

Mississippi River Navigation: Helping the Midwest Compete with South American Soybeans?

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Cover photograph taken by Gabriela Flora, IATP, July 2000. The photo is of Puerto Aguirre, located on the Bolivian side of the Paraguay River across the border from Brazil. The port is a Cargill holding area, principally for soy.

Executive Summary

Farmers and rural communities are frequently cited as the principle beneficiaries of expanded navigation on the Mississippi River. Proponents of expanded navigation state that decreasing the cost of transportation for U.S. grains will expand our international markets while also returning more of the profits to the farmers' pockets. The emergence of China as an international grain importer has also excited agricultural interests with the possibility of a huge new market.

IATP assessed future export projections for one of the primary Midwest crops, soybeans. Unfortunately, due to strong international competition and global overproduction, The outlook for U.S. soybean exports is not optimistic. This study found the following:

- The U.S. percentage of the global soybean market will continue to decline;
- South American competitors, particularly Brazil, are expected to rapidly expand soybean production; and
- Soybean imports to China are not likely to offset the increases in soybean production.

Efforts to reduce grain transportation costs do not appear to be an effective method of improving farm income and alleviating the current farm crisis. Instead of competing in this global soybean contest that allows for few winners, the U.S. government should instead pursue policies that benefit farmers, rural communities, and the environment.

The Mississippi River navigation system has been developed over the years to provide a channel for nine-foot draft vessels from the Gulf of Mexico as far north as Minneapolis. The vast system of locks, dams, and dredged channels has been built and maintained by the United States Army Corps of Engineers. In recent years, powerful towboats have been introduced that tow more barges than can easily pass through the existing locks. Towboats usually need two passes to get barges through a traditional 600-foot lock. The extra time required increases river congestion and creates bottlenecks in some areas of the river system.

The Corps is currently conducting a seven-year study on the need for navigational improvements on the Upper Mississippi and Illinois Rivers and to quantify the environmental impacts of providing these improvements. Several multi-billion-dollar proposals are currently under consideration and have generated substantial public controversy. Agribusiness and other interests that support the navigation project often claim that upgrading Mississippi River navigation is crucial if U.S. soybean exports are to stay competitive with advances in South America.

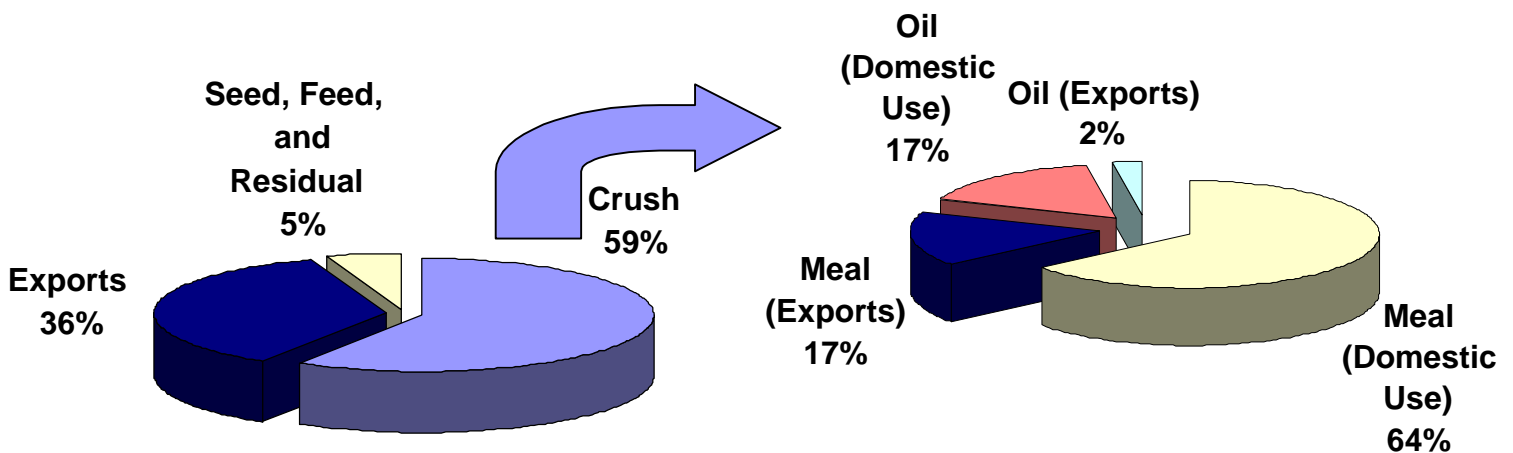
This paper assesses the international soybean market and how the race to capture new international markets has impacted U.S. farmers and rural communities. First, the continual overproduction of soybeans in the U.S. – and the subsequent erosion of price -- is documented. Second, expert projections are used to forecast world soybean production in 2020. Third, the potential to develop new markets for the forecasted increases in production is critiqued. Finally, the paper concludes with a recommendation that the governments of the U.S., Brazil, and Argentina abandon this unwinnable strategy of competing for new soybean markets and use a cooperative approach.

The U.S. Midwest and the Soybean

Midwest agriculture has embraced the soybean. Over the past 30 years, what is traditionally known as the Corn Belt is now better described as the corn-soybean belt. Most corn farmers have found that they do better economically by alternating corn with soybeans rather than planting corn every year. While corn depletes the soil of nitrogen, soybeans are a legume and help replenish soil nitrogen. Over a third of the Corn Belt is now planted in soybeans.

Despite the benefits of having a legume in a crop rotation, soybeans would not be planted if markets did not exist. Over the years, an incredible amount of uses have been developed for the soybean, from lubrication to ink to a non-dairy food substitute. However, the soybean's primary use continues to be as a high-protein animal feed, known as soybean meal. The meal is produced by "crushing" the soybean and removing the oil. Soybean oil is a commonly used vegetable oil.

