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Economic Impacts Analysis of Inland Waterways Disruption on the Transport of Corn and Soybeans (Summary)

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This is a summary of Staff Report #AE16-08, "Economic Impacts Analysis of Inland Waterways Disruption on the Transport of Corn and Soybeans" by T.E. Yu, B.C. English, and R.J. Menard, Department of Agricultural and Resource Economics, University of Tennessee. This paper was developed with funding from USDA's Agricultural Marketing Service (AMS) through cooperative agreement number 15-TMXXX-TN-0004. The opinions and conclusions expressed are the authors and do not necessarily represent the views of the USDA or AMS. The full report is available at https://ag.tennessee.edu/arec/Documents/publications/EconomicImpactsInlandWaterwaysDisruptions092016.pdf.

What is the Issue?

The Upper Mississippi River-Illinois River (UMR-IR) is a primary corridor for U.S. grain and oilseeds to Gulf of Mexico export ports. The U.S. Army Corps of Engineers (USACE or Corps) maintains a 9-foot-deep navigation channel for barge transportation on a total of 36 locks and dams, including 28 on the UMR and 8 on the IR. Built in the 1930s, most of these locks have surpassed their designed lifespan. However, maintenance and rehabilitative efforts by the Corps have extended the life cycle of many of the projects. Nevertheless, the U.S. grain and oilseed industry has frequently raised concerns about the navigational efficiency of these aging and constrained waterways. Congress authorized the Navigation and Ecosystem Sustainability Program (NESP) in 2007 to address the capacity constraints on the most congested segments of the UMR-IR. However, the implementation of NESP has been delayed due to a lack of pre-construction and construction appropriations from Congress.

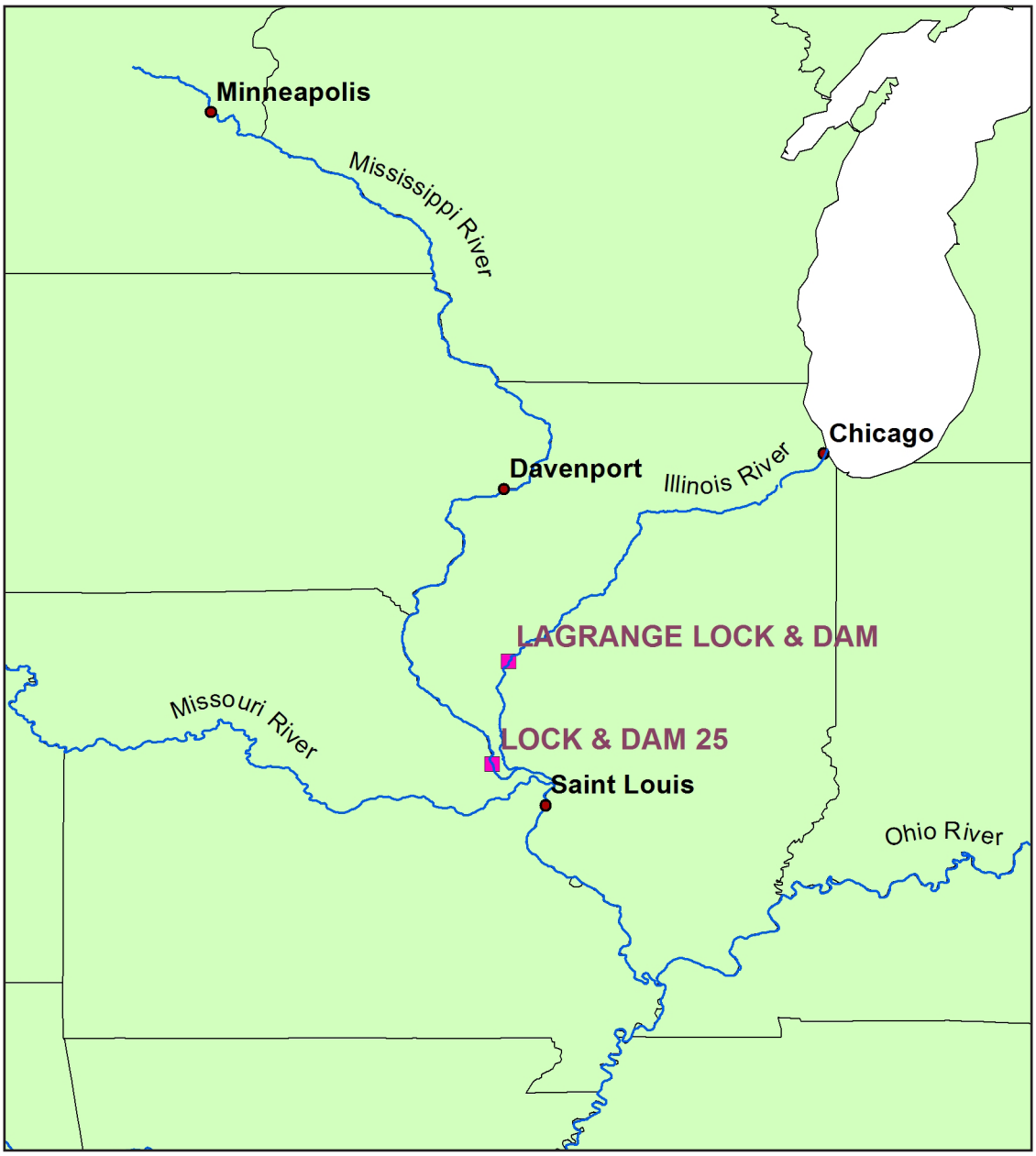
This study examines the potential economic impacts of UWR-IR navigability on U.S. corn and soybean stakeholders and certain sectors of the transportation industry if long-duration disruptions were to occur because of significant lock closures for major unanticipated repairs. Specifically, the study estimates the net changes in economic surplus of the corn and soybean sectors, along with shifts in transport mode for grain flows before and after assumed disruptions of the lock system in the next decade. Increased transportation costs caused by the disruptions resulted in changes in the economic surplus of the corn and soybean sectors due to a loss in profits by producers and increased purchase costs for consumers.

