
Chapter 5

U.S. Grain Exports and Trade Flows

Until well into the 19th Century, grain was traded regionally in relatively small amounts. Over the course of the past one hundred years, this relatively minor trade has burgeoned into a massive industry that ships millions of metric tonnes every day of the year.

As a share of total consumption, the international grain trade has risen from less than 0.03% in the nineteenth century to more than 20% in 2021. According to USDA data, the global grain trade has increased exponentially to an estimated 576 million tonnes in 2021. Despite the explosion in the volume of trade over the decades, it is still just a handful of nations that provides the bulk of the exports.

Between World War I and World War II, trade in grain first rose sharply due to technological advances, and then fell sharply due mainly to government policies. Following World War I, rapid improvements in steam-powered transportation and telegraph communications triggered a wave of globalization and a revolution in international grain trade. During this period the amount of world wheat production that was exported went from negligible to 18%. Nearly 90% this trade originated from four countries: the United States, Canada, Argentina and Australia. But the sudden increase in globally available supplies resulted in sharply lower grain prices, which hurt many farmers. Many governments reacted by imposing high tariffs on grains and other products, and world trade plunged.

With the advent of World War II commodity prices rallied. Following World War II, global trade once again rose rapidly. World population growth and rising prosperity increased demand for goods, and a reduction in trade barriers greatly facilitated trade. By the 1970's the United States evolved into the world's primary grain-trade superpower. By the end of the 20th Century, the United States annually exported one-third of the internationally traded wheat and 70% of traded corn. Many countries around the world came to depend upon the United States for a growing percentage of their grain needs.

THE GREAT RUSSIAN GRAIN ROBBERY OF 1971-73, AND THE U.S. – RUSSIAN GRAIN EMBARGO” OF 1979

Great Russian Grain Robbery

Volumes in the 1970s continued to rise dramatically, fueled in part by growing demand from the Soviet Union for grains and oilseeds. Two major events of the 1970s had a lasting impact on the international grain trade: the “great Russian grain robbery” of 1971-73, and the “U.S. – Russian grain embargo” of 1979.

By the 1960s, the U.S. and the U.S.S.R were deep in the middle of the Cold War. However, this did not stop the daily business of commercial trade between nations. By the late 1960s and early 1970s the United States was carrying uncomfortably large surpluses of grain that were a direct result of on-going government production subsidies and by prevailing government programs.

Given the combination of poor weather across the Soviet Union breadbasket (centered in the Ukraine), reoccurring crop failures, along with questionable agricultural policies, agricultural trade representatives from the Soviet Union often turned to foreign markets to make up shortfalls in seasonal production. In addition, the United States saw increased trade with the Soviet Union as a way to reduce Cold War tensions.

Prior to the 1970’s, the Soviet Union had purchased only a small quantity of wheat from the United States in 1963. In 1971 the Soviet Union began a policy of importing grain every year to feed its people and increasing livestock herds.

With satellite imagery for crops still over a decade away, harvest estimates were largely dependent on extrapolations from weather reports and direct field observations. Despite reports of crop failures in the Soviet Union and elsewhere in the world, neither governments nor international organizations, nor the grain trade appreciated the magnitude of the pending global grain shortage.

The following year, in 1972, faced with increasing shortages and rising domestic prices, the Soviet Union unexpectedly and quietly bought 10 million tons of wheat, approximately one-fourth of annual total U.S. wheat production. Once the scope of these purchases became known, grain prices rallied sharply

Federal grain subsidies continued to favor bargains for the Soviets buying American wheat. As domestic supplies of U.S. wheat and other grains began to tighten as the large stockpiles of wheat and corn where sharply

reduced. Prices rose sharply, resulting in a “world food crisis” in the United States and elsewhere. In 1973 global food prices increased as much as 30%.

It was estimated in a 1973 paper for the Brookings Institution that the U.S. government wasted \$300 million in public funds by unwittingly subsidizing the Russian wheat purchases. It was also estimated a similar amount was lost in additional potential government revenue. This event became known as the “**Great Grain Robbery**”. However, in its wake, a new market and trade flow for U.S. grain had been created. The Soviet Union would continue to import grain for decades to come. Over the next 20 years the Soviet Union would annually import record volumes of grain, growing from 27 million tonnes in 1975 to a record-high of 47 million tonnes in 1985. These event marked the beginning of the agricultural boom of the 1970s.ⁱ

U.S. – Russia Grain Embargo

However, this trade was far from smooth or free from politics. Then, in late 1979, the Soviet Union invaded Afghanistan. Following, in January of 1980, in response to the invasion, U.S. President Jimmy Carter enacted a grain embargo against the Soviet Union. The embargo remained in effect until President Ronald Reagan upon taking the office in 1981.

The American farmer felt the brunt of theses sanctions as it caused U.S. grain prices to fall sharply. At the same time, the effect of the embargo on the Soviet Union was minimal as they were able to purchase grain from other origins such as Argentina, Brazil and Venezuela. These sources were cheaper than the U.S. grain, as the cost of labor and other costs were much cheaper, though logistical supply chains were less developed.

Although the embargo was lifted the year after it was put into place, the damage had been done to the United States’ reputation as a reliable supplier of agricultural commodities, bringing the effectiveness of unilateral grain embargoes as a foreign policy tool into question as well.ⁱⁱ

Out of these unsettling agricultural and economic events of the 1970s, a number of increasingly robust reporting, monitoring and forecasting programs were established. In addition to several agencies within U.S. intelligence agencies, along with the U.S. Department of Agriculture (USDA), and the National Oceanic and Atmospheric Administration (NOAA), These organizations generate a number of periodic reports covering domestic and world crop production estimates, and sales reporting, along with trade flow and supply & demand analysis.

FLOATING EXCHANGE RATES

Under the post-World War II Bretton Woods ⁱⁱⁱ system of fixed exchange rates, the U.S. Dollar had a fixed value against gold. However, by the early 1960s the U.S. Dollar was becoming significantly overvalued against other currencies due to an increase in U.S. deficit spending driven primarily by both President Lyndon Johnson's Great Society programs and increases in military spending due to Cold War tensions and the Vietnam War. Through a series of events between 1968 and 1973 this establish system, known as the "gold standard", was dismantled.