U.S. Soybean Uses, 1996

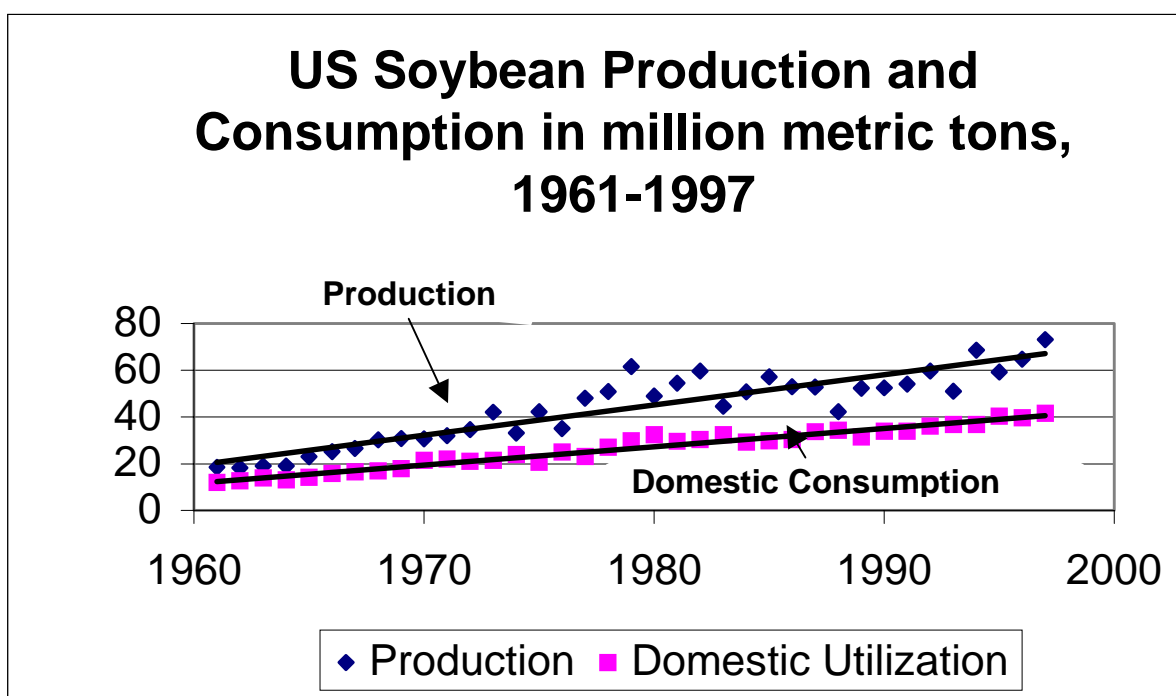


Source: USDA Ag Trade Database, <http://www.ers.usda.gov/>

Soybean Production and Export

As Figure 2 demonstrates, U.S. soybean utilization has risen substantially over the past 40 years. Much of that increase can be attributed to higher meat production. Another factor is the conversion from pasture-raised livestock, which primarily eat grass, to confined feeding operations, which are mainly fed corn and soybeans.

Despite the increased use, soybean production has increased much faster than utilization. One would think that supply and demand would parallel each other, but that is not the case. Over the past 40 years, an increasing amount of land is cropped in soybeans, while yields have also increased tremendously. The growing gap between production and utilization means that soybean farmers must become increasingly reliant on the development of new export markets.

