

**Brazil at 2040:
Customer and Competitor**

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TABLE OF CONTENTS

Executive Summary	iii
List of Figures and Tables	iv
Introduction.....	1
SECTION 1. The Brazilian Market for Agricultural and Food Products	1
Overview of U.S. Agricultural and Food Exports to Brazil.....	2
Current Market for U.S. Agricultural and Food Exports to Brazil.....	2
Competition in the Brazilian Agricultural and Food Market	8
Case Study A: Brazil-U.S. Food Price Comparison.....	15
Brazilian Packaging, Labeling, and Other Import Requirements	16
SECTION 2. Brazil as a Competitor in Global Agricultural and Food Markets.....	18
Brazil Agricultural Production Capacity.....	18
Case Study B: Ethanol Changes in Brazil.....	22
Competition from Brazil in International Markets.....	25
SECTION 3. Cross-Cutting Issues in Brazil	32
Transportation Infrastructure and Investment in Brazil	32
Governmental Policies and Regulations in Brazil.....	41
Case Study C: Brazilian Import Duty Drawback System	42
SECTION 4. What the Future Holds	45
Brazil as a Customer for U.S. Agricultural and Food Products	45
Brazil as a Competitor in Global Agricultural and Food Markets	53
Case Study D: Increased Beef Production in Brazil.....	54
Summary and Conclusions	65
References.....	67
Appendix A: List of Brazilian Stakeholders Interviewed.....	71

Executive Summary

- The United States and Brazil have a robust trade relationship. From 2000 through 2017, total two-way trade grew from about \$29.2 billion to an average of \$74 billion during 2011-14 before falling to \$60.7 billion from 2015-2017. An economic downturn in Brazil contributed to the recent decline in trade.
- U.S. agricultural exports to Brazil have generally grown since 2000, from \$264 million to \$1.9 billion in 2013 before dropping recently. U.S. agricultural imports from Brazil, many of which are tropical products not produced in the United States, continue to grow and exceed agricultural exports to Brazil by a substantial margin.
- Brazil is the largest South American market with a population of 207.4 million with growing spending power and imports and an average of \$10.5 billion in agricultural and food products per year; however, it is only the 3rd or 4th largest market for U.S. agricultural and food exports to the region as the United States has trade agreements with other South American countries but not with Brazil.
- Brazil has a trade agreement with other South American countries called MERCOSUL, providing Argentina, Paraguay, and Uruguay agricultural and food exporters with a competitive advantage over U.S. exporters. Brazil via MERCOSUL is also negotiating a trade agreement with the European Union. Brazil also has a combination of taxes and other policies which make imports more expensive.
- Even with competitive disadvantages, U.S. wheat, cotton, rice, animal feeds, processed foods, eggs, chocolates, and whey exports compete in the Brazilian agricultural and food import market. Many of these and other U.S. exports are predicted to grow over the next several years.
- Brazil has significant productive capacity in many commodities traded around the world including soybeans, corn, cotton, beef, poultry meat, and orange juice. Brazil is an extremely fierce competitor to the United States in the world markets for soybeans, beef, and poultry meat, and to a lesser extent in corn and cotton.
- Brazil continues to bring more land into crop production with pastureland being converted as more intensive and integrated livestock production techniques are adopted. As a result, Brazilian soybean production is expected to grow 117 percent by 2040 with exports growing by 120 percent. Brazilian corn and cotton production are both expected to grow by about 80 percent with large increases in exports. Brazilian beef, poultry and pork production are also forecast to grow significantly by 2040.
- Limiting Brazil's ability to compete in international markets are poor internal infrastructure and policies which inhibit commerce. Many in Brazil, including private sector coalitions, are working to improve their infrastructure for the more efficient transport of products within the country and to ports. Further, many ports, particularly in northern Brazil, are being upgraded with private investments to handle increased trade. Reforms to Brazilian tax, labor, crop insurance, and environmental regulations could unleash their full competitive capabilities.