Floating the U.S. Dollar

In August of 1971, U.S. President Richard Nixon announced a "temporary" suspension of the dollar's convertibility into gold. While the dollar had struggled throughout most of the 1960s remain within the parity levels established at Bretton Woods, this action marked the initial breakdown of the system. Subsequent attempts to revive the fixed exchange rates failed, and by March 1973 the major currencies began to float against each other. ^{iv}

The floating of the U.S. Dollar resulted in a sharp decline in its value in relation to other currencies. This made U.S. grain relatively "cheaper" for importing countries to purchase.

Since the collapse of the Bretton Woods system in the early 1970s, International Monetary Fund (IMF) members have been free to choose any form of monetary exchange rate arrangement (except pegging their currency to gold); allowing the currency to float freely, pegging it to another currency or a basket of currencies, adopting the currency of another country, participating in a currency bloc, or forming part of a monetary union.

This devaluation and floating of the U.S. Dollar and other currencies has been a contributing factor, not only to the increase in the price of gold and other precious metals, but also to the general increase in price of commodities across the board.

THE RISE OF GLOBALIZATION SINCE WORLD WAR II

To avoid any misunderstanding let's define "**globalization**" as the spread of technology, products, goods, service and information, across nations. It takes place through a variety of interlinked forces that includes communications, economics, culture, communications, politics, and the environment.

Difference Between Globalization and Globalism

However, let us make a clear distinction between “globalization” and “globalism”. Although “globalization” and “globalism” are similar concepts, there is a difference between them. The primary difference between However, let us make a clear distinction between “globalization” and “globalism” is that globalization is the spread of technology, products, information, and jobs across nations; while globalism is an ideology based on the belief that people, information, and goods should be able to cross national borders unrestricted.^v

The rise of globalization, since the end of World War II can be seen as the result of a series of events. Each of these have had a notable impact on the global grain trade.

Initially, an effort of post-World War II reconstruction and to break down barriers to commerce and trade, culminated in the Bretton Woods conference. The subsequent agreement by world leaders led to a framework for international commerce and finance, along with the founding of several international institutions designed to oversee the processes of globalization. These institutions included the International Bank for Reconstruction and Development (the World Bank), and the International Monetary Fund (IMF).

WTO

Original efforts to remove restrictions on international trade and reduce barriers were carried out as a result of the General Agreement on Tariffs and Trade (GATT), signed on the 30th of October 1947 by 23 countries. This agreement was an effort minimizing barriers to international trade by eliminating or reducing quotas, tariffs, and subsidies while preserving significant regulations. These discussions led to a further series of related agreements.

The GATT Uruguay Round (1986 to 1994) led to a treaty to create the World Trade Organization (WTO) to establish a uniform platform for international trade and a system to mediate any arising trade disputes.

In 1995 the WTO was formally established, an organization for which GATT provided the initial foundation. The WTO is to be an intergovernmental organization that regulates and facilitates international trade between nations. Governments were to use the organization to establish, revise, and enforce the rules that govern international trade.

The efforts of these organizations were to promote free trade by:

- Reduction or elimination of tariffs; creation of free trade zones with

low or no tariffs;

- Reduction or elimination of capital controls;
- Reduction or elimination of subsidies for local businesses;
- Harmonization of intellectual property laws across the majority of states, with more restrictions and penalties for violations;
- Supranational recognition of intellectual property restrictions (e.g. patents granted by China would be recognized in the United States and all other signatories to the agreement).

Along with these efforts we have also witnessed other bilateral, regional, and multilateral trade agreements, including sections of Europe's Maastricht Treaty 1992 (the foundation treaty for the European Union), and the North American Free Trade Agreement (NAFTA) 1994, among many others. In fact, many countries have found it easier and more feasible to pursue these smaller agreements than to try to update the WTO.

Globalization

Globalization and liberalized regulations international business activities, supported an increasing trend in trade, was further driven by the growth of multinational companies. Many of these companies were initially based in the United States, Europe, and Japan, expanding later across Southeast Asia, China, and elsewhere. These multinational organizations facilitated the exchange of goods and services, along with developments in science and technology. In the wake of these events world grain exports rose from 8.5% in 1970, to 16.2% of total world production in 2001.^{vi}

Further advances in technology continued to accelerate the rapid pace of globalization. Since the 1990s, the growth of low cost global communication networks, reaching increasingly into lower income countries, has allowed greatly increased the speed, volume, and efficiency of and reduced the costs communication, financial transactions, and transfer of data, along with other relevant information.

Within the context of agricultural commodities and trade, globalization can be characterized by the interconnection of local private and public markets into one global arena, with a globally accepted set of rules and regulations.

Rapid economic development and population growth has triggered increasing demand for meat and poultry. This trend combined with a gradual opening of developing markets has resulted in sky-rocketing global demand for grain and oilseeds.

At the same time, the revolution in yields and grain production that began during the Green Revolution of the 1970's, and commercialization of biotechnology crops (GMO's) beginning in the late 1990's provided sufficient supply to meet this demand. This progress in productivity continues today as technological developments are being adopted at an increasingly rapid pace. Despite significant price fluctuations from year to year, global grain prices on average have not increased dramatically in real terms over the past several decades.

Over the first quarter of the 21st Century the United States continues to ship record amounts of grain, but has lost market share in whole grain exports as other countries increase their respective exports.

While the United States remains a key exporter, its No. 1 position in soybeans has been supplanted by Brazil, and by Russia as the No. 1 wheat exporter. The United States continues to feel competitive pressure in corn exports from Brazil, Argentina and the Ukraine, driving down its export share.

Globalization

In the 1970's Brazil emerged as a major soybean exporter and continues to play an increasingly significant role in global markets for other agricultural commodities. This role is likely to continue to grow in the decades to come.

Perhaps one of the greatest transformations in the grain trade in recent years can be seen in Russia. The nation moved from a net grain importer of 3 million tonnes per year on average from 1996-2000 to a net exporter of an estimated 49 million tonnes of wheat and coarse grains in 2020-21.

In the last 30 years, grain production in Russia increased by 66% as new land was brought into production. Average yields increased by 76%, further increasing production. By 2000, Russia began consistently producing exportable surpluses. Russia is now the world's largest wheat exporter exporting in 2020/21 39.1 million tonnes out of its 85.3 million tonnes harvest.

Canada was for many years the number one market for U.S. grain exports. While remaining a major market, the rapidly growing economies of Japan, Korea, Mexico and more recently China has been taking increasing volumes of U.S. commodity exports. Competition between major exporters for this business has increased as productivity in other countries has increased proportionately.

