Shipments as Share of Total In-State Production and Economic Impacts



Corn Export Impacts

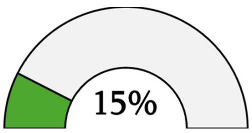
0.4M tons exported via inland waterways

<1k jobs

$180M in output

$84M in GDP

$42M in labor income



Soybeans Export Impacts

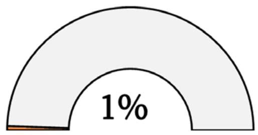
0.4M tons exported via inland waterways

<1k jobs

$283M in output

$235M in GDP

$60M in labor income



Wheat Export Impacts

<0.1M tons exported via inland waterways

<100 jobs

$1M in output

$1M in GDP

$<1M in labor income

Wisconsin: Top Industries Impacted by Key Crops

Corn

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	451	$9	$44	$105
Support activities for agriculture and forestry	123	$4	$6	$6
Other real estate	52	$1	$5	$11
Wholesale - Other nondurable goods merchant wholesalers	16	$1	$3	$6
Full-service restaurants	11	<$1	<$1	$1

Soybeans

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Oilseed farming	412	$1	$204	$227
Support activities for agriculture and forestry	40	$1	$2	$2
Other real estate	22	<$1	$2	$5
Hospitals	14	$1	$1	$3
Full-service restaurants	12	<$1	$1	$1

Wheat

Impacted Industry	Employment (Number of jobs)	Labor Income ($ Million)	GDP ($ Million)	Output ($ Million)
Grain farming	3	<$1	<$1	$1
Support activities for agriculture and forestry	1	<$1	<$1	<$1
Other real estate	0	<$1	<$1	<$1
Wholesale - Other nondurable goods merchant wholesalers	0	<$1	<$1	<$1
Full-service restaurants	0	<$1	<$1	<$1

ECONOMIC IMPORTANCE OF INLAND WATERWAYS TO U.S. AGRICULTURE

2026

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U.S. Department of Transportation Volpe Center

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