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Agriculture as a Source of Barge Demand on the Upper Mississippi and Illinois Rivers: Background and Issues

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Summary

Five of the nation's top agricultural production states — Iowa, Illinois, Minnesota, Missouri, and Wisconsin — have traditionally relied on the Upper Mississippi River-Illinois Waterway (UMR-IWW) navigation system as their principal conduit for export-bound agricultural products — mostly bulk corn and soybeans. The low-cost, high-volume capability of barge transportation has long provided an important competitive advantage for U.S. agricultural products in international markets. Agricultural barge freight on the UMR-IWW grew rapidly for several decades in the post-WWII era, but has leveled off since the early 1980s. There is disagreement over the cause for this lack of growth in barge demand.

Shipping and agricultural interests argue that stagnant UMR-IWW barge traffic is due to delays associated with aging infrastructure and limited lock capacity; that delays are increasingly forcing grain shippers to switch to alternate transportation modes to ensure timely arrival at down-river processing plants or Gulf ports; that the declining efficiency of the UMR-IWW is hurting both U.S. competitiveness in international markets and U.S. farm incomes at home; and that investment is needed to modernize and expand the capacity of the locks.

Other interest groups contend that growth in domestic demand, as well as international market conditions, have changed substantially since the period of rapid growth in barge demand experienced during the 1960s and 1970s. Changes in the shape and origin of international demand and supply, an increasing number of bilateral and multilateral trade agreements, and other factors have resulted in the emergence of new trade routes for agricultural commodities that have drawn exportable supplies of corn and soybeans away from the UMR-IWW system.

Recent trade patterns, coupled with USDA's long-run market outlook, suggest that U.S. corn and soybean exports may increasingly turn to overland trade routes to access growing Asian markets (via the Pacific Northwest), as well as to nearby markets in Mexico and Canada. In addition, expected strong competition from South American producers, particularly in global soybean and product markets, may lead to a refocusing of U.S. exports away from Atlantic-rim markets and toward Canadian, Mexican, and possibly Asian markets, where geography offers some competitive advantages. If these expectations are realized, then growth in future barge demand from the agricultural sector may be well below levels anticipated by proponents of large-scale investments in the UMR-IWW.

This report provides background on the linkage between U.S. agriculture and the UMR-IWW navigation system. In addition, it explores several of the key issues and uncertainties behind evolving trade patterns and projections for future agricultural freight traffic on the UMR-IWW navigation system. This report will be updated as events warrant.

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Agriculture as a Source of Barge Demand on the Upper Mississippi and Illinois Rivers: Background and Issues

The Upper Mississippi River basin encompasses large portions of the central and western Corn Belt and the eastern fringes of the Northern Great Plains. Five of the nation's top agricultural production states — Iowa, Illinois, Minnesota, Missouri, and Wisconsin — have traditionally relied on the Upper Mississippi River - Illinois Waterway (UMR-IWW) navigation system as their principal conduit for export-bound agricultural products — mostly bulk corn and soybeans (see **Figure 1**). The low-cost, high-volume capability of the UMR-IWW system has long provided an important competitive advantage for U.S. agricultural products in international markets.[1]

Commercial navigability on the UMR-IWW is dependent on a system of 37 lock and dam locations (with 43 lock chambers) situated on the Mississippi River between Minneapolis and St. Louis, and on the Illinois Waterway between Chicago and the Mississippi River (see **Figure 2**). Since the early 1980s, the UMR-IWW has experienced increasing traffic congestion and delays related to its aging infrastructure and limited lock capacity — most UMR-IWW locks are 600 ft. in length requiring the prevalent 1,100-ft. barge tows to split in half and pass through the lock in two steps. The U.S. Army Corps of Engineers (Corps) has been investigating the feasibility of navigation improvements to UMR-IWW since 1993.[2] Preliminary results from the Corps' navigation study have touched off a public debate over the full economic costs associated with barge traffic delays, as well as the nature of new investments in the UMR-IWW system needed to reduce the delays.

Since the development of the UMR-IWW navigation system, the UMR-IWW region's agriculture and economic development have been linked to barge transportation on the Mississippi River system. However, over the past decade it appears that domestic and international developments have gradually been changing the nature and intensity of that linkage.

This report provides background on the linkage between agricultural production and the regional economies of the UMR-IWW basin on the one hand, and the UMR-

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[1]USDA, Economic Research Service (ERS), *Agriculture in Brazil and Argentina: Developments and Prospects for Major Field Crops*, Agr. and Trade Report No. WRS013, December 2001, pp. 53-60.

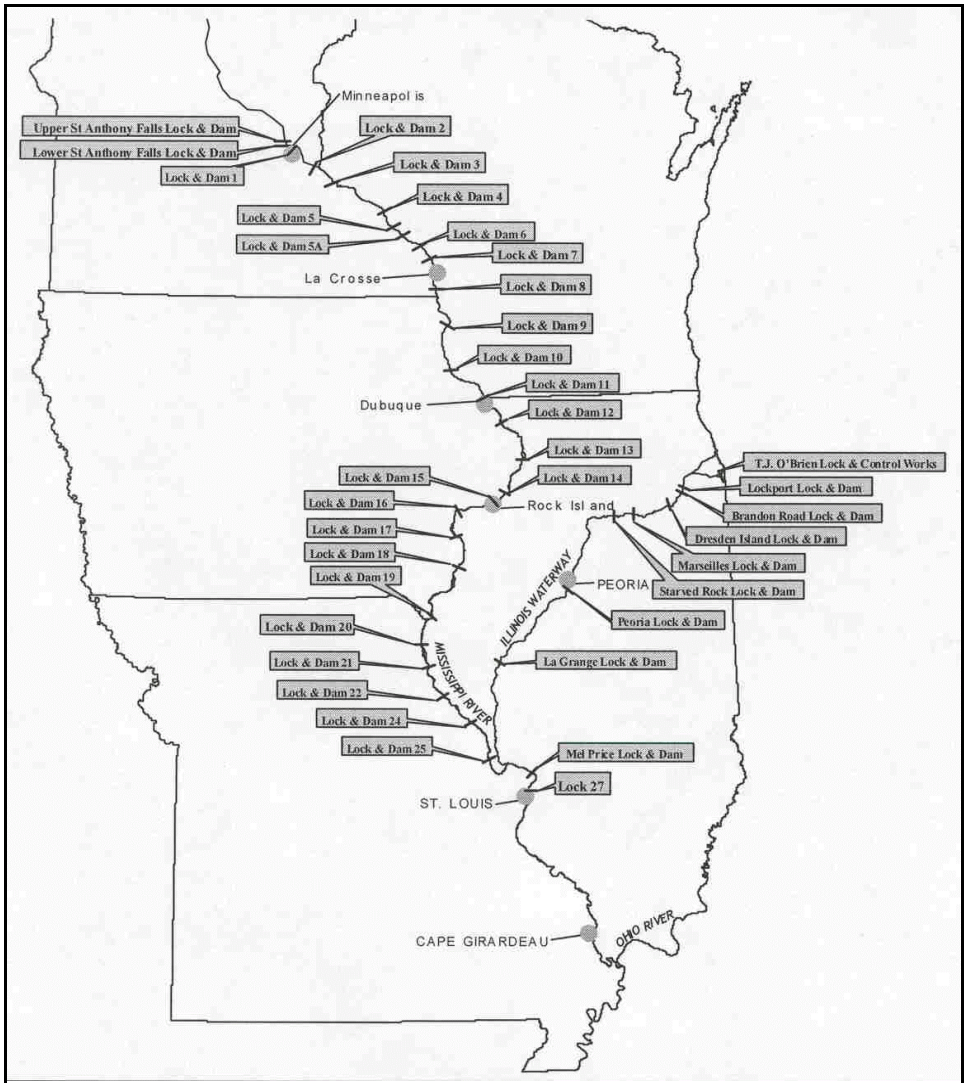
[2]For a discussion of lock capacity, barge delays, and the Corps navigation study, see U.S. Army Corps of Engineers, "Alternate Formulation Briefing Pre-Conference Report for the UMR-IWW System Navigation Feasibility Study," February 9, 2004.

IWW navigation system on the other hand. In addition, it explores several of the key issues and uncertainties behind evolving domestic use and international trade patterns and projections for future agricultural freight traffic on the UMR-IWW navigation system.

Figure 1. Upper Mississippi River and Illinois Waterway Flood Plain

Source: U.S. Army Corps of Engineers, Rock Island District, Jerry A. Skalak, Regional Project Manager, Upper Mississippi River Comprehensive Plan, Presentation at Tulane University, November 14, 2002.