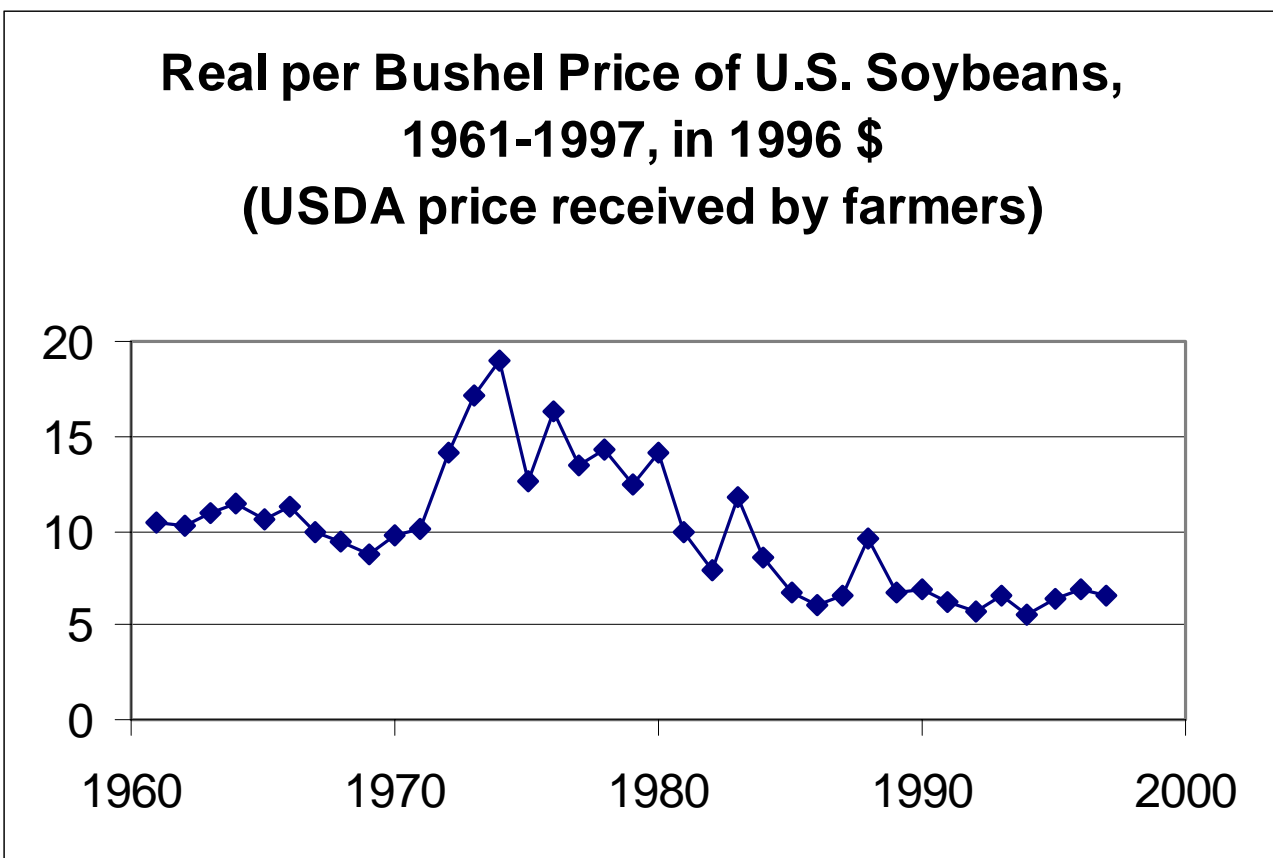


Source: The Food and Agriculture Organization of the United Nations Statistical Database on Agriculture, <http://apps.fao.org/cgi-bin/nph-db.pl?subset=agriculture>

Soybean Economics for the Farmer

The law of supply and demand indicates that price varies inversely with quantity. The soybean provides an excellent example of this law at work. Figure 3 shows that soybeans have been in a long-term price decline, particularly since 1974.

To maintain income in this scenario, farmers need reduce production costs and, at the same time, improve efficiency. If efficiency does not increase this results in reduced farm income. Some years, when the weather cooperates and demand is high, farm income increases. More times than not, however, the market does not provide an adequate income, and government payments are necessary.

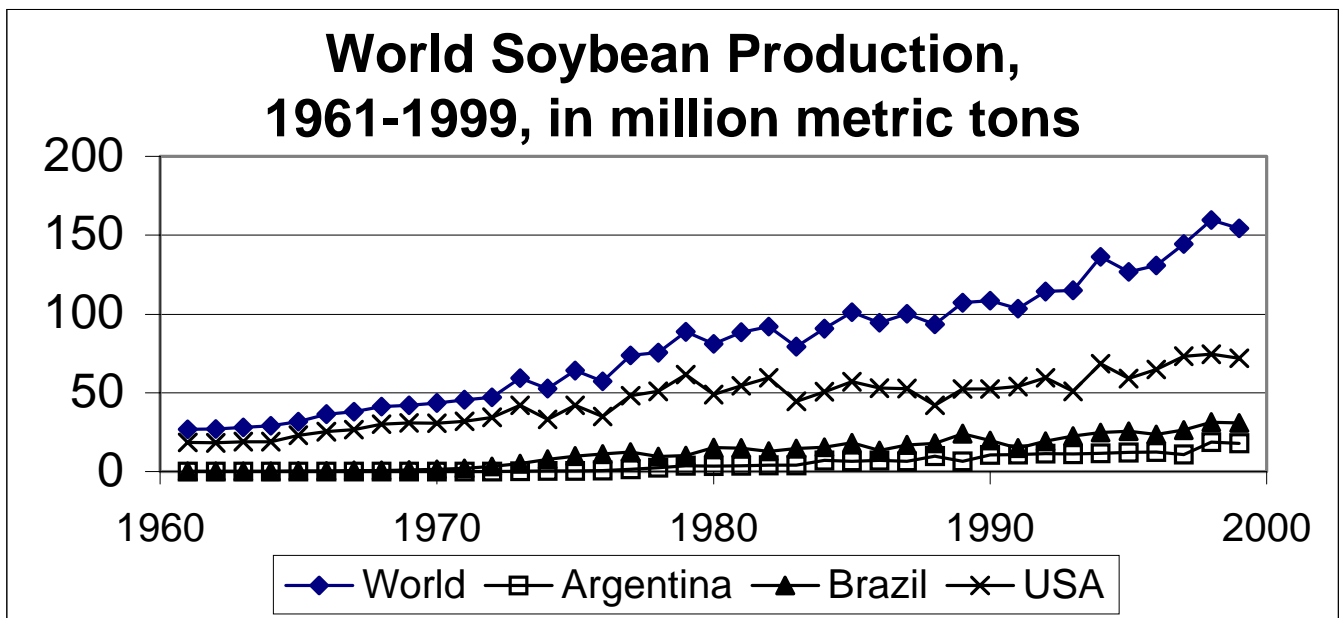


Source: USDA Economic Research Service, <http://www.ers.usda.gov/>

The International Soybean Market

Until the late 1970s, the United States essentially controlled the global soybean market. The U.S. produced 70 percent of the soybeans on the export market. But several competitors have emerged, particularly Brazil and Argentina. Figure 4 shows that world soybean production has increased sharply since 1980, while U.S. exports have remained relatively flat.

For the past 30 years, U.S. farmers have been told to maximize production -- plant "fence row to fence row" -- and the U.S. government will capture new markets. IATP is concerned that this world view, which never really provided much stability to the soybean farmer in the first place, is dangerously outdated. South American soybean producers are projected to outproduce the U.S. in coming years, and at less cost. This paper reviews some of these forecasts and what they mean for the international soybean market and the U.S. farmer.