List of Figures and Tables

Figures

Figure 1. Total U.S. Trade with Brazil, 2000-2017	1
Figure 2. U.S. Ag and Food Trade with Brazil, 2000-2017	2
Figure 3. U.S.-Brazil Monthly Exchange Rate	4
Figure 4. U.S. Ag and Food Exports to Brazil, 2005-2017	5
Figure 5. U.S. Agricultural and Food Exports to Brazil, 2016	6
Figure 6. U.S. Agricultural and Food Exports to Brazil, 2017	6
Figure 7. U.S. Ag-Related and Input Exports to Brazil, 2005-2017.....	7
Figure 8. Brazilian Import Market for Wheat.....	8
Figure 9. Brazilian Import Market for Cotton	9
Figure 10. Brazilian Import Market for Rice	10
Figure 11. Brazilian Import Market for Corn	10
Figure 12. Brazilian Import Market for Animal Feed Preps.....	11
Figure 13. Brazilian Import Market for Processed Foods	12
Figure 14. Brazilian Import Market for Eggs	13
Figure 15. Brazilian Import Market for Chocolate/Cocoa Products.....	13
Figure 16. Brazilian Import Market for Whey Products.....	14
Figure 17. Brazil Import Process	17
Figure 18. Soybean Production in the U.S., Brazil and the World.....	18
Figure 19. Soybean Yields in the U.S., Brazil and the World	19
Figure 20. Corn Production in the U.S., Brazil and the World.....	20
Figure 21. Corn Yields in the U.S., Brazil and the World.....	20
Figure 22. Cotton Production in the U.S., Brazil and the World.....	21
Figure 23. Cotton Yields in the U.S., Brazil and the World.....	21
Figure 24. FCOJ Production in the U.S., Brazil and the Rest-of-World	23
Figure 25. Beef Production in the U.S., Brazil and the World	24
Figure 26. Broiler Production in the U.S., Brazil and the World	24
Figure 27. Pork Production in the U.S., Brazil and the World	25
Figure 28. World Soybean Exports.....	26

Figure 29. U.S. & Brazil Exports of Soybeans, 2014-2017.....	26
Figure 30. World Corn Exports	27
Figure 31. U.S. & Brazil Exports of Corn, 2014-2017	28
Figure 32. World Cotton Exports	28
Figure 33. U.S. & Brazil Exports of Cotton, 2014-2017	29
Figure 34. World Beef Exports.....	30
Figure 35. World Broiler Exports.....	30
Figure 36. World Pork Exports.....	31
Figure 37. U.S. & Brazil Exports of Meats, 2014-2017	31
Figure 38. World Orange Juice Exports	32
Figure 39. Brazilian Transportation Infrastructure: Highways.....	34
Figure 40. Brazilian Transportation Infrastructure: Railways	35
Figure 41. Brazilian Transportation Infrastructure: Inland Waterways.....	36
Figure 42. Inland Waterway Facilities at Itaituba/Miritituba Serving the Northern Arc Ports	37
Figure 43. Example of Private Sector Investment in Sao Luis, Brazil	37
Figure 44. Brazilian Grain and Soybean Distribution Logistics.....	38
Figure 45. Brazilian Soybean Simulated Transportation Costs	39
Figure 46. Export Corridors in Brazil	40
Figure 47. Probabilities of U.S. OIP Exports to Brazil being < \$124 Million and > \$212.9 Million.....	46
Figure 48. Probabilities of U.S. Prepared Foods Exports to Brazil being < \$41.4 Million and > \$66.6 Million.....	47
Figure 49. Probabilities of U.S. Whey Products Exports to Brazil being < \$13.4 Million and > \$38 Million.....	47
Figure 50. Probabilities of U.S. Feed & Fodders Exports to Brazil being < \$31 Million and > \$72.4 Million.....	48
Figure 51. Probabilities of U.S. Chocolate & Cocoa Products Exports to Brazil being < \$12.1 Million and > \$44.4 Million	48
Figure 52. Probabilities of U.S. Eggs & Products Exports to Brazil being < \$11.7 Million and > \$22.4 Million.....	49