Figure 2. Upper Mississippi River - Illinois Waterway Navigation System



Source: U.S. Army Corps of Engineers, "Alternative Formulation Briefing Pre-Conference Report, 9 February, 2004, p. 5.

Agriculture's Importance to the UMR-IWW Region

Economic Importance of Agriculture. Production agriculture plays an important, albeit declining, role in the economies of the five-state region directly affected by the UMR-IWW navigation system. In 2000 and 2001, cash receipts from crop and livestock activities averaged nearly $35.8 billion per year for the five-state region (see **Table 1**). Crop production receipts just edged out livestock receipts at $18 billion vs. $17.8 billion. Of the $18 billion in crop revenue, over 88% was derived from two crops, corn ($9.3 billion) and soybeans ($6.5 billion).

Table 1. Cash Receipts from Crop and Livestock Production Activities, and Agriculture's Share of Total Gross State Product, Five-State UMR-IWW Region

	Cash receipts: average for 2000 & 2001			Farm Sector's share of Gross State Product	
State	Total	Crops	Livestock & products	Average: 1977-79	Average: 2000-01
	$ million			%	
Iowa	10,744	5,243	5,500	12.5	3.2
Minnesota	7,508	3,544	3,964	6.7	1.2
Illinois	7,397	5,692	1,704	2.7	0.4
Wisconsin	5,540	1,420	4,120	5.0	1.3
Missouri	4,562	2,069	2,493	4.0	0.9
Total	35,750	17,969	17,781	4.8	1.0

Source: Cash receipts by state are from USDA, Economic Research Service, Farm Income, online data available at [http://www.ers.usda.gov/Data/FarmIncome/firkdmu.htm]. Farm output as a share of Gross State Product is from U.S. Department of Commerce, Bureau of Economic Analysis, Gross State Product, online data available at [http://www.bea.doc.gov/bea/regional/gsp.htm].

During the 2000-2001 period, the farm sector represented only 1% of the total gross product for the five-state region, down from a nearly 5% share in the 1977-1979 period. Despite its declining role in the region's economy, agriculture's total value and volume underlie much of the region's food, feed, and biofuel (ethanol) industries. In addition, the five-state region lies within the heart of the U.S. Corn Belt and represents an important component of the nation's agricultural production system (see **Table 2**). Together, the five states of the UMR-IWW basin accounted for over half of U.S. corn and soybean production, and nearly half of the value of U.S. corn and soybean exports, during 1998-2002. In contrast, the region accounted for only about 10% of U.S. wheat production and exports.

Table 2. Upper Mississippi River - Illinois Waterway Five-State Region: Corn, Soybean, and Wheat Production and Trade, Annual Average for 1998-2002

Crop/State	Production				Export value	Export % of Prod.
	Planted	Output	Price	Value		
	Million ac.	Million bu.	$/bu.	$ millions	$ millions	%[a]
CORN					Feed grains	
Iowa	12.2	1,777	1.90	3,372	1,057	31%
Illinois	11.0	1,556	2.05	3,184	966	30%
Minnesota	7.1	969	1.81	1,758	581	33%
Missouri	2.7	312	2.00	622	224	36%
Wisconsin	3.6	379	1.93	732	238	33%
Subtotal	36.7	5,050	2.02	10,219	3,066	30%
Share of US	47%	53%	— -	54%	46%	
US total	78.4	9,524	2.06	18,878	6,684	35%
SOYBEANS					Soybean & products	
Iowa	10.7	484	4.75	2,298	1,270	55%
Illinois	10.6	460	4.91	2,259	1,199	53%
Minnesota	7.1	289	4.65	1,344	732	55%
Missouri	5.1	170	4.79	813	453	56%
Wisconsin	1.4	59	4.75	281	143	51%
Subtotal	35.0	1,406	5.12	7,200	3,797	53%
Share of US	48%	51%	— -	55%	52%	
US total	73.6	2,759	5.21	13,197	7,265	55%
ALL WHEAT					Wheat & products	
Iowa	0.0	1	2.53	3	14	516%
Illinois	0.9	49	2.35	116	120	104%
Minnesota	2.0	80	3.08	245	197	80%
Missouri	1.0	45	2.39	108	133	120%
Wisconsin	0.2	9	2.30	21	23	110%
Subtotal	4.1	191	2.81	538	487	91%
Share of US	7%	9%	— -	9%	10%	
US total	62.2	2,131	2.91	5,855	4,725	81%

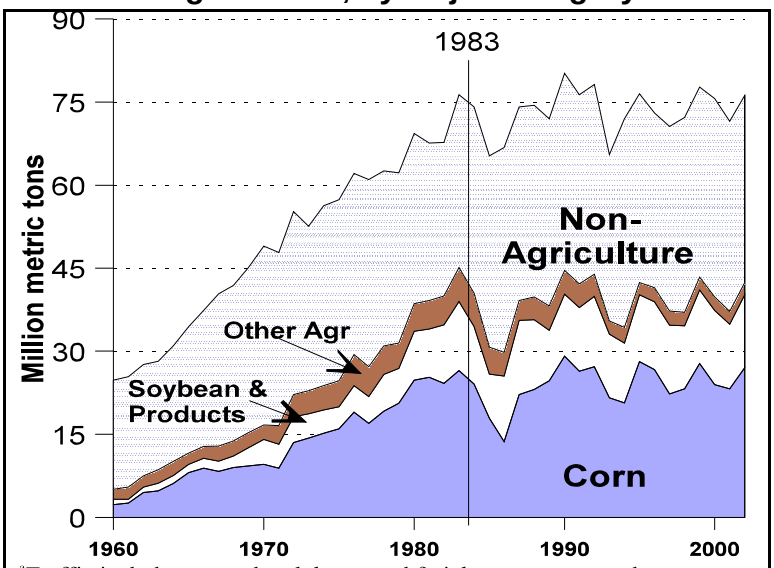
Source: Crop production data is from USDA, National Agricultural Statistics Service, Agricultural Statistics Database, available online at [http://www.nass.usda.gov:81/ipedb/]; export data is from USDA, Economic Research Service, "State Export Data," available at [http://www.ers.usda.gov/data/stateexports/].

[a]Export totals include the value of products. As a result, exports expressed as a share of the value of production represent an upper bound on the true bulk export share.

Agricultural Freight Traffic on the UMR-IWW. The UMR-IWW navigation system has been the traditional export outlet for much of the agricultural production of the upper Midwest. During 1998-2002, the five-state region exported approximately 30% of its corn production, 53% of its soybeans, and over 91% of its wheat (Table 2). The UMR-IWW carried nearly 66% of the region's corn exports and 64% of the region's soybean exports headed to international markets.[3] Only 18% of the five-state region's wheat exports moved via the UMR-IWW. Instead, the Great Lakes-St. Lawrence Seaway carried a majority of the region's wheat to international markets.

An average of nearly 40.7 million metric tons (mmt) of grain, oilseeds, and other agricultural products — representing 54% of total barge traffic — moved between Minneapolis and the mouth of the Missouri River on the UMR-IWW each year during 1998-2002.[4] Corn and soybeans and products comprised the bulk of annual agricultural trade averaging a combined 35.5 mmt — representing 87% of all agricultural freight or 47% of total freight (see **Figure 3**). In addition, the UMR-IWW system provides an inward conduit for fertilizers, fuel, and other farm inputs. For example, over 3 mmt of agricultural fertilizers moved within the UMR-IWW system annually in support of U.S. agricultural production during 1998-2002.

Figure 3. UMR-IWW Navigation System Freight Traffic, by Major Category[a]



[a]Traffic includes upward and downward freight movement on the Mississippi River and its tributaries between Minneapolis and the mouth of the MissouriRiver.
Source: U.S. Army Corps of Engineers, Waterborne Commerce of the United States.

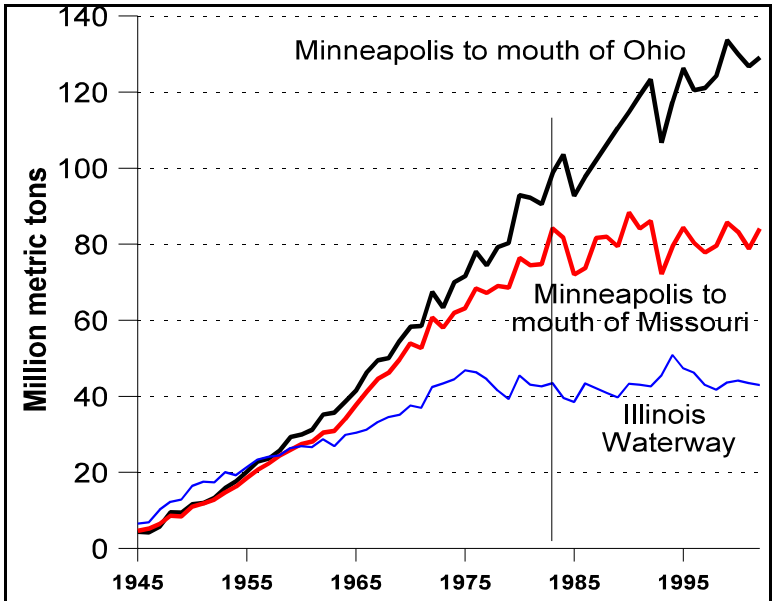
[3]Estimated by CRS using Corps freight data (U.S. Army Corps of Engineers, *Waterborne Commerce of the United States*) and state-level export data from USDA, Economic Research Service, "State Export Data," available at [http://www.ers.usda.gov/data/stateexports/.].