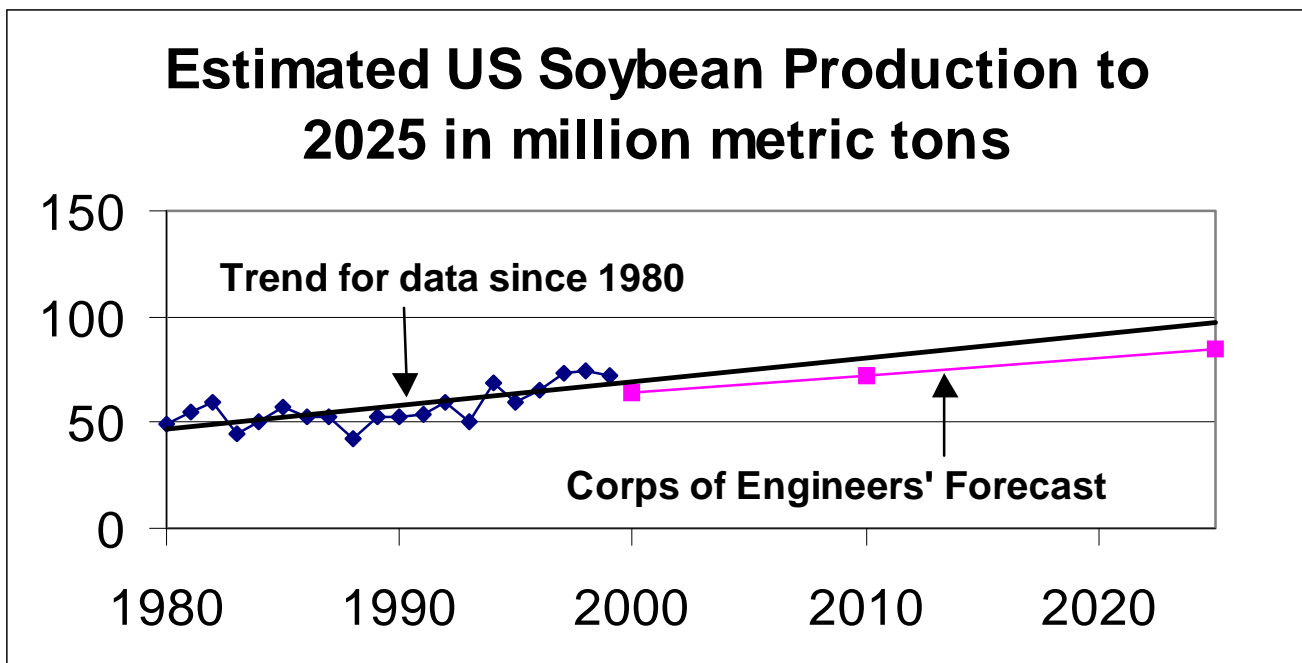
Source: The Food and Agriculture Organization of the United Nations Statistical Database on Agriculture, <http://apps.fao.org/cgi-bin/nph-db.pl?subset=agriculture>

Forecasted U.S. Soybean Production

The expansion of infrastructure on the Mississippi River is largely based on the assumption that grain production in the Midwest will expand, resulting in increased exports of grains to foreign markets. These forecasts are based on the anticipation of substantial yield increases due to advances in biotechnology, coupled with increased acreage in grain production. Many agricultural policy analysts have called these forecasts into question, particularly since soybean exports have been volatile but flat since 1980. Production has increased slightly, as Figure 5 shows, but exports have not.

In this assessment, however, these optimistic forecasts are not questioned. Rather, we will use these data to show what the "best case" scenario may look like.

To assess future use of the Mississippi River, The U.S. Army Corps of Engineers commissioned a study to forecast grain production 50 years in the future. The graph below displays actual soybean production data and forecasted production to 2025. A trend line drawn with the data since 1980 shows a close correlation with the Corps data. The U.S. could potentially produce 90 million metric tons of soybeans by 2020.



Source: Jack Faucett Associates, "Waterway Traffic Forecasts for the Upper Mississippi River Basin. Volume II: Grain." Submitted to Institute for Water Resources, U.S. Army Corps of Engineers. Contract No. DACW72-90-D-003. April 18, 1997; The Food and Agriculture Organization of the United Nations Statistical Database on Agriculture, <http://apps.fao.org/cgi-bin/nph-db.pl?subset=agriculture>

Forecasted Brazilian Soybean Production

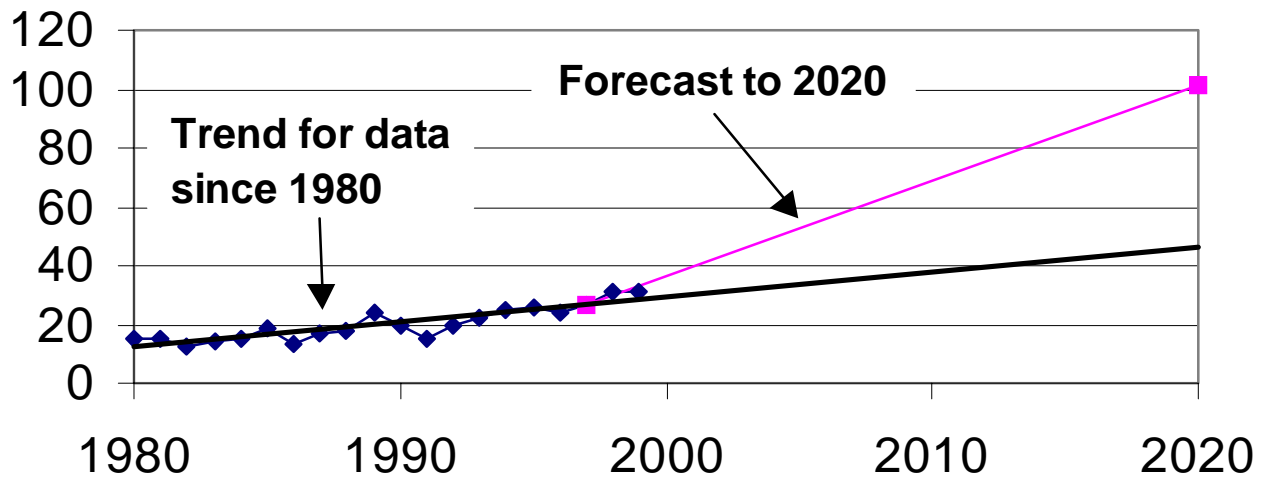
Just as U.S. citizens are debating the merit of spending billions of dollars on expanded Mississippi River Navigation, a similar debate is occurring in South America. Several countries, led by Brazil and Argentina, have proposed to dredge a channel in the Hidrovía Paraguay-Paraná River System, removing curves and undertaking other heavy engineering in order to expand shipping, particularly of soybeans. Another river project, the Hidrovía Araguaia-Tocantins, would transform some of Brazil's major rivers into commercial waterways for the export of soybeans.