More recently, China's emergence as a consistent and major grain importer is a major development. With over one-fifth of the world's

population, it has only 7% of the world's arable land. Imports first surged in the 1990s, following economic reforms, and have continued to increase annually as the nation emerged from isolation. In the first decade following its 2001 accession into the World Trade Organization, China's imports were led by soybeans. By 2021 China had become the largest importer corn and soybean at over 29 million tonnes and 100 million tonnes, respectively, and buying over 10 million tonnes of both grain sorghum and wheat.

In recent years China has also become the primary destination for grain sorghum. This has been driven by their increasing domestic demand for feed grains, along with the growing consumption of Baijiu, a colorless liquor typically coming in between 35% and 60% alcohol by volume.

With one of the fastest-growing economies in the world in which animal protein is highly prized, imports of corn and other feed grains is likely to fix China as a dominant force for the foreseeable future.

SUPPLY CHAIN – STORAGE, HANDLING AND TRANSPORTATION

Globalization

Continuous improvements across the supply chain are another pillar supporting the explosive growth in grain trade since WWII. Advances in the storage, handling and transportation sectors increased operational efficiency. These developments created capacity for the large increase in volumes and a resulting drop in per unit costs.

An example of these improvements can be seen with the advent of the 100 car "unit train". Larger ocean vessels, improvements in loading and unloading technologies, and more reliable and efficient surface transportation, have greatly facilitated the global movement of agricultural commodities, as well as all goods.

One of the dramatic advances in transportation came with the introduction of shipping containers and the development of the inter-modal network. Although comprising only a small portion of total grain and other related agricultural commodities, shipping containers provide added traceability for specialty bulk grains such as higher value "Identity Preserved" or "Organic" grains that are purchased in smaller volumes. In addition, containers allow shipping of processed grains such as meal, starch, and flour.

Another key development supporting the expansion of the global grain trade has been the revolution in communication and technology. As explained in other chapters, the development of instantaneous global access to market, pricing, and other information has created international commodities markets in which traders around the world can conduct

business with confidence and reduced risk. As we progress through the 21st century, the demand for timely information will also continue increase along with the need for food, fiber and fuel.

LOOKING AHEAD...

When measured by volume, capacity, quality, and cost per unit, the international grain trade is unquestionably the most productive and efficient it has ever been.

Looking to the future, the global grain trade is likely to be shaped by the same combination of factors that shaped its past, including evolving production technology, changing population trends, changing demographics and dietary preferences, income growth, continuing advances in transportation, distribution, and communications, and the overriding impact of evolving government policies.

Looking Ahead

A recurring issue is the “**food versus fuel**” dilemma, i.e. whether to divert a certain portion of limited farmland or crops for the production of renewable biofuels instead of for food. This long-standing debate involves wide range of views over how to strike this balance. There is continuing disagreement on the significance of the issue, what may be causing it, as well as what can or should be done to remedy the situation. Especially in times of shortages and high prices, this debate can become quite heated and controversial. For example, the current global push for renewable biofuels and electric v. fossil fuel vehicles is likely to grow in coming years, along with the demand for improved diets.

Another element that makes the “food v. fuel” debate so difficult to resolve is the fact that today’s food and agricultural production, processing, distribution and storage systems require tremendous amounts of fuel and other forms of energy to function.

In addition to the traditional factors discussed above, there are a number of new drivers on the horizon that appear certain to impact the trade flow of agricultural commodities. These include how governments and producers adapt to climate change, along with an increasing focus on the “sustainability of production.

Despite the technical advances that allow grain to be shipped in ever greater volumes, the age-old issues of protectionism, tariffs, quotas, scientifically unjustified technical trade barriers, and prohibitions on exports continue to constrain trade. As described above, the flow of commodities in and out of countries has fluctuated significantly as government policies evolved and changed. Primary drivers of freer trade were population growth (especially in developing countries), income

growth, and the desire to access cheaper food sources.

In the near future we can anticipate that changing population demographics are going to play a greater role in shifting demand. Changes in geographic distribution of populations, and a projected negative population growth rate, will dramatically impact demand for food, fiber and fuel.

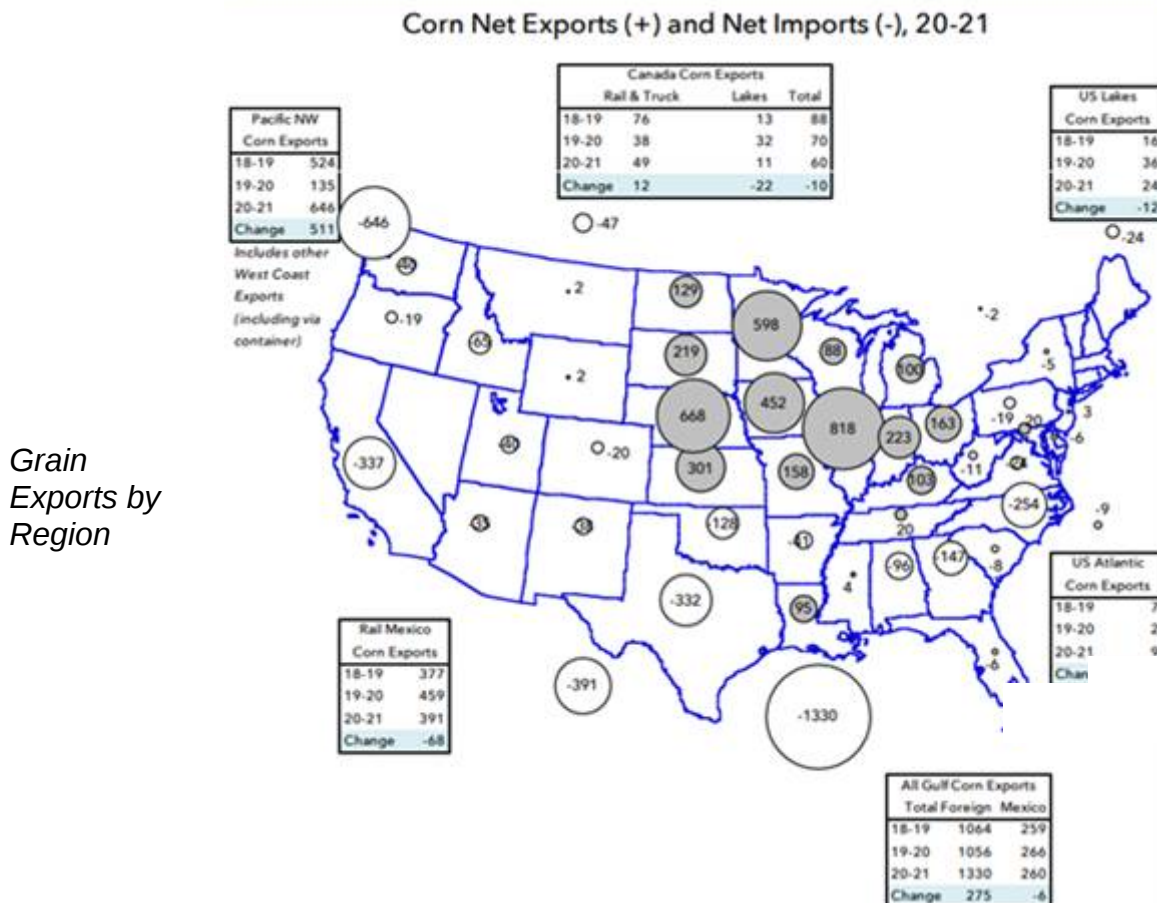
History has shown that grain flows will shift over time, sometimes rather quickly. Political events can impact global trade for years and even decades to come. There are lessons to be learned in studying events of the past.