[4]This report focuses on the freight moving on the upper 2 reaches of the UMR-IWW system, i.e., between Minneapolis and the mouth of the Missouri River including the Illinois Waterway. This limited region encompasses those locks and dams presently under consideration by the Corps for modernization and/or expansion to 1,200 ft.

Variations in Freight Movement by River Sections or "Reaches". At first glance, data for UMR-IWW freight traffic between Minneapolis and the mouth of the Missouri River would appear to suggest that demand for barge transportation has shown little growth over the past two decades (see **Figure 4**). The same situation appears to hold for the IWW. However, the Corps suggests that such a view of the data could be misleading.

The Corps is responsible for operations and maintenance of the UMR-IWW navigation system.[5] Officials from the Corps report that the Corps has been forced to significantly reduce allowable traffic flows due to problems associated with the lock system's aging infrastructure. A Corps official suggested that, over the past 14 years, the Corps has been compelled to increasingly reduce allowable traffic by as much as 10% annually due to accumulating infrastructure degradation.[6] As a result, the Corps argues that freight traffic on the first two reaches of the UMR-IWW has been essentially flat over the past two decades, not from stagnant demand for barge transportation, but because the delays and uncertainties associated with moving commodities on the UMR-IWW system have prevented higher usage.

Figure 4. UMR-IWW Freight Traffic, Various Navigation Stages
(volume in million metric tons)[a]



[a]Traffic includes upward and downward freight movement.
Source: U.S. Army Corps of Engineers, Waterborne Commerce of the United States, various issues.

According to the Corps, commodity shippers under contract delivery deadlines are increasingly shifting to alternate, often more expensive transportation modes to ensure timely delivery. This shows up in the data as stagnant levels of freight traffic on the UMR-IWW system above the mouth of the Missouri River. The two

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[5]See CRS Report RS20866, *The Civil Works Program of the Army Corps of Engineers: A Primer*.

[6]Source: CRS telephone conversation with Corps officials.

remaining locks located below the mouth of the Missouri River — the Melvin Price Lock and Dam (formerly Lock and Dam 26) and Lock and Dam 27 — are both 1,200 ft. long. Below Lock and Dam 27, the Mississippi River is free-flowing to the Gulf Ports. Freight traffic measured between Minneapolis and the mouth of the Ohio River (which excludes Ohio River traffic) has continued to grow during the past two decades, albeit at a much slower pace than during the four decades following World War II (see **Table 3**). This is in contrast to freight movement on the UMR-IWW above the mouth of the Mississippi River and tends to support the argument that some freight is being diverted from the upper reaches of the UMR-IWW system where locks and dams are subject to congestion and delays.

Table 3. Average Annual Growth in Freight Traffic for Various Reaches on the UMR-IWW Navigation System: 1945-1983 Compared with 1983-2002

	Average annual growth rate	
UMR-IWW region	1945 to 1983	1983 to 2002
Minneapolis to mouth of Ohio	7.7%	1.4%
Minneapolis to mouth of Missouri	7.2%	0.0%
Illinois Waterway	4.8%	-0.1%

Source: Growth rates were calculated by CRS using Corps freight data (U.S. Army Corps of Engineers, *Waterborne Commerce of the United States*).

Shipping and agricultural interests maintain that stagnant barge traffic on the UMR-IWW is due to delays associated with aging infrastructure and limited lock capacity. The delays, they argue, are increasingly forcing grain shippers to switch to alternate transportation modes to ensure timely arrival at down-river processing plants or Gulf ports. These groups also argue that the declining efficiency of the UMR-IWW is hurting both U.S. competitiveness in international markets and U.S. farm incomes at home, and that investment is needed to modernize and expand the capacity of the locks. Major proponents of this viewpoint include the National Corn Growers Association, state-level corn growers associations (Iowa, Illinois, Minnesota, Missouri, and Wisconsin), the American Soybean Association, the shipping industry, and the Minnesota state legislature.[7]

In contrast, some interest groups contend that there are plausible explanations for the lack of growth in barge demand on the UMR-IWW other than barge delays. Steady growth in domestic demand, as well as significant changes in the shape and origin of international demand and supply, and other factors have resulted in the emergence of new trade routes for agricultural commodities that have drawn exportable supplies of corn and soybeans away from the UMR-IWW system. Major proponents of this viewpoint include the Institute for Agriculture and Trade Policy and Taxpayers for Common Sense.

[7]The websites for proponents, opponents, and interested parties are provided in the "For More Information" section at the end of this report.

Why Transportation Costs Matter to Agriculture

In competitive grain and oilseed markets, transfer costs — handling and transportation charges — are a major factor in determining market price differentials. Agricultural producers are concerned about transportation costs because the price that they receive for their agricultural commodities is derived from the price established in major markets (whether a processing plant, feedlot, or export terminal) by subtracting transportation and handling costs. The more it costs to transport a commodity to a buyer, the less the producer will receive and vice versa. As a result, any process that reduces the cost of moving a commodity to a buyer likely benefits producers by raising the price that they receive, which subsequently benefits the local economy by generating greater farm income and associated economic activity.[8]

In contrast, raising domestic transportation costs widens the farm-to-market price differential. A widening differential generally compels exporters to offer the products in international markets at higher prices — that is, less competitively. Higher U.S. export prices relative to international competitors will lower the demand for U.S. exports of corn and soybeans. Lower export demand reduces total demand, and consequently lowers the prices and income received by farmers for a given level of production. In the long run, permanent changes to corn and soybean prices relative to the prices for other agricultural production activities will likely alter the crop or activity mix of farms in the affected region.

Barge Transport and Cost Savings. Barge transportation represents a low-cost method of moving bulk commodities long distances. Furthermore, most economists and market analysts agree that inexpensive barge transportation helps keep in check rates charged by the rail and truck transportation industries. Low internal transport costs relative to export competitors such as Argentina and Brazil have helped U.S. products compete in international corn and soybean markets.[9]

An evaluation of transportation costs for the UMR-IWW System commissioned by the Corps indicated that rate savings to waterway users averaged about $8.60 per ton (1994 prices) over the best possible all-land routing alternative.[10] Based on these cost savings relative to alternate transportation modes, it has been estimated that the

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[8]For a discussion of the economy-wide economic costs associated with higher agricultural transportation costs (including higher consumer food prices, as well as local, state, and national tax revenue and employment losses) see Evans, Carroll & Associates, Dr. Michael Evans, *Determination of the Economic Impact of Increased Congestion on the Upper Mississippi River — Illinois River Waterway*, March 2002.

[9]USDA, Economic Research Service (ERS), *Agriculture in Brazil and Argentina: Developments and Prospects for Major Field Crops*, Agr. and Trade Report No. WRS013, December 2001, pp. 53-60.

[10]U.S. Army Corps of Engineers and the Tennessee Valley Authority, "Transportation Rate Analysis: Upper Mississippi River Navigation Feasibility Study," July 1996.

existing UMR-IWW system generates transportation cost savings of $0.8 billion to $1.2 billion (2001 prices) per year (based on year 2000 traffic levels).[11]

Effects of Barge Delays. Shippers of bulk commodities rely on volume to make a profit. For a barge plying the inland waterways, a key determinant of the amount of freight that can be carried in a season is the time it takes to make each haul.[12] The shorter the haul time, the more total hauls that can be made and the more freight that can be moved. As a result, delays associated with aging locks and dams represent lost time, lost potential freight, and lost profits. Waiting delays also represent lost fuel. Towboats on the UMR-IWW burn about 80 gallons of diesel fuel per hour. The engines are kept running while each towboat waits for its turn through the lock.