How Was the Study Conducted?

The hypothetical disruptions used for the study are lock closures at Mississippi River Lock 25 and Illinois River La Grange Lock, since these two locks are the only two included in both modernization and small-scale navigation improvement under NESP (see figure 1). These locks were also selected because they have a smaller capacity chamber of only 600 feet; and because they are older than the remaining two southernmost locks on the Mississippi River in the St. Louis area.

For the analysis, two lock closure time horizons are considered for each of the locks. The study independently analyzes the Lock 25 and La Grange closures. The closure times assumed in the study were: (1) the fall quarter (September through November in 2024/25), and (2) the entire marketing year in 2024/25 (September through August). In addition, three potential changes in rail rates are incorporated in the lock disruptions scenarios: (1) no change, (2) an increase of 5 percent, and (3) an increase of 15 percent. The report looked at how traffic is diverted by a lock closure and the revenue shifts between the modes as a result of reduced navigation. Overall economic impacts are measured by combining the transportation sector impacts with the impacts on the corn and soybean sectors.

Figure 1. Location of Two Locks in Study



An econometric model of the international corn and soybean sectors was applied to USDA's Agricultural Baseline Projections[1] for corn and soybean supply and demand in 2024/25 and was initially used to determine corn and soybean flows. The study used the econometric model to determine producer and consumer surplus of the U.S. corn and soybean sectors before lock disruptions on the UMR-IR by inputting the baseline values into a spatial model for the disruptions at selected locks and dams on the UMR-IR. The model also estimates the flows and usage of transportation across mode, after the lock disruptions. Aggregate economic impacts of the before and after disruptions were then obtained from an input-output model, IMPLAN (IMpact analysis for PLANning Version 3.0). The estimated prices, producer and consumer surplus, and economic metrics (employment, labor income, total value added, and total industry output) were contrasted to isolate the impacts of lock disruptions on the UMR-IR.

What Did the Study Find?

The key findings of the economic impacts from lock disruptions are summarized as follows:

- The closure of Lock 25 during harvest season from September to November—with rail rates remaining unchanged—resulted in corn and soybean prices in Illinois, Iowa, and Minnesota (adjacent to the UMR) decreasing up to $4.89/ metric ton (mt) ($0.13/bushel (bu)) and $8.25/mt ($0.22/bu), respectively.
- When the horizon of the lock closure extends to 1 year, corn prices in the regions next to the river decrease $6.61/mt ($0.17/bu) and the soybean prices decline up to $10.81/mt ($0.29/bu) if rail rates remain steady.
- The producer prices of corn and soybeans drop further when rail rates increase and Lock 25 is inaccessible for a year, with prices reducing up to $8.15/mt ($0.21/bu) for corn and $16.33/mt ($0.44/bu) for soybeans.
- The reduction in producer prices varies across region subject to the availability of alternative routes and modes to markets.
- The analysis shows a similar pattern when La Grange Lock is closed. A reduction of 5 million tons, or a 9-percent decrease, of corn and soybean exports at Gulf ports occurs with a closure of Lock 25 for the fall quarter.
- Extending the closing horizon through the entire marketing year results in a reduction of exports of nearly 8 million tons, or 13 percent.
- Disruptions at La Grange Lock lower corn and soybean exports at Gulf ports by 5 percent.
- Pacific Northwest ports are the major alternative routes to the international markets when Lock 25 or La Grange is closed if rail rates do not increase. Exports from Atlantic Coast emerge as an important substitute port area if rail rates elevate after lock closure.
- When one or the other of the two locks is not accessible, it results in a considerable reduction in the number of ton-miles of corn and soybeans hauled by barge. Rail ton-miles for corn and soybeans, unsurprisingly, escalate. However, increases in rail rates divert some volume to truck and barge transportation.
- Aggregate economic activity related to grain barge transportation is reduced by $933 million (40-percent decrease) if Lock 25 is closed from September to November. The reduction reaches nearly $2 billion if the lock is unavailable for the entire marketing year.
- If rail rates increase due to the lock closure, economic activity associated with rail transportation increases from corn and soybean shipments diverted from barge to rail. The positive economic impacts for the rail sector surpass the loss of economic activity of barge and truck transportation when rail rates increase.

1 The agricultural baseline database provides long run, 10-year projections from USDA's annual long-term projections report, which is published in February each year. http://www.ers.usda.gov/data-products/agricultural-baseline-database.aspx.

- Economic surplus of the corn and soybean sector declines between $171 million for a fall closure and $747 million annually when Lock 25 is inaccessible. Closing La Grange Lock also leads to a loss of $549 million per year in economic surplus of the corn and soybean sectors.
- Corn and soybean producers in the Corn Belt region suffer the most loss in economic surplus, followed by the Lake State region and Northern Plains region.
- The estimated decline in economic surplus in the corn and soybean sectors due to a closure of Lock 25 could cause a decrease of more than 7,000 jobs, a $1.3 billion loss of labor income, and a reduction of about $2.4 billion of economic activity (total industry output) annually.
- Similarly, closing La Grange Lock for the entire marketing year could result in a reduction of 5,500 jobs, a loss of $900 million in labor income, and a reduction of $1.8 billion of economic activity annually.
- Closing Lock 25 or La Grange Lock creates net negative impacts on jobs, labor income, total value added, and total industry output in the U.S. economy.

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