While it's not possible to precisely identify what the next disrupting event may be and how trade flows may shift, we must always be alert to potential issues on the horizon.

UNITED STATES GRAIN EXPORTS REGIONAL AREAS

Changing global and domestic economic conditions drive the demand for food and agricultural products, providing the foundation for U.S. agricultural trade. The underlying drivers of these changes include world population, disposable income, economic growth, and trade policies. Other factors affecting agricultural trade include global supplies and prices, changes in exchange rates, and government support for agriculture. As such, the composition and pattern of both agricultural exports and imports shift to reflect changes

The U.S. is the world's second largest trader of agricultural commodities and products, following the European Union. U.S. agricultural exports and imports have both increased significantly over the last quarter century. This had been due to the economic ascension of many emerging economies, as well as the implementation of policies that have expanded U.S. access to foreign markets. Over that same period, the geographic and product composition of U.S. agricultural trade has shifted, as rising incomes and growing supply capacity of emerging economies have reshaped global supply and demand for agricultural and food products.



The United States has a significant exportable surplus of grains and oilseeds. The United States exports approximately 25 percent of the grain it produces and just under half of its soybeans.



This surplus is exported from every coast in the country, as well as from Canadian ports along the St. Lawrence Seaway and in the Pacific Northwest. In addition, notable volumes are exported across land borders to neighboring Canada and Mexico by both road and rail transport. These can be divided into seven geographical ranges:

- U.S. Gulf
 - Mississippi River / Center Gulf / NOLA
 - Texas / Western Gulf
 - East Gulf / Mobile
- Atlantic Coast
- Pacific Northwest
- Great Lakes
- Interior
 - Mexico
 - Canada
 - Los Angeles / Long Beach (*Container Ports*)

Each of the six export ranges handling grain export, (four via ocean ports and two by land crossings), have a unique relationship with one or more

*Grain
Exports by
Region*

interior producing regions. This relationship is characterized by its geography and the underlying mode of transportation used to bring these commodities into an export position.

The two largest grain exporting regions in the U.S. are the U.S. Gulf and the Pacific Northwest (PNW). Typically, a larger share of ocean-vessel loading activity (corresponding with a higher volume of grain exports) occurs in the U.S. Gulf.

However, there is a competitive pricing tension and market dynamics between these two important exporting regions. Generally, as ocean freight rates increase, the relative rates of shipping from the PNW relative to the Gulf (the freight spread), result in the more competitive rates from the PNW. This will cause some shippers to switch their export grain shipments from the Gulf to the PNW as it becomes the overall lowest cost pathway. As the “freight spread” continues to increase, even more shippers will switch from the Gulf to the PNW. This will be reflected in a drop in exports (along with a drop in vessel loading activity) through the Gulf and more through the PNW.

Conversely, as ocean freight rates decrease, the relative rates of shipping from the PNW relative to the Gulf (the freight spread), result in the more competitive rates from the Gulf.

It is also important to note here, the shipping time to east Asian destinations from the PNW is about two weeks less than that out of the Gulf when transiting the Panama Canal.

U.S. GULF

U.S. Gulf - An area that includes Mississippi Gulf, Texas Gulf, and East Gulf.

The U.S. Gulf, which spans the coast line of the Gulf of Mexico is divided into three areas that are generally referred to as the East Gulf, Center Gulf and the Texas or West Gulf.

- The East Gulf refers to the ports of Mobile, Alabama and Pascagoula, Mississippi.
- The Center Gulf refers to the Mississippi River in the general vicinity of New Orleans, Louisiana.
- West Gulf refers to ports in Texas.

Of these areas, the most important by far is the Center Gulf, which is located at the downstream terminus of the Inland Waterway. Soybean export shipments from the East Gulf each year are usually limited to locally grown soybeans for which the East Gulf represents the most convenient market.

MISSISSIPPI RIVER SYSTEM / CENTER GULF

Mississippi River / Center Gulf - A grain export region that includes export elevators along the Mississippi River at Ama, Belle Chasse, Convent, Darrow, Destrehan, Paulina, Port Allen, Reserve, and Westwego, LA.

The greatest number of U.S. export elevators and facilities are located upriver from the Gulf along the inland waterway system connected to the Mississippi River. These export elevators take advantage of barge transportation to ship bulk commodities efficiently at relatively low costs from the interior to ocean-vessel loading areas along the Gulf Coast.

Mississippi River / Center Gulf

This Center Gulf region, services the Mississippi River and its navigable tributaries that extend deep into the fertile heart land of North America's grain producing regions. The Mississippi River system is the primary waterway for moving agricultural products by barge. It is especially important for transporting bulk grains and oilseeds from the Midwest to export ports in the New Orleans region.

Long before the first European explorers reached the waters of the Mississippi River, Native Americans were using this network of rivers for travel and trade.

Over the past 500 years the Mississippi River and its tributary waterways have evolved into the largest navigable inland waterway system in the world providing a transportation gateway into fertile prairies and plains found in the interior of the United States.