According to the Corps, the UMR-IWW system has over half (19 of 36) of the most delayed lock sites in the country's system of inland waterways.[13] Existing delays vary based on the location in the system. In general, delays are greatest at the 600-ft. locks furthest downstream. For the 10-year period 1990-99, delays per tow averaged 3.4 hours at Locks 20-25; 2.2 hours at Locks 14-18; 0.9 hour at Locks 8-13; and 0.4 hour for Upper St. Anthony Lock to Lock 7. On the IWW over the same period, delays per tow averaged 1.8 hours at Peoria and La Grange and 1.1 hours for each of the other six lock sites. Accumulating delays raise operating costs and, inevitably, the freight rate charged.

Yu and Fuller (in the first of three studies) found that lock delays on the UMR-IWW are associated with higher barge rates. However, they found that the effect was not large — a 10% increase in delay at any given lock was estimated to increase barge rates by 0.16% to 0.59%.[14] Furthermore, Yu and Fuller found that lock delays at all 27 locks including the three 1,200-ft. locks (Locks and Dams 19 and 27, and the Melvin Price Lock and Dam) would lead to about a 6% increase in the total barge rate between Minneapolis and Gulf Ports.

Several studies have found positive links between barge rate changes and U.S. farm and export prices. Bessler, Fuller, and Khan estimated that barge rates account for 10% to 12% of changes in corn farm and export prices, and about 4% of changes in soybean prices.[15] Yu and Fuller (in the second of three studies) concluded that less

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[11]U.S. Army Corps of Engineers, "Alternate Formulation Briefing Pre-Conference Report for the UMR-IWW System Navigation Feasibility Study," 9 February, 2004, p. 88.

[12]The Upper Mississippi River closes for nearly four months every winter above the Quad Cities near Lock and Dam 15. This increases the time pressure to move a maximum quantity of the fall's harvest before the winter freeze occurs.

[13]U.S. Army Corps of Engineers, "Alternate Formulation Briefing Pre-Conference Report for the UMR-IWW System Navigation Feasibility Study," 9 February, 2004, pp. 87-88.

[14]Yu, Tun-Hsiang and Stephen Fuller. *Evaluation of Factors Affecting Lock Delays on the Upper Mississippi and Illinois Rivers and the Effect of Lock Delay on Barge Rates*, prepared for USDA, Agricultural Marketing Service (AMS), 2002.

[15]David Bessler, Stephen Fuller, and Asim Khan. *Dynamics of Grain Prices and Barge* (continued...)

than 20% of variation in corn farm and export prices, and less than 15% of variation in soybean farm and export prices, were attributable to barge rates.[16]

As barge rates for corn and soybean freight rise, the demand for barge services declines. Yu and Fuller (in the third of three studies) have estimated a -0.5% decline in grain barge demand on the UMR and a -0.2% decline on the IWW in response to a 1% increase in barge freight rates.[17] For example, the April 2004 barge freight rate from Minneapolis to Gulf Ports of about $10.71 per metric ton is equivalent to about $0.27 per bushel of corn and $0.29 per bushel of soybeans.[18] Based on Yu's and Fuller's estimations, a 5% rise (approximately 1.4-cents per bushel) in the barge freight rate would result in a 2.5% decline in the volume of corn and soybean freight (or about 0.89 mmt out of 41 mmt). The barge price rise would shift these commodities to alternate uses (feed, food, industrial, or storage), to alternate transport modes (rail or truck), or to alternate trade routes (e.g., Canada, Mexico, or the Pacific Northwest).

A possible effect of a sustained rise in barge transport rates is a rise in rail freight costs, due both to rising demand for rail as freight shifts away from barge and towards rail transport, and to decreased efficiency due to longer rail delays as more traffic moves over the same mileage of freight track and through the same number of terminals. The degree, if any, to which rail costs would rise in response to greater demand would depend on the level of slack capacity available to immediately absorb the agricultural freight that is being diverted from barge transportation. The level of rail slack capacity is seasonal, but tends to be near full capacity at harvest time when barge demand is highest. The rise in rail rates will likely be more acute for goods that rely more heavily on UMR-IWW barge transportation as a share of total freight shipped (e.g., corn and soybeans), due to limited alternatives. (Trucks do not compete well with barge or rail for long distance movement of bulk commodities.) However, the rise in rail rates would partially dampen the freight shift occurring because of barge delays and rising barge rates, thus preventing a greater shift of freight from barge to rail than would otherwise occur.

Evans estimated that railroad freight rates for farm products will increase 1/4% for every 1% increase in UMR barge freight rates.[19] In other words, a 2 cents per bushel rise in barge freight rates for corn and soybeans would result in about a half-

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[15](...continued)
Rates on the Upper Mississippi/Illinois Rivers, presented at the 43rd annual Conference of Transportation Research Forum, Williamsburg, VA, 2001.

[16]Yu and Fuller. *Dynamic Relationships Between Grain Prices and Barge Rates on the Upper Mississippi and Illinois Rivers*, prepared for USDA, AMS, circa 2002 (no date).

[17]Yu and Fuller. *Estimated Grain Barge Demands for the Upper Mississippi and Illinois Rivers: Tentative Findings*, prepared for USDA, AMS, circa 2002 (no date).

[18]USDA, AMS, Transportation and Marketing Service, *Grain Transportation Report*, Washington, D.C., April 29, 2004.

[19]Evans, Carroll & Associates, Dr. Michael Evans. *Determination of the Economic Impact of Increased Congestion on the Upper Mississippi River — Illinois River Waterway*, March 2002, p.39.

cent per bushel rise in rail freight rates for those commodities as some freight transport demand shifts from barge to rail.

UMR-IWW Agricultural Barge Demand: Recent Developments

Good decisions regarding investments in large civil works projects such as lock extensions on the UMR-IWW require some consideration of the future demands for those projects.[20] Agriculture-related demand for barge transportation on the UMR-IWW is highly dependent on the region's exportable surplus production of corn and soybeans, on international market conditions, and on the availability and cost of alternate transportation modes and routes. Historically, corn and soybeans exported from the western and central portions of the U.S. Corn Belt have relied on the UMR-IWW navigation system as the lowest-cost, most direct route to Gulf Ports and international markets. However, U.S. domestic and international market conditions have changed substantially since the period of rapid growth in barge demand experienced during the 1960s and 1970s.[21] As a result, traffic delays on the UMR-IWW may not be the sole explanation for stagnant barge demand since the early 1980s.

In recent years the UMR-IWW region's agricultural production has faced strong demand from domestic users including the livestock sector, the food and industrial processing sector, and the biofuels industry. This internal demand has steadily pushed upward domestic use's share of production. Shifts in the sources and nature of international demand resulting from population and income dynamics, increasing competition from South American exporters, evolving bilateral and multilateral trade agreements, and trade disputes related to U.S. production and use of biotech crops have induced exporters to seek nontraditional routes to new and expanding export markets. These multiple forces have likely drawn exportable supplies away from the UMR-IWW system. Long-run projections by the U.S. Dept of Agriculture (USDA) suggest that these trends may continue. This section briefly reviews recent developments, while the following section discusses USDA's long-run outlook.

Domestic Production. The UMR-IWW basin states have a strong comparative advantage in the production of corn and soybeans with abundant rich soils and mild temperate summer-time weather. Low production costs relative to other crops, high yields, and an agronomically favorable rotation pattern between corn and soybeans have kept cultivated area for the two crops near record levels since 1997, and have generated fairly steady output growth over the past several decades. In recent years growth in corn production has benefitted from strong steady yield growth, while soybean production has gained from increases in the area planted.

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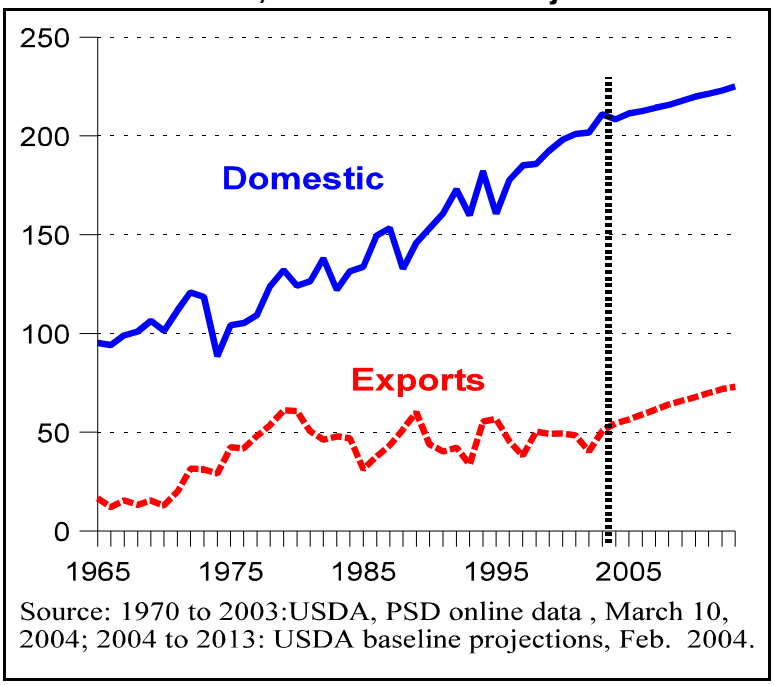
[20]National Research Council, Transportation Research Board, *Review of the U.S. Army Corps of Engineers: Restructured Upper Mississippi River — Illinois Waterway Feasibility Study*, National Academy Press©2004, Washington, D.C. , p. 7.