Figure 53. Probabilities of U.S. Planting Seeds Exports to Brazil being < \$14.3 Million and > \$29.2 Million.....	50
Figure 54. Probabilities of U.S. Rice Exports to Brazil being < \$6.5 Million and > \$81.1 Million.....	50
Figure 55. Probabilities of U.S. Wheat Exports to Brazil being < \$190.2 Million and > \$1.2 Billion.....	51
Figure 56. Probabilities of U.S. Cotton Exports to Brazil being < \$51.3 Million and > \$321.5 Million.....	52
Figure 57. Brazilian Agricultural Production by Region, Pre-Boom	55
Figure 58. Brazilian Agricultural Production by Region, Post-Boom.....	56
Figure 59. Baseline: Brazil Area Harvested, Selected Crops	58
Figure 60. Brazilian Soybean and Corn Production Averages	58
Figure 61. Brazilian Soybean, Corn and Sugar Export Averages	59
Figure 62. Brazilian Beef, Pork and Poultry Production Averages	63

Tables

Table 1. Selected Brazilian Market Characteristics.....	3
Table 2. Prices for a Similar Basket of Groceries, Brazil and U.S., Spring–Summer 2017	15
Table 3. Infrastructure Extension and Density for Selected Countries.....	33
Table 4. Infrastructure Quality Rank for Selected Countries	33
Table 5. Soybean Transportation in Brazil and the United States	39
Table 6. Brazil: Selected Economic Indicators 2018–40	57
Table 7. Brazilian Area Harvested, Major Crops, 2018–40.....	60
Table 8. Brazilian Production, Major Crops, 2018–40	61
Table 9. Brazilian Exports, Major Crops, 2018–40	62
Table 10. Brazilian Meat Production, 2018–40	64

Brazil at 2040: Customer and Competitor

Flynn Adcock, Luis Ribera, Yuri Calil, Constanza Valdes¹

Introduction

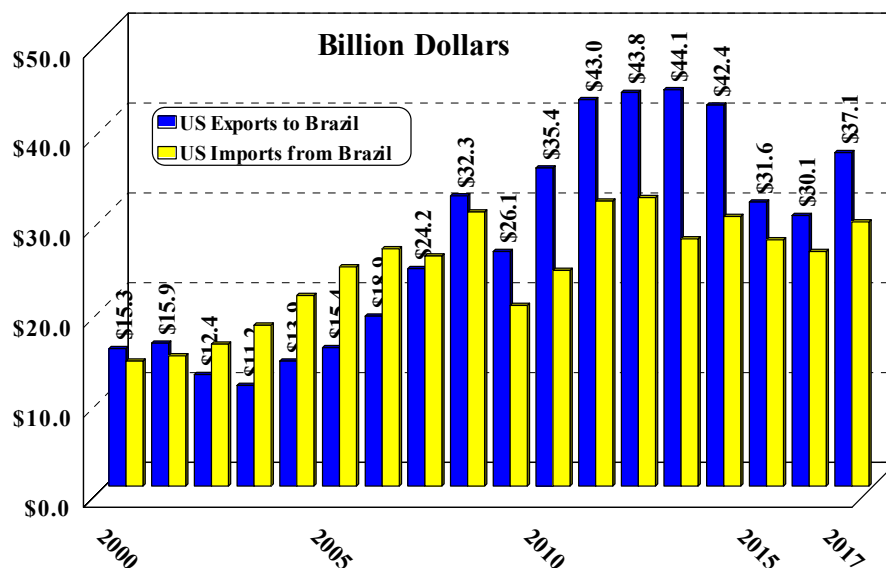
Brazil is viewed as a U.S. competitor in the trade of beef, broilers, soybeans, corn, and cotton while its potential as a market for U.S. foods and other agricultural products is often overlooked. This study examines the prospects of Brazil as a market for U.S. agricultural and food products and contains the latest information on market size and potential, market trends related to growth, packaging and labeling requirements, competing products, and exchange rates. Also included are sections on Brazil's productive capacity, transportation infrastructure and government policies. Forward-looking scenarios of Brazil as a customer and competitor are analyzed. Finally, vital to the research for this report was input gathered by the project team from approximately 40 Brazilian stakeholder organizations during five trips throughout Brazil in 2017. A list of these stakeholder organizations can be found in Appendix A.