Today the Mississippi River system continues to be the primary artery for U.S. grain exports serving global markets for corn, sorghum, wheat, soybeans and other grain products.

The New Orleans Port Region is used to move a significant percentage of U.S. waterborne agricultural exports *****?***** percent in ********. The majority of these exports were bulk grains and bulk grain products, such as corn, soybeans, animal feed, and rice.

Mississippi
River /
Center
Gulf

[illegible]

South Louisiana, includes:	
- Ama	▪ Baton Rouge
- Convent	▪ Darrow
- Destrehan	▪ Gramercy
- Reserve	▪ Myrtle Grove
- St. Elmo	▪ New Orleans
- Westwego	

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Tennessee, White, Cumberland, Alabama and Minnesota Rivers. Through this system, river transportation reaches into every Corn Belt state, providing easy access to 80 percent of U.S. corn production, more than 33 percent of sorghum production and up to 15 percent of barley production.

River terminals receive feed grains by truck or rail and transfer it into barges, each carrying approximately 1,500 tons, which are collected into tows of six or more barges and moved downriver to New Orleans or another river port.

Barge transportation is actively traded on a daily basis between suppliers and users. , quoted in percentage of tariff, and a cost schedule established with prices for each river shipping point.

*Mississippi
River /
Center
Gulf*

The U.S. Inland Waterway System utilizes an open market and a “percent of tariff” system to establish market based barge freight rates.

The tariffs rate were originally part of the Bulk Grain and Grain Products Freight Tariff No. 7, which were issued by the Waterways Freight Bureau (WFB) of the Interstate Commerce Commission (ICC).

Each location / city on the river has its own benchmark tariff rate, with the northern most cities, being a greater distance from New Orleans, La. having the highest benchmark tariff rates.

In 1976, the United States Department of Justice entered into an agreement with the ICC and made Tariff No. 7 no longer applicable.

Today, the WFB no longer exists and the ICC has become the Surface Transportation Board of the United States Department of Transportation. However, the barge industry continues to use the tariffs as benchmarks as rate units.

To calculate the rate in dollars per ton, multiply the percent of tariff rate by the 1976 benchmark.

For example, a 200% tariff for Minneapolis-St. Paul barge grain would equal 2.00 times the benchmark rate of \$6.19, or \$12.38 per short ton.

Once a barge arrives in port, a fast, modern, export terminals transfer grains from the barge into storage or waiting ocean vessels. There are over a dozen such terminals along the lower Mississippi from Baton Rouge, La. to the Southwest Pass. A good number of these facilities can load out more than 50,000 mts in a single day, drastically reducing the cost and the time a

vessel spends in port.

Not all grain moves by river barge to Mississippi export terminal, with supplement supplies moving by rail. Trains of up to 120 cars, carrying more than 10,000 mts, will also carry grains to these same export facilities.

Rail movement must compete with cheaper barge transportation to move grain from a range of diverse and over-lapping geographic regions. While the cost of rail freight is generally much higher, its time in transit is much shorter. Nonetheless, in a given year, an average of 10 percent of the grain delivered to Center Gulf ports will arrive by rail.

As grain can be delivered to these center gulf export facilities by barge, rail and road truck. Port terminal operators will originate deliveries utilizing a combination of transportation modes from a range of origins to not only minimize their sourcing costs, but to also maximize their operational efficiencies.

Reference to map of U.S. Mississippi - Center Gulf:
https://www.bluewatershipping.com/maps_ms.php

TEXAS GULF

Texas Gulf - A grain export region including export elevators located in Beaumont, Brownsville, Channelview, Galena Park, Galveston, and Corpus Christi, Texas.

Texas occupies a unique and strategic place in U.S. Grain transportation logistics. Its geography in the southwest along the Gulf coast, provides easy access to Mexico, Europe, West Africa, and Latin America countries, as well as access to Asia via the Panama Canal. The geographical location of Texas makes it a strategic hub for grain transportation.

Texas or West Gulf

There are several ports that handle grains along the Texas coast. Although they are principally wheat facilities designed to receive the trains of hard winter wheat that originate in Kansas, Oklahoma, Nebraska and Texas. They also service coarse grains, principally corn and grain sorghum, grown in these states as well.

This grain arrives mostly by rail, except for truck deliveries that originate in coastal areas of Texas where sorghum and corn are both produced. Rail in multi-car units moves along the BNSF, Missouri Pacific, Southern Pacific and Union Pacific railroads to facilities in Brownsville, Corpus Christi, Galveston, Houston and Beaumont in Texas. Occasionally, in times of extreme transportation squeezes at the Center Gulf because of

river problems or concentrated demand, corn will move from Nebraska and Iowa to Texas, but this is quite unusual.

Many of these facilities are, except for their reliance on rail delivery, as fast and efficient as their Center Gulf counterparts. They are also extremely fast in loading vessels and keeping waiting time to a minimum.

The top destination countries for grain exports from Texas ports were: China, Mexico, and Indonesia.

Reference to map of U.S. Texas Gulf:

https://www.bluewatershipping.com/maps_texas.php

EAST GULF

East Gulf - A grain export region, which includes the export elevator in Mobile, Alabama and Pascagoula, Mississippi.

The East Gulf is a coastal port region with direct access to 1,500 miles of inland and intracoastal waterways serving the Great Lakes, the Ohio and Tennessee river valleys (via the Tennessee-Tombigbee Waterway), and the Gulf of Mexico.

East Gulf

The major port in this region is the Port of Mobile, Alabama. The public and private terminals handle containerized, bulk, break bulk, roll-on/roll-off, and heavy lift cargoes. The bulk facilities have immediate access to two interstate systems and five Class I railroads. The Port of Mobile is maintained to a depth of 45 feet.

This port generally handles smaller and more specialized shipments of grain, particularly when extra capacity is required.

Reference to map of U.S. East Gulf:

https://www.bluewatershipping.com/maps_mobile.php

ATLANTIC COAST

U.S. Atlantic Coast

Atlantic Coast- A grain export region that includes export elevators along the coastal waterways in Brunswick, GA, Albany, NY, and Chesapeake, VA.

Much like the Texas Gulf, elevation capacity on the U.S. Atlantic Coast has been contracting. Grain elevators in Philadelphia and Norfolk have been shut down or destroyed. Still the Atlantic Coast has the capacity to elevate grain with facilities in Baltimore, Md.; Norfolk, Va.; Charleston, S.C.; and Savannah, Ga. can receive grain by rail and truck for export.