[21]Institute for Agriculture and Trade Policy, Mark Muller, "Comments on the U.S. Army Corps of Engineers' Upper Mississippi River — Illinois Waterway System Navigation Study," Oct. 28, 2003; available at [http://www.iatp.org/enviroag/publications.cfm].

Domestic Demand Conditions. Since the late 1970s, U.S. domestic demand has grown in lockstep with production, thereby limiting growth in exportable supplies. The primary source of domestic demand for corn and soybeans is the livestock sector. In recent years, increases in U.S. demand for meat products has maintained feed usage at historical high levels. Robust growth in demand from food and industrial processing as well as from the renewable biofuels sector (particularly corn-based ethanol production) also has helped to bolster growth in domestic use of corn and soybeans both in terms of total volume and as a share of production. For corn, domestic use as a share of production varied widely during the 1980s, but has grown steadily through most of the 1990s peaking at an 88% share in 2002/03. In contrast, domestic use of soybeans as a share of production has been fairly stable at about 66% since the early 1980s.

Figure 5. U.S. Domestic and Export Demand for Corn, Historical and Projected



Source: 1970 to 2003:USDA, PSD online data , March 10, 2004; 2004 to 2013: USDA baseline projections, Feb. 2004.

Strong growth in domestic use as a share of total production tends to limit growth in exportable supplies for two reasons. First, domestic users generally offer higher returns over international markets. As a result, exports are generally supplied as a residual outlet after domestic users have been satisfied. Second, strong domestic demand has traditionally kept U.S. prices at a slight premium to other international exporters, hindering U.S. competitiveness, particularly as compared to foreign producers with heavier export orientations like Argentina and Brazil.

International Corn Market Conditions. Since most corn traded in global markets is used for animal feed, international demand is highly dependent on general economic conditions. (This is because livestock are fed to produce meat and dairy products, the demand for which is very sensitive to changes in income.) The United States dominates global trade in corn supplying about two-thirds of total exports to world markets. As a result, U.S. corn exports are particularly sensitive to international market conditions. Global economic conditions were positive in the

1970s, but stagnated during the 1980s. U.S. corn exports echoed this pattern, but were further reinforced by widespread growth in foreign grain production since the late 1970s. In addition, specific circumstances, first in the former Soviet Union (FSU), then in China and the European Union (EU) further contributed to weak international demand, highly competitive markets, and flat U.S. exports (see **Figure 5**).

During the 1970s, U.S. feed grain exports rose sharply due to strong demand from the FSU. Between 1971 and 1985, FSU imports of U.S. corn averaged over 6.5 mmt per year out of average annual U.S. corn exports of about 43 mmt.[22] Most of this corn was shipped to the FSU via the UMR-IWW system. However, U.S. corn exports to the FSU fell to zero during 1986-1990 when the FSU reversed its policy of maintaining domestic livestock herds by buying corn on the international market. The early 1990s witnessed the loss of a historical demand source for U.S. corn with the breakup of the FSU and the wide scale liquidation of FSU animal herds. U.S. corn exports to the FSU have averaged less than 1 mmt since 1990. In addition, China entered world corn markets as a major exporter in 1984, just as the FSU was preparing to leave the market. From 1984 to 2003 China's corn exports averaged 6.5 mmt per year displacing U.S. corn in many Asian markets that had traditionally imported U.S. corn (e.g., South Korea, Taiwan, Philippines, and Indonesia). In addition to its favorable geographic proximity, China appears to have routinely used implicit export subsidies (such as price discounts on marketing and transportation fees) on its corn exports making it difficult for U.S. corn to compete in Asian markets.[23]

In the late 1980s, three major U.S. corn importers — Japan, South Korea, and Taiwan — began to import increasing amounts of beef, displacing their internal beef production and lowering their demand for feed grains. This trend continued through the 1990s and had the effect of reducing demand for U.S. corn. U.S. corn exports were dealt a further blow in 1998 when the EU, in a dramatic policy reversal, imposed a de facto ban on agricultural products originating from genetically engineered seeds.[24] This move effectively shut U.S. corn out of EU markets. During the six years prior to the ban, EU imports of U.S. corn had averaged about 2 mmt per year. Since the de facto ban, annual U.S. corn exports to the EU have averaged 88,000 tons. The net sum of these changes has been heightened competition in a demand-weakened international feed-grains market, and stagnant U.S. corn exports since the early 1980s.

International Soybean Market Conditions. As with corn, soybean's primary use is as an animal feed. "Crushing" whole beans yields high-protein meal

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[22]USDA, PSD database, April 8, 2004; available at [http://www.fas.usda.gov/psd/].

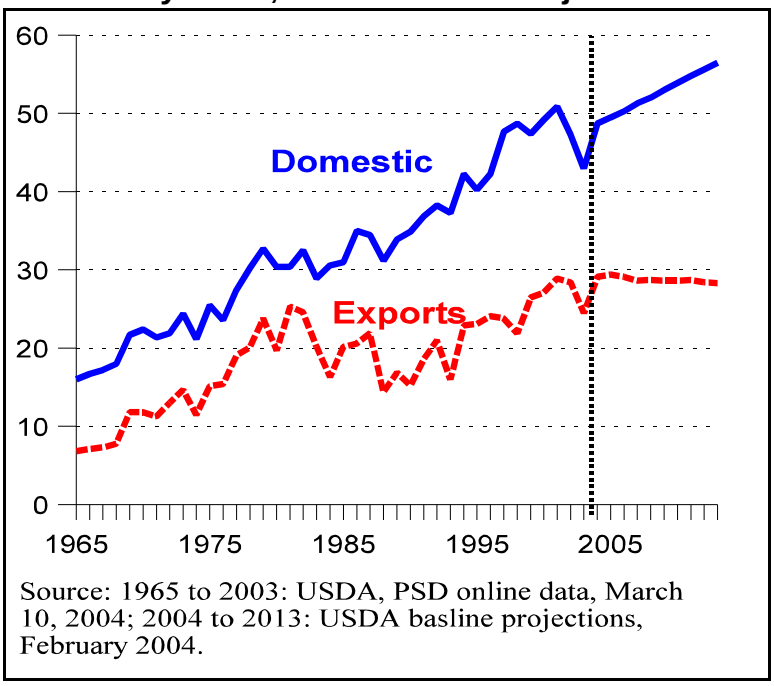
[23]USDA, ERS, *China's Corn Exports: Business as Usual, Despite WTO Accession*, FDS1202-01, December 2002; available at [http://www.ers.usda.gov/publications/fds/dec02/fds1202-01/].

[24]CRS Report RS21556, *Agricultural Biotechnology: The U.S.-EU Dispute*.

that is widely prized as a supplement in dairy, hog, and poultry rations.[25] A secondary use is as a source of vegetable oil. Soybeans may be exported as either whole beans, soymeal, or soyoil. During 1998 to 2002, the UMR-IWW navigation system was used to transport an annual average of 10.7 mmt of whole soybeans, 2.6 mmt of animal feeds (primarily soymeal), and 0.6 mmt of vegetable oil (primarily soyoil).

As with corn, U.S. soybean exports showed a strong rise during the 1970s and early 1980s in response to strong global economic growth. However, U.S. soybean exports encountered a much sharper fall-off in the 1980s (see **Figure 6**) compared to U.S. corn exports. In addition to weak international demand, the drop-off in U.S. soybean exports of the early 1980s was also the result of policy changes in the EU — the primary market for U.S. soybeans. By the late 1970s, the EU had instituted lucrative subsidies to EU oilseed processors which expanded EU rapeseed production and curtailed EU imports of foreign oilseeds.[26]

Figure 6. U.S. Domestic and Export Demand for Soybeans, Historical and Projected



Source: 1965 to 2003: USDA, PSD online data, March 10, 2004; 2004 to 2013: USDA basline projections, February 2004.