Transportation costs are believed to be the factor limiting soybean production in Brazil. Most Brazilian and Argentine soybeans are trucked to port, rather than railed or barged like in the United States. If river navigation can reduce South American transportation costs from \$54 per metric ton of soybeans to the vicinity of U.S. costs, which are under \$20 per metric ton, analysts expect a huge expansion in South American soybean production¹.

The Hidroservice-Louis Berger-EIH Association, who did a 1996 assessment of the Hidrovía project, projects a 16.6 percent increase in Brazilian soybean yields from 1997 to 2020². Additionally, many analysts predict a large expansion in cropped land in Brazil, particularly in the undeveloped Cerrados region. In a special article on Brazil agricultural production, USDA stated that some analysts predict a 12 to 30 million-acre increase in crop acreage (mostly soybeans) in the next five to 10 years³. Michael Cordonnier, president of Soybean and Corn Advisor, Inc., predicts a 50 million-acre increase in Brazilian crops, mostly soybeans, in the next 10 years. 150 million additional acres of additional crop production are forecast for the long-term.⁴

Using these forecasts, an estimate for Brazilian soybean production in 2020 was computed. Brazil currently has 32 million acres in soybean production. A conservative estimate of a 75-million acre increase in soybean production by 2020, combined with the 16.6 percent increase in yield, results in Brazil's soybean production rising from 26 million metric tons in 1997 to 101 million metric tons in 2020. The graph below shows Brazil's historical production, a trend line for data since 1980, and the forecast to 2020.

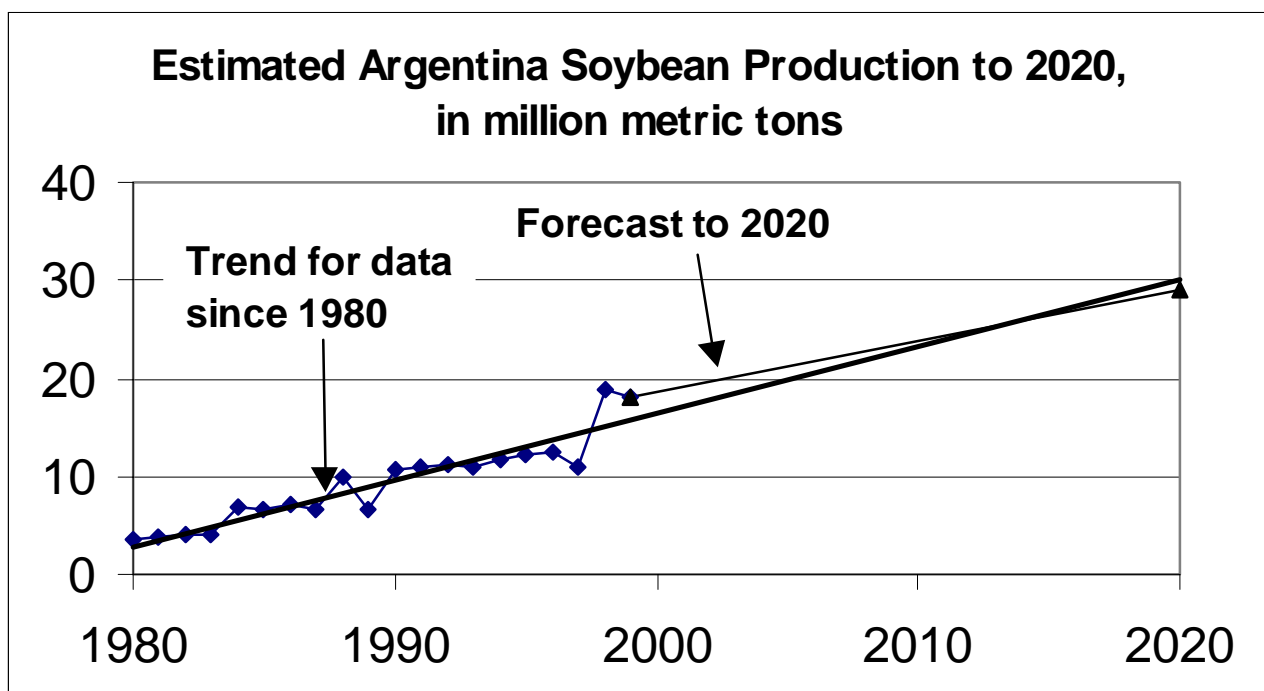
Estimated Brazil Soybean Production to 2020, in million metric tons



Source: The Food and Agriculture Organization of the United Nations Statistical Database on Agriculture, <http://apps.fao.org/cgi-bin/nph-db.pl?subset=agriculture>