The export facilities in Norfolk compete with both the Center Gulf and Great Lakes ranges for corn origination out of the states of Illinois, Indiana, Michigan and Ohio.

When importers from Europe or North Africa are active corn buyers, the Atlantic Coast has an advantage over the Gulf because of its physical proximity to these destinations. For the most part, high rail transportation costs consume this freight advantage the Atlantic Coast has over the Gulf. Furthermore, each of the elevators that handle feed grains on the Atlantic has some kind of draft or vessel size restriction.

Reference to map of U.S. Atlantic Baltimore / Norfolk Coast:
https://www.bluewatershipping.com/maps_usec.php

PACIFIC NORTHWEST (PNW)

Pacific Northwest (PNW) - A major grain export region that includes Portland, Oregon; Kalama, Seattle Tacoma, and Vancouver, Washington. Located tributary to the Columbia River system in the Pacific Northwest, it is a major location of bulk grain and oilseed exports.

The Lower Columbia River, which empties into this port region of Puget Sound, is currently maintained at a 43 ft. draft, making it unable to accommodate the largest dry bulk ships.

However, the greatest advantage the PNW ports is their proximity to Asia relative to Gulf and Atlantic ports. Investments on the Lower Columbia River and Puget Sound are indicative of the region's geographical advantage and exporters' confidence in future growth in northeast Asia demand for bulk commodities.

Pacific Northwest

In addition, to feed this important export location, western railroads have made a significant investment into transportation assets linking the PNW with both coal fields in the western plains and grain producing areas of the Northern Plains and the Midwest.

The Pacific Northwest export facilities have a freight advantage over U.S. Gulf locations when shipping to destinations in east Asia or the Pacific. Due to the much shorter distance, this freight advantage works the same way as when the U.S. Gulf or Atlantic Coast locations are shipping to European and west Africa destinations and crossing the Atlantic Ocean. The much shorter distance, along with an approximate 12 day shorter transit time, from the PNW to Asian destinations, as well as the savings in costs of not having to transit the Panama Canal, allows importers to pay a substantially higher price for feed grains delivered from that coast.

Again, like the Atlantic, the Pacific Coast range must compete with the Mississippi River system to originate feed grains for export. The “price spread” between the two points of origin can be very dynamic at times as underlying market fundamental change. Even though the Pacific Coast has a large, consistent ocean freight advantage, it is still a good distance from significant volumes of inland grain production. The reach (drawing arc) of the PNW does may not begin to cover the bulk of feed grains production. The ocean freight advantage may only cover a portion of the cost when competing with grain from the U.S. Gulf and the interior river system.

Reference to map of U.S. Pacific Northwest Ports:

https://www.bluewatershipping.com/maps_pacific.php

GREAT LAKES

Great Lakes - A grain export region that includes U.S. export elevators in Duluth, MN; Milwaukee and Superior, WI; Chicago, IL; Portage, IN; Huron, Maumee, and Toledo, OH. The region also includes Canadian elevators in Windsor, in the Province of Ontario; and Baie Comeau, Montreal, Port-Cartier, Quebec City, Sorel-Tracey, Trois Riveieres, in the Province of Quebec.

The Great Lakes comprise a unique inland waterway system. Access to the Lakes' ports is through the St. Lawrence Seaway which consists of a lock system connecting Lake Superior and Lake Huron at Sault Ste. Marie and lakes Erie and Ontario (bypassing Niagara Falls) via the Welland Canal.

The Great Lakes

Great Lakes ports cannot directly benefit from larger vessels sizes as the Welland Canal and St. Lawrence Seaway locks (which can pass vessels 740' in length, 78' in width and drafting 26'9") are too small to accommodate even the older Panamax-sized vessels. A separate class of vessels has been built, since the completion of the Seaway, with the specific intention of plying the waters of the Great Lakes. Naturally, they have shallow drafts and narrow beams that just allow them to pass through the lock system. They are called Lakers and can carry about 25,000 mts of heavy grain. Grain loaded in these specialty vessels at lake ports is then discharged at export facilities in the St. Lawrence River.

Importers can charter a vessel to go into the seaway and load grain at a lake port, buy a portion of their cargo in the lakes (usually two-thirds) and load the balance at a St. Lawrence facility (the final third) or lift the entire cargo from a St. Lawrence facility.

However, economics will still present economic opportunities for export to Europe and other destinations. Differences in Laker freight, ocean freight, vessel size and port discharge capacity will determine which is most economical.

It is also important to note that the Lakes are closed during the winter due to ice, generally from mid-December to early April, because of ice.

One other significant difference compared to originating grain from other ranges is that the buyer must decide whether the grain will be purchased on certificates issued at the interior lake port or based on a new inspection (and/or new weighing) as it is transshipped. Although inspectors for the United States Department of Agriculture's (USDA) Federal Grain Inspection Service (FGIS) are in Canada, ordinarily a new inspection at the time of transshipment is not undertaken (and not unless specifically requested by the buyer). If a new inspection is not performed, the shipment is traded based on the original grade issued at the first load port; this is commonly known as "Western Inspection." This is, for the most part, a matter of indifference, but a buyer should be aware that a Western Inspection will be used unless a Seaboard Inspection at the time of transshipment is specified.

The price of lakes' freight, like barge and rail freight in the United States, trades freely over time and determines how competitive execution will be. Several the lakes' ports also double as points for delivery against the CME / CBOT corn and wheat contracts.

INTERIOR

Interior - An area that includes direct overland exports by road or rail to destinations in Mexico and or Canada. While there is some cross-border trade executed by road truck. The greatest portion of this volume is executed by rail to end user markets in Mexico, perennially one of the top two buyers of U.S. corn.

In the wake of the North American Free Trade Agreement (NAFTA), which was enacted in 1994 and created a free trade zone for Mexico, Canada, and the United States; grain and other agricultural commodities began to move quite freely between these three countries.

Interior

This important trade relationship was reaffirmed with the implementation of the United States–Mexico–Canada Agreement (USMCA) in July of 2020, and is sometimes characterized as "NAFTA 2.0", since it largely maintains or updates many provisions from its predecessor. This further improved the relationship between the three countries making the trade of agricultural commodities a rather seamless process between these important trading partners..

Rail is a major form of transportation modes for moving agricultural commodities. The U.S. has an extensive nationwide rail system capable of moving grain and soybeans to destinations throughout the U.S., as well as across borders to export destinations in Mexico and Canada.