U.S. exports recovered somewhat in the late 1990s as the global economic recovery produced widespread international demand for soybeans and high-protein meals. However, U.S. soybean exports have faced increasing competition from Argentina and Brazil who have emerged during the 1990s as major producers and exporters of soybeans and products. Between 1995 and 2003, the two South American countries expanded their production by about 250% — from a combined

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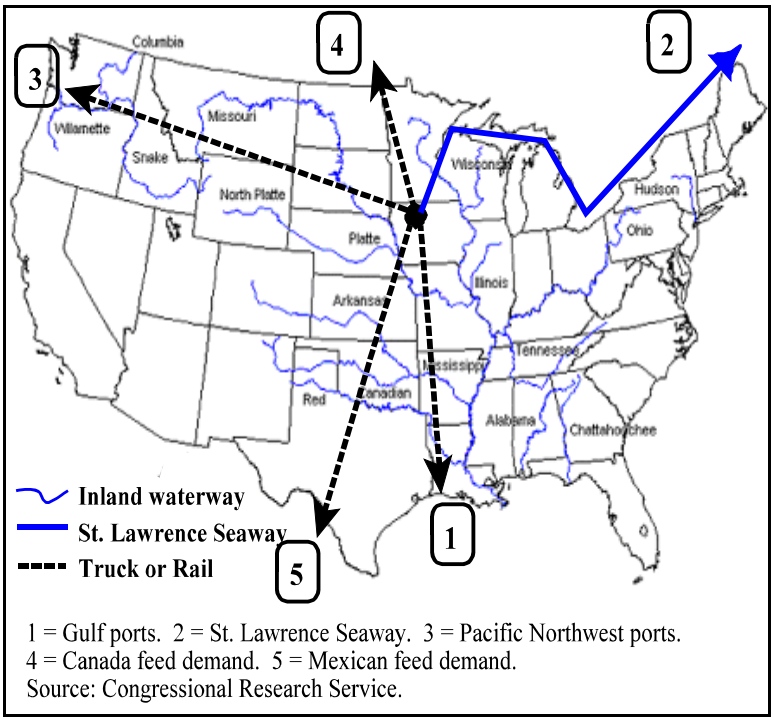
[25]The crushing process converts whole beans to meal at a rate of about 74-78%, and to oil at about an 18% rate. Source: USDA, ERS, *Oil Crops Yearbook*, OCS-2003, Table 10, October 2004, p. 35.

[26]USDA, ERS, *Background for 1995 Farm Legislation*, AER 715, May 1995, p. 21.

36.6 mmt to 91 mmt. Similarly, Argentine and Brazilian exports of soybeans and products expanded by 256% between 1995 and 2003 — from a combined 31.4 mmt (soybeans and soymeal in whole soybean equivalents) to 80.3 mmt.[27]

Alternate Freight Routes Emerge. In recent years, the UMR-IWW system has faced increasing competition from alternate trade routes, primarily in response to shifts in the source of international grain and oilseed demand, but also possibly due to the rising costs and delays associated with the UMR-IWW's aging lock and dam system (see **Figure 7**). Some of the major factors that have contributed to shifts towards other trade routes include the following.

Figure 7. UMR-IWW Compared with Alternate Trade Routes out of the Basin



1 = Gulf ports. 2 = St. Lawrence Seaway. 3 = Pacific Northwest ports.
4 = Canada feed demand. 5 = Mexican feed demand.
Source: Congressional Research Service.

First, the North American Free Trade Agreement (NAFTA) between the United States, Mexico, and Canada, beginning in 1994, increased market access for U.S. agricultural products to Mexican and Canadian markets. A key feature of NAFTA has been the gradual elimination of tariffs on all commodities including agricultural products. Overland truck and rail routes to the NAFTA partners — Mexico and Canada — have expanded rapidly during the past 10 years, particularly for perishables, but also for grains and oilseeds.

In addition to NAFTA-related market access gains, Mexico has made major changes in its domestic agricultural policy that have contributed to growing imports of U.S. agricultural products. As a result, U.S. corn exports to Mexico have more than doubled since NAFTA took effect, growing from a 2 mmt average (a 4.5% share of U.S. corn exports) in 1989-1993, to a 5.1 mmt average (11% share) during 2000-

[27]USDA, PSD data base, April 8, 2004; available at [http://www.fas.usda.gov/psd/].

2003.[28] U.S. exports of soybeans and soymeal to Mexico have shown similar growth increasing from 1.8 mmt (11% share of U.S. soybean and product exports in whole-soybean equivalents) in 1989-1993 to 4.6 mmt (18% share) in 2001-2003.

Traditionally, grains and oilseeds from the U.S. interior moved down the UMR-IWW, mainly by barge, to Gulf Ports and then by ship to Mexican ports like Veracruz. From there, grains traveled inland to Mexico City and other major destinations by rail. Reports suggest that transport costs on this Mississippi River-Gulf-rail route may be as much as 10% lower than direct rail rates. However, market reports suggest that, despite the cost disadvantage, rail's share of grain shipments to Mexico has increased from about 10% since the early 1990s to possibly 20% or greater by 2001.[29]

U.S. corn exports to Canada also have shown strong growth in recent years. This growth is linked to several factors: the 1995 elimination of Canadian transportation subsidies under the Western Grain Transportation Act and the subsequent development of a substantial pork industry in Canada's prairie states; growth in Canada's poultry industry; and agronomic limitations on Canada's ability to produce corn. During 1989-94 U.S. corn exports to Canada averaged 0.7 mmt annually. Since 2000 Canada's imports of U.S. corn have surged upward averaging 3.6 mmt for an 8% share of U.S. corn exports.[30]

Together, the two NAFTA partners import a sizable share of U.S. corn shipments. During 2000-2003, Canada and Mexico have accounted for about 19% of U.S. corn exports, up sharply from a 6% share during 1989-93. U.S. exports of soybeans and soymeal to Canada and Mexico have shown similar growth increasing from a 17% share (2.6 mmt average) in 1989-1993 to a 26% share (6.5 mmt average) during the 2000-2003 period.

Second, as mentioned earlier, competition from Argentina and Brazil in international agricultural markets has increased sharply since the mid-1990s. U.S. exports that move via the UMR-IWW system to Gulf Ports and the Atlantic directly confront growing South American competition. In contrast, overland routes to major ports on the West Coast offer direct access to the Pacific Ocean and Asian markets and are beginning to compete with the traditional UMR-IWW-to-Gulf-Ports-to-Panama-Canal route.

Third, phenomenal growth in soybean import demand from China in recent years has spurred the growth of rail shipments out of the Northern Plains and the UMR-IWW basin to the Pacific Northwest (PNW). During 1983-1995, China's annual imports of soybeans averaged less than 0.2 mmt. However, dramatic income

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[28]USDA, ERS, *Effects of North American Free Trade Agreement on Agriculture and the Rural Economy*, "Grains, Oilseeds, and Related Products," Agriculture and Trade Report No. WRS0201, July 2002, pp. 70-85.

[29]USDA, ERS, *Effects of North American Free Trade Agreement on Agriculture and the Rural Economy,* "Modal Choices in the Transportation of U.S.-Mexico Agricultural Trade," Agriculture and Trade Report No. WRS0201, July 2002, pp. 51-55.

[30]USDA, PSD database, April 8, 2004; available at [http://www.fas.usda.gov/psd/].

growth since the mid-1980s has been accompanied by sharp increases in China's demand for meat products. One of several policy responses by China's government has been to permit increased soybean imports starting in the late 1990s. During 1999 to 2001 China imported an average of 11.2 mmt per year of soybeans. However, in 2002 China's soybean imports jumped to 21.4 mmt (or 34% of global soybean imports), and are projected at 20.5 mmt for 2003/04.[31]

With fully one-third of all soybeans traded in international market going to China in the past two years and USDA projecting further import growth by China, U.S. soybean shippers are looking for the most cost-effective routes to China. Traditionally, shipments of U.S. grains and oilseeds to Asian markets have traveled down the UMR-IWW system to Gulf Ports, then through the Panama Canal and across the Pacific. While this remains the principal route for Asian-bound agricultural products, delays and higher costs associated with the UMR-IWW system plus rising fees to pass through the Panama Canal have made the PNW route increasingly more attractive, particularly for soybeans produced in the Dakotas.

Finally, two other events have contributed to the development of an overland PNW route for soybeans from the western Corn Belt. First, recent genetic advancements have produced hardier soybean varieties that have pushed their production into the Plains states at the expense of traditional small grains crops. Soybean production in the Dakotas is located far enough from the UMR-IWW system to make a PNW route more viable. Once the Midwest-to-PNW route becomes established and economies of scale ensue, more soybeans from the western Corn Belt could potentially be diverted from the UMR-IWW. A second factor has been the increased use of 110-car shuttle trains to the PNW. These longer trains are designed to capture the economies of scale inherent in shipping larger volumes of a commodity long distances.