Forecasted Argentine Soybean Production

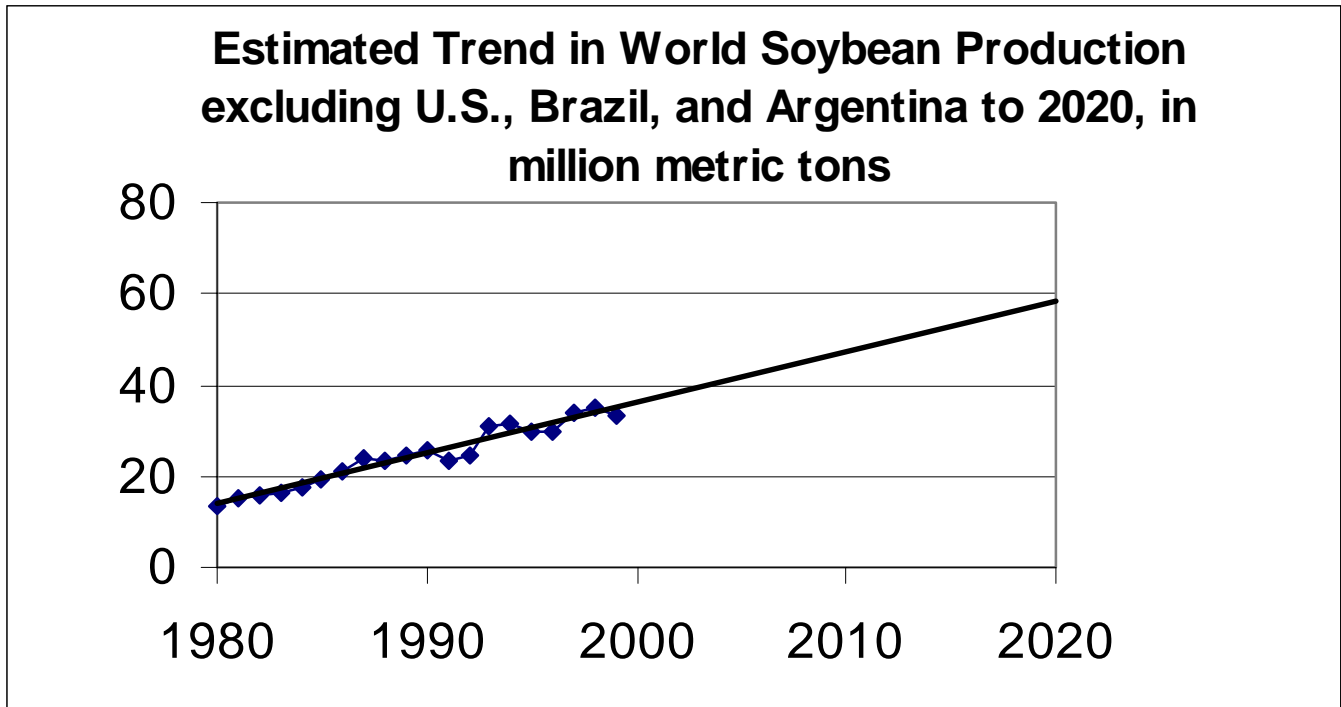
Future Argentine soybean production has not been studied as rigorously as in Brazil. A 1998 USDA special article on Argentina's agricultural growth potential predicted a 22 percent increase in soybean production from 1997 to 2007, largely due to double-cropping soybeans with wheat.⁵ Extrapolating out to 2020, Argentina's soybean production is predicted to expand to 27 million metric tons. However, Argentina is also expecting to crop an additional 2.4 million acres as river transportation improves.⁶ If recent trends continue, about half of that acreage will be planted in soybeans, resulting in 29 million metric tons of soybeans (Figure 7).



Source: The Food and Agriculture Organization of the United Nations Statistical Database on Agriculture, <http://apps.fao.org/cgi-bin/nph-db.pl?subset=agriculture>

Soybean Production for the Rest of the World

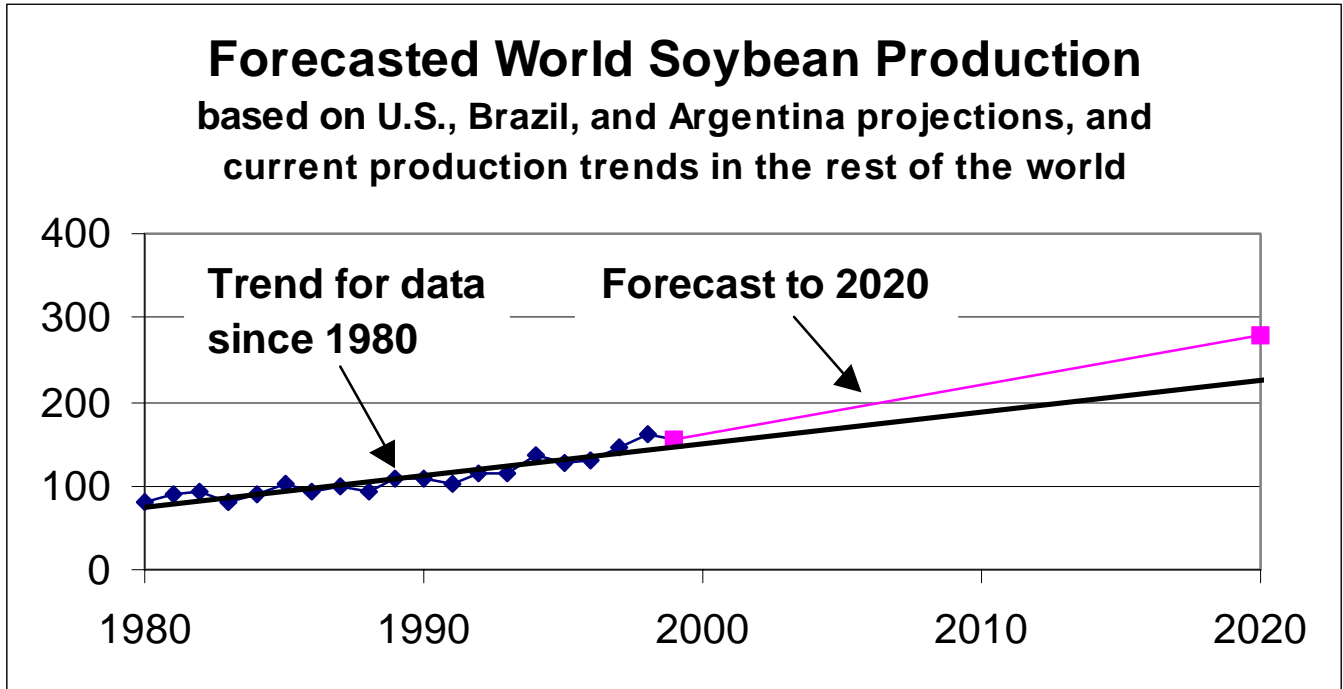
Estimates were developed for the rest of the soybean-producing countries by producing a trend line for world soybean production for the past 20 years not including the U.S., Brazil and Argentina. In 2020, these countries, led by China, India, and Paraguay, are expected to increase production to 58 million metric tons (Figure 8).