Most grains are shipped by train in large hopper cars that carry 80 to 90 metric tons each. To achieve maximum efficiency many rail shipments, especially those to export points, are in trains of 100 to 120 cars carrying approximately 10,000 tons that are loaded, moved and unloaded together as a single “unit train” or “shuttle”. They are then returned as a single unit to be loaded again.

Many of these hopper cars are leased by exporters and dedicated to their use.

INTERIOR – INTERMODAL

Interior Intermodal – To accommodate a diverse customer base, U.S. grain exporters use both intermodal containers and dry bulk vessel modes of transport. Over the past three decades, containers moving through the intermodal network, have become a normal part of the grain export supply chain.

The United States moves less than 10 percent of its total grain exports by container each year.^{vii} The largest part of this are higher valued commodities such as soybeans and processed products of distillers dried grains (DDGS), animal feed, soybean meals, etc... Over the past several years the top containerized grain products has shifted between soybeans and distillers dried grains (DDGS). These products are generally moving to high value destination markets.

Generally, container shippers have an established service contracts either directly with an international ocean carrier or through a freight forwarder. These affreightment contracts provide a relatively stable rate structure over a period of time that protects shippers from sharp market rate fluctuations. However, these contracted rates are confidential.

In addition, container shippers will also utilize the spot freight market to take advantage of short term rate reductions to certain destinations to supplement additional export capacity. While these spot rates provide an overall trend of container rates, but they do not show the specific impact on individual commodities.

Intermodal

While freight and transportation costs for container shipments are generally higher than that for bulk vessel execution, other logistical costs, storage and handling charges, at the destination; along with financing considerations by the buyer, will often make purchases by container more attractive.

Intermodal containers are crucial for identity-preserved, specialty grain markets, and for customers with smaller volume demands. They tend to service niche markets larger volume bulk grain execution cannot service.

Over 90 percent of U.S. containerized grain is shipped to Asian markets such as Taiwan, Indonesia, Vietnam, and Korea. The chart below presents the top 12 destination markets for U.S. containerized grain exports. Use the filter function to view a particular year or month. Additionally, clicking a section of the chart will show the top grain products exported to that country.^{viii}

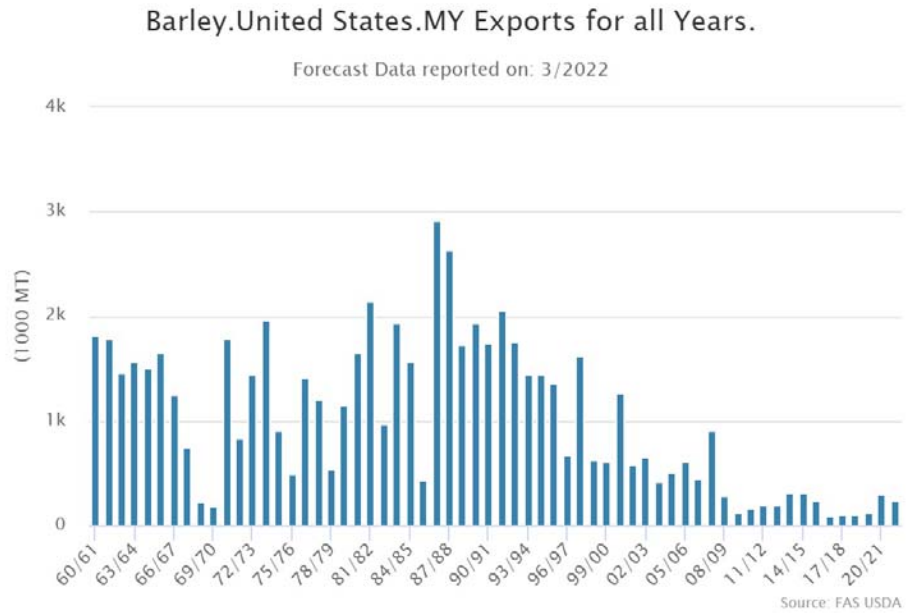
Containerized grain exporters use the Los Angeles and Long Beach port complex approximately 50 percent of the time, making this the busiest container port region in the country.^{ix}

This port region is advantageous to shippers because it typically has access to the widest range of ocean container freight services, the greatest vessel capacity, and often the lowest ocean freight rates from

ocean container carriers.

Additionally, regular rail service from Chicago and other mid-western locations makes Los Angeles and Long Beach significant partners for containerized grain exporters.