U.S. Wheat Export Outlets. Historically, most U.S. wheat moving to international markets via the Mississippi River system and Gulf Ports has originated out of central and southern prairie states such as Kansas, Oklahoma, Colorado, and Texas. This wheat accesses the River's waterway at points below the UMR-IWW system of locks and dams. High-protein wheat from the U.S. northern Plains and Canadian prairies has traditionally relied on the Great Lakes-St. Lawrence Seaway as the lowest-cost, most direct route to their primary source of demand — high-valued European bread markets. U.S. wheat moving on the upper reaches of the UMR-IWW navigation system has tended to be soft red wheat (SRW) grown in the central and eastern Corn Belt. However, SRW freight traffic on the UMR-IWW has never comprised a very large share of agricultural freight and has seen both its volume and share decline substantially over the past two decades. During the 1980-1984 period, over 3 mmt of wheat moved on the UMR-IWW system representing about 4% of total freight traffic. During 1998-2002, UMR-IWW wheat freight has declined to under 1 mmt and less than a 1% share of freight.

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[31]USDA, World Agricultural Outlook Board, *World Agricultural Supply and Demand Estimates Report*, April 8, 2004; [http://www.usda.gov/oce/waob/wasde/wasde.htm].

UMR-IWW Agricultural Barge Demand: Long-Run Issues

A central issue surrounding the projected economic benefits of new investments to modernize and expand lock capacity on the UMR-IWW navigation system is the outlook for agricultural bulk trade, particularly corn and soybeans, seeking access to international markets via Gulf Ports. Projecting exportable surpluses of corn and soybeans involves evaluating the long-run outlook for U.S. agriculture in general and for competing land uses in particular. Given the western Corn Belt's likelihood of remaining a major corn and soybean producer, projections of barge demand on the UMR-IWW system hinge on the outlook for three aspects of U.S. corn and soybean production and trade:

1. How will growth in U.S. production compare with domestic use? In other words, what are the prospects for exportable supplies? Higher levels of grain exports would increase demand for rail and barge transportation with the relative shares of rail versus barge depending on routes used. In contrast, increased domestic off-farm feed use and increased domestic demand for processed grain products would drive up demand for truck and rail transportation.[32]

2. What is the likelihood that such exportable surpluses, if realized, will demand barge transportation on the UMR-IWW navigation system rather than alternate transportation modes and routes? This hinges on projected changes in the sources of international demand. For example, shifting the center of soybean demand from Europe to Asia might favor an overland rail route to the Pacific Northwest over the UMR-IWW. Alternately, unexpectedly strong growth in feed demand from Middle Eastern markets could accelerate the movement of corn exports via the UMR-IWW and Gulf Ports.

3. How competitive will U.S. exports be and in which international markets? This relates to projections of export competition from foreign producers, particularly Argentina and Brazil, but also newly emerging Eastern European producers.

UMR-IWW Agricultural Trade Projections. One of the Corps' objectives under the UMR-IWW navigation study has been to evaluate the potential barge demand over a 50-year time horizon (specifically, 2000 to 2050). To date, the primary studies undertaken either by or for the Corps to examine projected UMR-IWW traffic flows and barge demand have met with criticism from the National Research Council (NRC) of the National Academies.[33] Major short-comings cited by the NRC include the following points.

First, most studies have relied on fairly optimistic outlooks for growth in both international demand for bulk commodities, U.S. exportable surpluses of bulk commodities, and UMR-IWW traffic flows and barge demand (see **Table 4**). In

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[32]USDA, AMS, *Transportation of U.S. Grains: A Modal Share Analysis, 1978-95*, March 1998.

[33]Corps-sanctioned economic studies and the National Academies' National Research Council reviews are included in the "For More Information" section at the end of this report.

contrast U.S. corn exports have shown no growth during the past two decades, and USDA's long-run outlook suggests that increasing competition in global soybean markets will dampen U.S. soybean exports.

Second, the various models used to project barge demand in Corps-sanctioned studies have been constrained, partial-equilibrium models for the most part. To be operable, these models have held constant important aspects of commodity and transportation markets. As a result, the NRC review said that the Corps barge-demand projections inadequately consider the potential cross-price effects in commodity and transportation markets.

Third, the NRC review also indicated that Corps sanctioned-studies have tended to ignore or minimize the potential for alternate routes to evolve based on international market conditions. While projections for global population and income growth would suggest that demand for agricultural products will increase, this alone is insufficient to justify projections for strong growth in bulk commodity flows on the UMR-IWW system. Any comprehensive analysis must consider the evolution of specific market forces and the potential shifts in trade flows and patterns that they will engender.

Table 4 compares the growth rates from various studies for agriculture-related barge demand on the UMR-IWW with growth rates from USDA's 2004 long-run outlook projections. USDA does not project port shares for U.S. exports. However, a hypothetical scenario has been developed by CRS and applied to USDA's total growth rates — referred to as the adjusted UMR-IWW freight in Table 4 — to evaluate the potential effects of increased trade flows via non-UMR-IWW routes. (See the next section for a discussion of potential expansion of non-UMR-IWW export trade in accordance with USDA's long-run market outlook.) In every non-USDA study, with the sole exception of the SCI-least-favorable scenario, the average annual growth rates for UMR-IWW barge demand from corn and soybeans exceeds the UMR-IWW freight projections based on USDA's 2004 baseline report after adjustment for growth in alternate trade routes.

The Evans study assumed a very strong average annual growth rate of 3.5% for U.S. corn and soybean exports moving on the UMR-IWW. Both the SCI-central scenario and JFA projections assumed an average annual growth rate of 1.2% for weighted corn and soybean freight on the UMR-IWW. In contrast, CRS calculated a 0.3% hypothetical growth rate from USDA's 2004 baseline projection adjusted for moderate rates of freight diversion from the UMR-IWW to alternate routes.

Table 4. Comparisons of UMR-IWW Average Annual Agricultural Freight Export Growth Rate Projections, Various Studies

	Corn	Soybeans	Weighted Average
Evans[a]			
Total U.S. exports	3.5%	3.5%	3.5%
UMR-IWW	3.5%	3.5%	3.5%
Sparks Companies, Inc. (SCI)[b]			
UMR-IWW (Most favorable scenario)	1.8%	0.4%	1.5%
UMR-IWW (Central scenario)	1.3%	1.0%	1.2%
UMR-IWW (Hypoxia scenario)	1.1%	0.8%	1.0%
UMR-IWW (Least favorable scenario)	-7.0%	0.2%	-2.0%
Jack Faucett & Associates (JFA)[c]			
UMR-IWW	1.4%	0.6%	1.2%
USDA[d]			
Total U.S. exports	3.2%	0.0%	2.1%
Adjusted UMR-IWW[e]	1.4%	-2.4%	0.3%

[a]Evans, Carroll & Associates, Dr. Michael Evans, *Determination of the Economic Impact of Increased Congestion on the Upper Mississippi River — Illinois River Waterway*, March 2002. Study commissioned by the National Corn Growers Association; growth rate projections are from 2000 to 2020.

[b] Sparks Companies, Inc., Upper Mississippi River and Illinois Waterway Navigation Study, "Economic Scenarios and Resulting Demand for Barge Transportation," May 1, 2002. Study commissioned by the Corps; growth rate projections are from 2000 to 2050. Growth rates are projected stronger through 2040, but fall off between 2040 and 2050 as projected export volumes decline due to projections of strong domestic use relative to production.

[c] Jack Faucett Associates (JFA), "Review of Historic and Projected Grain Traffic on the Upper Mississippi River and Illinois Waterway: An Addendum," September 20, 2000. Study commissioned by the Corps; growth rate projections are from 2000 to 2050. JFA based their corn projections on USDA's 2000 baseline projections.

[d]USDA, Office of the Chief Economist, *USDA Agricultural Baseline Projections to 2013*, Staff Report WAOB-2004-1. Growth rate projections for 2003/04 to 2013/14.

[e]Adjustments are hypothetical constructs made by CRS based on USDA's long-run market outlook and potential trade shifts as described in the text of this report.

USDA's Long-Run Agricultural Outlook. USDA annually publishes 10-year baseline projections for the supply, use, and trade of most major field crops and livestock products in U.S. and international markets.[34] USDA uses a global, comprehensive country- and commodity-based system of models that incorporate a broad range of cross-commodity price and area effects in supply and demand relationships to project prices and trade patterns in international markets. Population projections (from the U.S. Census Bureau), and macroeconomic projections (from Global Insights and Oxford Economic Forecasting) of GDP growth and exchange rates for 40 regional markets underlie USDA's modeling process. Furthermore, the models are supported by analysts from several USDA agencies (including the Economic Research Service, Foreign Agricultural Service, Farm Service Agency, and the World Agricultural Outlook Board) that monitor and report on developments in U.S. and global commodity markets. As a result, USDA's long-run projections capture most of the fundamental economic forces underlying international commodity markets; allow for considerable supply-and-demand cross-commodity effects; and provide an internally consistent market outlook for U.S. production and trade in corn and soybeans.