Source: The Food and Agriculture Organization of the United Nations Statistical Database on Agriculture, <http://apps.fao.org/cgi-bin/nph-db.pl?subset=agriculture>

Total Forecasted World Soybean Production

The production forecasts for the U.S., Brazil, Argentina, and the rest of the world provide a forecast for world soybean production in 2020. The quantity, 278 million tons, is slightly larger than the estimated production based on a 20-year trend (Figure 9).



In Search of Future Soybean Markets?

Figure 2 demonstrated that U.S. soybean production is increasing much faster than domestic utilization, thus excess production requires the continual search for emerging markets, and results in a gradual erosion of price. Unfortunately, finding those future markets is increasingly difficult. While global population increased 32 percent since 1980, global soybean production increased 98 percent (Table 1). The question is not "who will feed the world?" but "who will use our soybeans?"

Table 1 – World Population and Soybean Growth, 1980 and 1998

Year	1980	1998	Percent Change
World Population (in billions)	4.44	5.90	32
World Soybean Production (in million metric tons)	81	160	98

Source: The Food and Agriculture Organization of the United Nations Statistical Database on Agriculture, <http://apps.fao.org/cgi-bin/nph-db.pl?subset=agriculture>

For the 800 million people whom the Food and Agriculture Organization of the United Nations estimates are undernourished, the soybean does not present many possibilities. Soybeans cannot form the basis of the human diet as can corn, rice or manioc. Rather, it is largely a luxury food, used as a feed in an animal diet, or as an oil in a diet rich in fat.

For this reason, soybean farmers and exporters have their hopes set on increasing disposable income in less-developed countries, and the conversion from low-fat diets with little meat to the "western" diet. And the greatest potential for increased soybean demand is found in China.

The Chinese Market

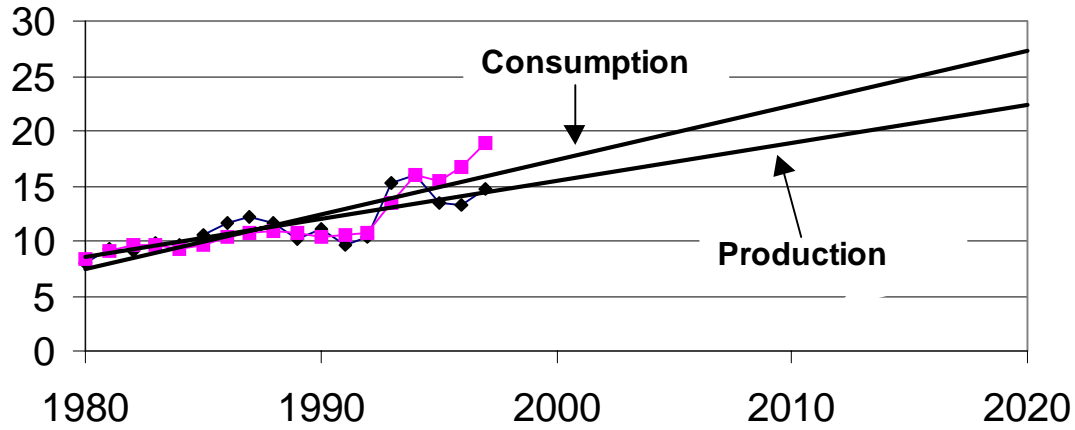
For years, U.S. grain farmers have been anticipating the opening of China's market and access to its 1.2 billion people. The market-based economic reforms that have been instituted in China in recent years have led to a dramatic rise in grain imports and meat consumption. The eventual inclusion of China into the World Trade Organization will presumably result in a strong demand for U.S. soybeans.

Figure 10 shows that China soybean imports will undoubtedly rise. There has been an explosion in soybeans used as animal feed in China, and Chinese production is not capable of meeting that demand. The more difficult question to answer is how much that future import demand will be, and how much of that demand will be met by U.S. soybeans.

In Figure 11, the trend for the volume of Chinese soybean imports since 1990 was extrapolated out to estimate soybean imports in 2020. A continuation of the tremendous growth in the Chinese soybean market in the 1990s is unlikely, but is used here to provide a "best case scenario". The second set of bars utilizes USDA's 2000 forecast for Chinese soy complex imports in 2005, which includes soybeans, soymeal, and soyoil. The USDA actually predicts a decline in soybean imports, but increases in meal and oil, for an 8.2% increase overall in the soy complex.⁷ That increase was extrapolated to 2020. The final set of bars are Chinese soy imports of U.S. soybeans calculated by Dr. C. Phillip Baumel, Charles F. Curtiss Distinguished Professor in Agriculture at Iowa State University, who recently completed a trend analysis supplemented by expected changes in the structure of China's agriculture.