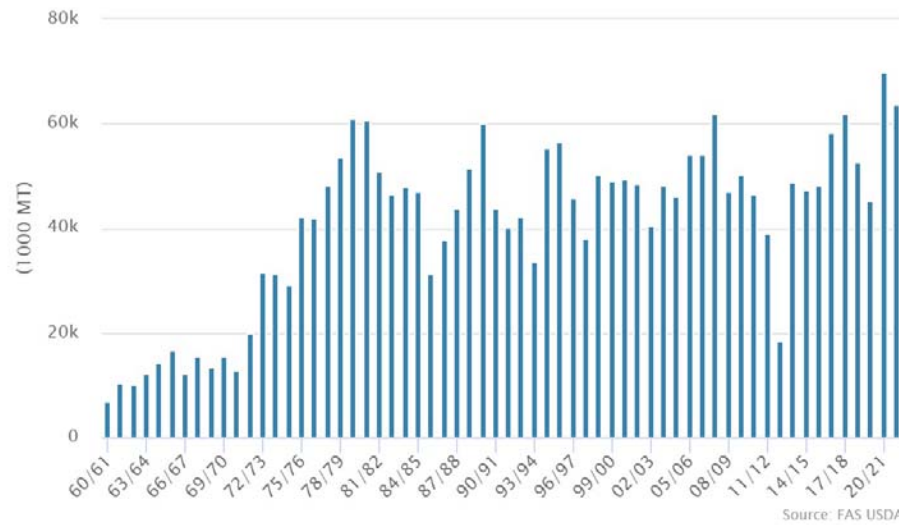
HISTORICAL UNITED STATES EXPORTS AND DESTINATION MARKETS



Barley

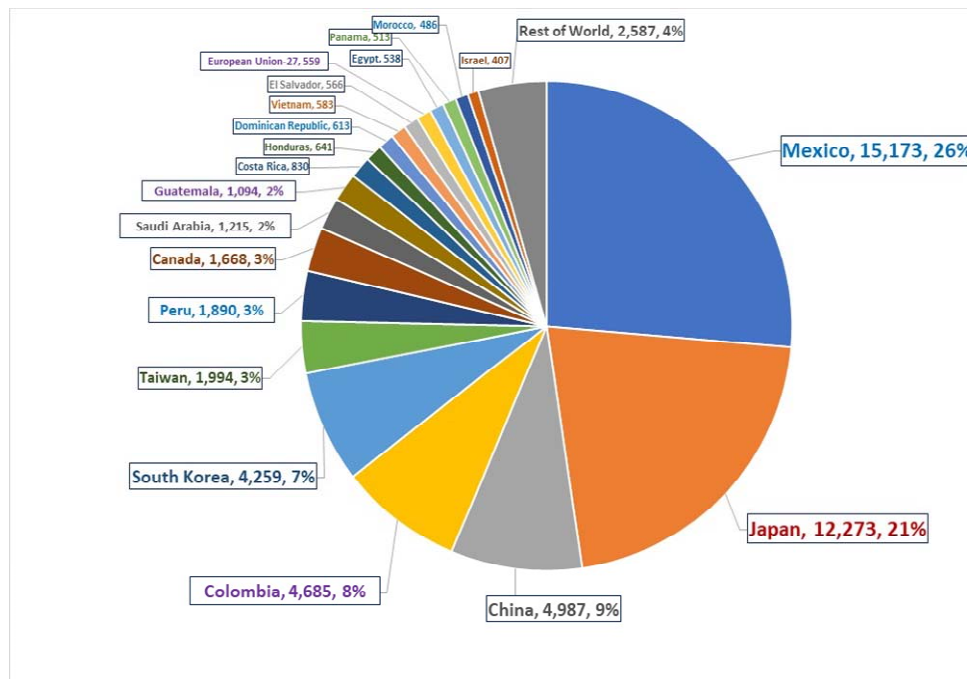
Corn.United States.MY Exports for all Years.

Forecast Data reported on: 3/2022



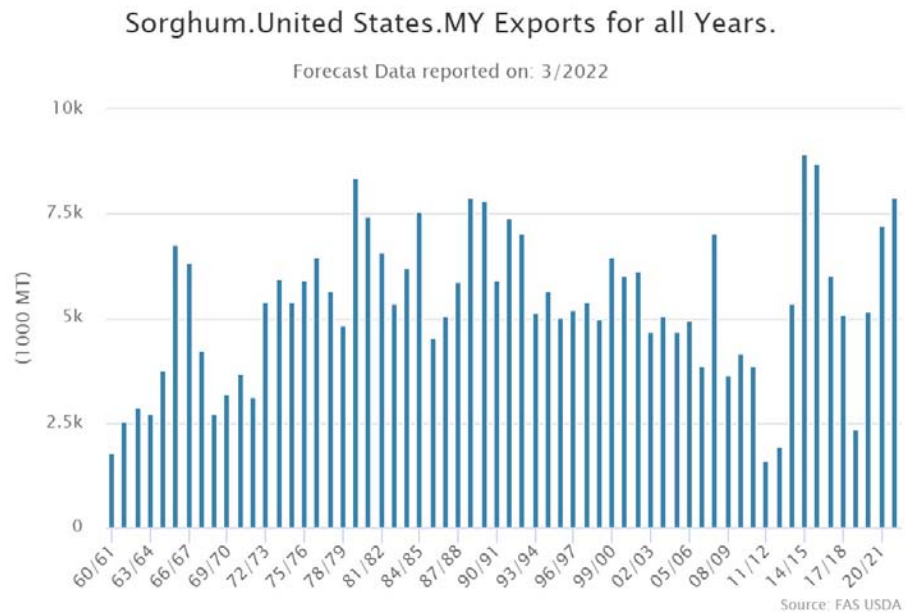
Corn

Top 20 U.S. Corn Export Buyers – Five Year Average MY 2016/17 - MY 2020/21

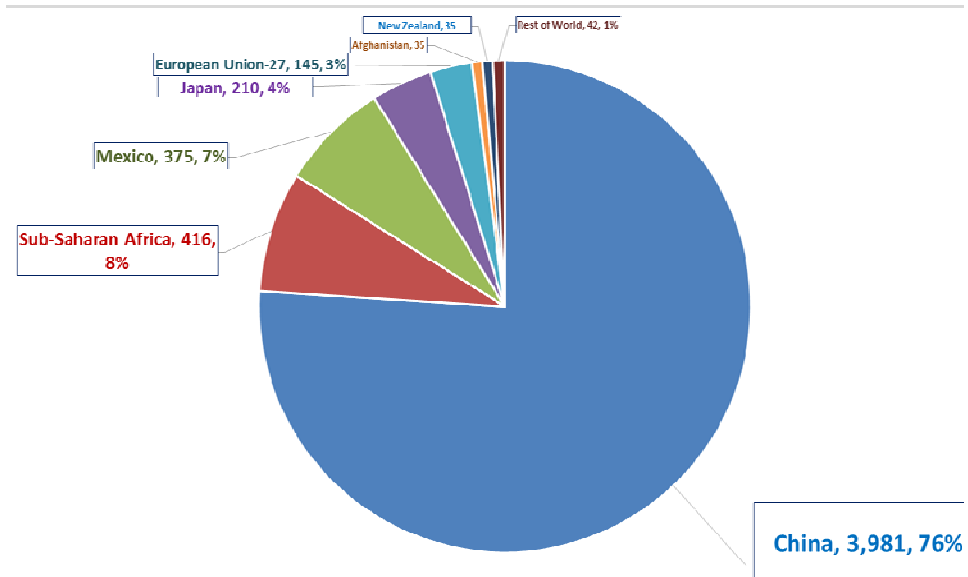


Source: USDA Feed Grain Yearbook (1,000 mt), March 23, 2022

Sorghum



Top 7 U.S. Grain Sorghum Export Buyers – Five Year Average MY 2016/17 - MY 2020/21



Source: USDA Feed Grain Yearbook (1,000 mt), March 23, 2022

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ix "U.S. Waterborne Containerized Exports" United States Department of Agriculture, Agriculture Marketing Service; <https://agtransport.usda.gov/stories/s/U-S-Waterborne-Containerized-Grain-Exports/33uv-zvv7/> Accessed 21 March 2022