The following paragraphs summarize USDA's current long-run outlook for the period 2003/04 to 2013/14 as it relates to projections for U.S. corn and soybean exports with an eye towards potentially emergent issues and how they might impact UMR-IWW barge demand.

Strong World Economic Growth; Increasing Export Competition. Strengthening global GDP growth over the next decade and beyond implies increased demand for livestock products and animal feeds which, in turn, supports increased international demand for corn, wheat, and soybeans and products. An inherent weakness in this projection is that much of the economic and demand growth is from "developing" countries, where optimistic projections have often turned out to be inaccurate.

USDA projects that global import demand for animal feeds will push growth rates for trade in major feed stuffs higher over the next ten years. However, increased competition in these markets is expected from both traditional exporters (Argentina, Australia, Canada, and the EU), as well as from countries that are in the process of investing in previously underdeveloped resources (Brazil, Hungary, Romania, Russia, Ukraine, and Kazakhstan). Heightened trade competition is expected to keep pressure on global prices, and to accentuate trade advantages afforded by geographic proximity, regional trade pacts, and bilateral and multilateral trade agreements.

U.S. Advantage in Global Corn Markets. USDA's long-run outlook for U.S. corn exports is very optimistic, bolstered by projections for strong, widespread international GDP growth and the gradual decline of China as a major corn exporter. Global trade in corn is projected to grow at about a 3%-per-annum rate. As a result of limited opportunities to expand corn production in foreign-producer countries, the

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[34]USDA, Office of the Chief Economist, *USDA Agricultural Baseline Projections to 2013*, Staff Report WAOB-2004-1, February 2004; available at [http://www.ers.usda.gov/publications/waob041/].

U.S.-market share of global trade is expected to rise from about 62% in 2003/04 to nearly 71% by 2013/14.

Two-thirds of the growth in demand for corn in international markets is projected to originate from three countries — Mexico, China, and Canada — which have strong potential to divert freight away from the UMR-IWW. The remaining one-third is comprised of demand growth primarily from Middle Eastern, African, and Latin American countries. Uncertainties include how rapidly and to what extent Eastern Europe and Brazil will expand their corn production. Greater-than-expected gains in production from these non-traditional exporters would likely result in increased competition in corn markets served by the UMR-IWW system — namely, Latin America, the Middle East, and Africa.

Another uncertainty regards U.S. growth in domestic use of corn versus its production. USDA projects that the annual growth rate in U.S. corn production will outpace the growth rate in domestic use by 0.5% (1.4% versus 0.9%). As a result, exportable supplies of corn are expected to grow by a robust 3.2% (see **Figure 5**). This would bode well for UMR-IWW barge demand if no dramatic changes in the proportion of corn moving by alternate trade routes were to occur.

South America to Dominate World Soybean Markets. As with corn, USDA projects strong global demand growth for soybeans and products resulting from optimistic projections for widespread global income gains over the next 10 years. Global trade in soybeans and products (expressed in whole soybean equivalents) is projected to grow at about a 3%-per-annum rate. However, most of the projected increases in whole soybean trade is limited to relatively few countries. Over 72% of projected global growth is attributable to expected increases in China's soybean imports. Growth in Mexico's soybean import demand is also projected to be robust accounting for 10% of the growth in world soybean trade. Growth in soymeal demand is more widespread emanating from several countries throughout the Middle East, Africa, Latin America, and Southeast Asia.

Uncertainties include how rapidly China will expand its imports of soybeans and products; to what extent Argentina and Brazil will expand their soybean production; and what might be the potential impacts of a widespread soybean rust outbreak in the United States.[35] Another uncertainty regards U.S. growth in domestic use of soybeans versus its production. USDA projects that the annual growth rate in domestic soybean crush (use) will outpace the growth rate in production by 1% (1.7% versus 0.7%). As a result, U.S. soybean exports are expected to decline marginally by -0.2% (Figure 6). U.S. exports of soymeal are expected to grow at a 2% annual rate and partially offset the decline in whole soybean exports. USDA's projections for U.S. soyoil exports are flat over the next decade, again due to South American competition. Combined exports of soybeans and soymeal (in whole-soybean equivalents) are expected to grow marginally at a 0.2% rate. However, a significant shift of U.S. soybean and product exports towards the PNW may occur given the

[35]For a discussion of the potential implications of a soybean rust outbreak in the United States, see CRS Report RL32225, *Asian Soybean Rust: Background and Issues*.

dramatic outlook for China's soybean import demand and the expected sharp increase in South American soybean and product exports.

Abundant land resources, particularly in central Brazil, suggest that South American soybean production will continue to expand rapidly for the next several decades. Expanding production coupled with investments in infrastructure are expected to greatly diminish the U.S. share of global soybean and product markets.[36] Argentina and Brazil are projected to capture over 95% of the global trade gains in soybean and products during the next decade. Furthermore, a recent USDA study estimated that every 1% increase in South American soybean production reduces the season-average farm price received for U.S. soybeans by 0.26 %.[37] USDA projects Brazil's soybean production to increase by 108% between 2003/04 and 2013/14, suggesting a 27% decline in U.S. farm gate prices over that period. This implies a strong disincentive for U.S. soybean production over the projection period.

Outlook Summary. The Corn Belt has a strong comparative advantage in the production of corn and soybeans that is likely to preserve the region's emphasis on production of these crops for years to come. As such, the UMR-IWW navigation system will likely remain an important component of U.S. corn and soybean export competitiveness. However, projections for substantial increases in UMR-IWW barge traffic will depend on corn and soybean production growing faster than their domestic demand, and the evolution of international market conditions that would favor the UMR-IWW system over alternate trade routes and transportation modes.

While the long-term outlook for corn production may be optimistic, the trend of the past five years suggests that domestic consumption, driven by growth in meat and dairy products, as well as increasing ethanol production, will continue to capture an important share of total use. The introduction of a renewable fuels standard (RFS), as proposed in pending energy legislation, could accelerate this process.[38] Furthermore, growing trade with neighboring NAFTA partners and the longer-term prospects for increased trade with East Asia suggest that alternate trade routes such as by rail to Pacific Northwest ports, or by rail and/or truck routes to Canada and Mexico are likely to garner an important share of future U.S. corn exports.

USDA's projected outlook for international trade in soybeans and soy-based products has important implications for the country-focus of U.S. exports. Soybean and products that use the UMR-IWW and Gulf Ports to access European, Middle-Eastern, African, and Latin American markets come into direct competition from Argentine and Brazilian exports. This could result in a re-focusing of U.S. exports towards nearby Mexican and Canadian markets, as well as the burgeoning China

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[36]USDA, Office of the Chief Economist, *USDA Agricultural Baseline Projections to 2013*, Staff Report WAOB-2004-1, February 2004; available at [http://www.ers.usda.gov/publications/waob041/].

[37]USDA, ERS, *How Does Structural Change in the Global Soybean Market Affect the U.S. Price?*, OCS 04D-01, Apr 2004; available at [http://www.ers.usda.gov/publications/OCS/APR04/OCS04D01/].

[38]For more information see CRS Report RL30369, *Fuel Ethanol: Background and Public Policy Issues*.

market via a growing Pacific Northwest corridor. Such a re-orientation could potentially result in smaller UMR-IWW barge demand from the U.S. soybean sector.

While it is likely that investments in the UMR-IWW navigation system would result in lower barge freight rates and increased demand for barge services, the actual magnitude of these outcomes will depend on the interplay of the many forces affecting U.S. agricultural export markets. Based on an evaluation of USDA's long-run outlook for international commodity markets, there appears to be substantial potential for future agriculture-related barge demand to fall far short of investment proponent's expectations.

For More Information

General Background

USDA, ERS, "Agricultural Baseline Projections" briefing room with long-run projections and market outlook discussion, at [http://www.ers.usda.gov/Briefing/Baseline/].

USDA, ERS, "Corn" briefing room with current and long-run projections and market situation and outlook discussion, at [http://www.ers.usda.gov/Briefing/Corn/].

USDA, ERS, "Soybeans and Oil Crops" briefing room with current and long-run projections and market situation and outlook discussion, at [http://www.ers.usda.gov/Briefing/SoybeansOilCrops/].

USDA, Agricultural Marketing Service (AMS), Transportation Services Branch, at [http://www.ams.usda.gov/tmd/TSB/index.htm].

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