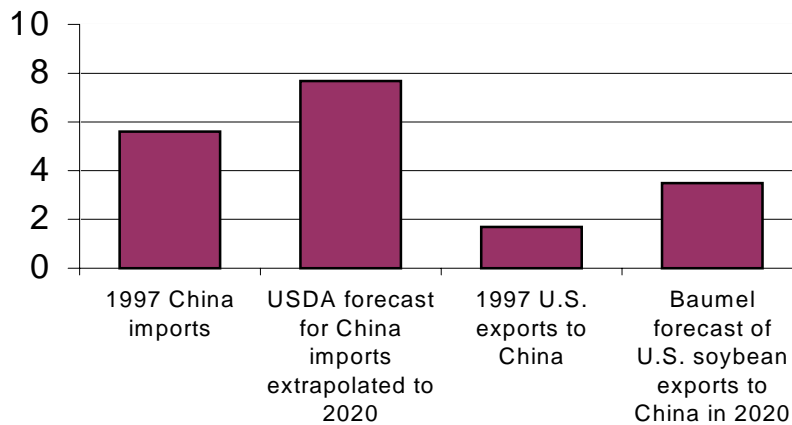
The chart shows that the best case scenario for future Chinese soybean imports is still negligible compared to increases in world soybean production. Even if an 8-million metric ton increase in Chinese soybean imports occurs by 2020, world soybean production is expected to increase by 118-million metric tons, wiping out any positive impacts the Chinese market may have on soybean price. And if the actual demand is closer to the estimates of the USDA or Baumel, the glut of soybeans on the world market will only get worse.

Chinese Soybean Production and Consumption, extrapolated to 2020, in million metric tons



Source: The Food and Agriculture Organization of the United Nations Statistical Database on Agriculture, <http://apps.fao.org/cgi-bin/nph-db.pl?subset=agriculture>

Chinese Soybean Imports in 1997 and Projected Imports in 2020, million metric tons



A USDA forecast estimates an 8.2% increase in Chinese imports of soybeans, meal and oil From 2000 to 2005. Extending this projection out to 2020, this results in slightly more than 2-million metric tons more of Chinese imports. During that same time period, global supply is projected to increase 118-million metric tons.

Source: The Food and Agriculture Organization of the United Nations Statistical Database on Agriculture, <http://apps.fao.org/cgi-bin/nph-db.pl?subset=agriculture>; USDA. Agricultural Outlook, March 2000. "China's WTO Accession Would Boost U.S. Ag Exports & Farm Income." Economic Research Service/USDA; Baumel, C. Phillip, "Evaluation of the U.S. Army Corps of Engineers Forecasts of U.S. Grain Exports", unpublished.

Conclusion – Time to Reconsider U.S. Farm Policy

The 1996 Farm Bill, known as "Freedom to Farm", intended to get government out of agriculture. Replacing price supports and other methods of maintaining farm income, the U.S. government promised to develop world markets, thereby creating more demand for U.S. farm products. The proposal to expand the locks on the Mississippi River can be seen as part of the government's responsibility to help farmers get grain out to world markets.

Yet the U.S. is not the only country pursuing such a "market oriented" solution to surplus production. If the United States, Brazil, and Argentina all proceed with their production and export plans, two things will result. First, all three countries will see substantial environmental degradation of precious river resources. Second, world soybean production will double in the next 20 years. Market growth is not likely to offset the expanded production, so soybean prices will continue to decline for the foreseeable future. The consequence will be lower farm income, fewer farmers, and calls for still more massive government bailout programs in the United States.

The "winner" of this soybean competition will be the country most willing to withstand environmental damage, transfer private costs to its taxpayers, and endure the lowest prices for soybeans. One has to wonder if winning such a contest is that much worse than losing it.

When countries are pitted against each other to capture international grain markets -- while the same agribusiness corporations stake out positions in all three countries -- "market oriented" solutions produce these perverse situations. Yet alternatives do exist. Rather than view Brazil and Argentina as competitors, the U.S. should consider them as partners in an effort to supply the global soybean market in a rational way that benefits all parties. Global supply control can be used to limit the excesses of unrestrained soybean production and export.

Currently, global markets penalize countries that place a high value on environmental or socioeconomic issues. Efforts to mitigate environmental impacts, protect small farms, or improve the livelihood of farm workers are all eschewed due to the forces of international competition. One has to wonder why the U.S. chooses to compete in a contest that provides so little in return. Perhaps, instead of doling out more than a billion dollars to subsidize degradation of the Mississippi River, that money would be better invested by developing alternative crops and local markets for U.S. farmers. Or better yet, we all agree to place a higher value on our natural resources and human capital, and none of the river projects go forward. Then our rivers are preserved and farmers receive the benefit of a restraint on overproduction.

The U.S. needs a farm policy that works for the benefit of farmers, rural communities, and the natural resources that these communities utilize and enjoy. Competing with Brazil and Argentina in a race to degrade rivers does none of that.

About the Author

This report was prepared by Mark Muller. He is a senior associate in the Environment and Agriculture Program at the Institute.

About the Institute for Agriculture and Trade Policy

The Institute for Agriculture and Trade Policy (IATP) was established in 1986 as an independent non-profit and tax-exempt research, education and advocacy organization. The Institute for Agriculture and Trade Policy promotes resilient family farms, rural communities and ecosystems around the world through research and education, science and technology, and advocacy.

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