SECTION 1. The Brazilian Market for Agricultural and Food Products

The United States and Brazil have a robust trade relationship. From 2000 through 2017, total two-way trade grew from about \$29.2 billion to an average of \$74 billion during 2011-14 before falling to \$60.7 billion from 2015-2017 (Figure 1). Contrary to previous years, U.S. exports to Brazil have exceeded imports from Brazil since 2008.

Figure 1.

Total U.S. Trade with Brazil, 2000 - 2017



Source: U.S. Census Bureau, Foreign Trade, U.S. Trade in Goods by Country, www.census.gov/foreign-trade/balance

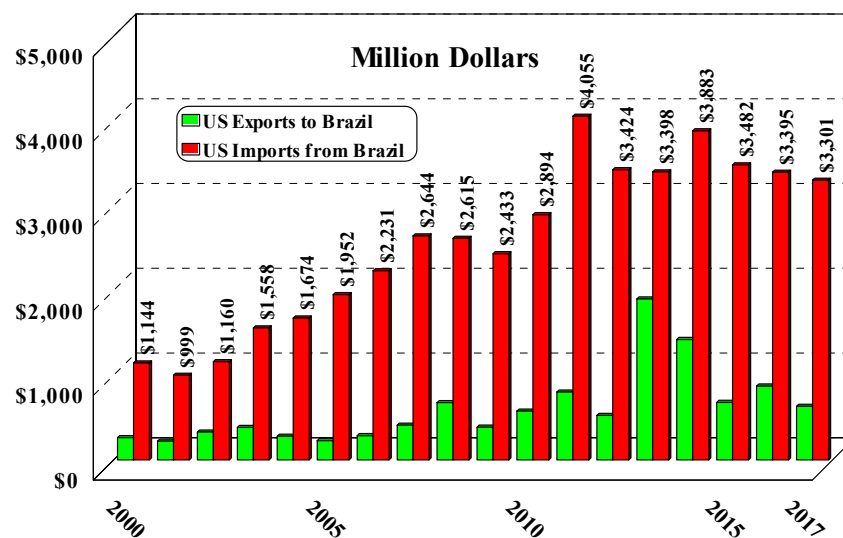
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Overview of U.S. Agricultural and Food Exports to Brazil

When considering only agricultural and food products trade between the United States and Brazil, that relationship has also seen substantial growth. U.S. agricultural exports to Brazil have generally grown since 2000, from \$264 million to \$1.9 billion in 2013 before dropping to \$1.4 billion in 2014 and settling at \$634 million in 2017 (Figure 2). U.S. agricultural imports from Brazil have also grown and continue to exceed agricultural exports to Brazil by a substantial margin. Much of the reason for this is that Brazil produces a wide variety of products not produced in the United States but demanded by U.S. consumers. For instance, about 31 percent of the \$3.3 billion in U.S. agricultural imports from Brazil in 2017 consisted of coffee. Nonetheless, Brazil also ships many products to the United States that it also produces, including tobacco, fruit juices, red meats and sugar. The following section looks more closely at the Brazilian market for U.S. agricultural, food, and related products.

Figure 2.

U.S. Ag and Food Trade with Brazil, 2000 - 2017



Source: Global Ag Trading System (GATS), FAS/USDA

Current Market for U.S. Agricultural and Food Exports to Brazil

Brazil is a large market with a population of 207.4 million, fifth highest in the world, and Brazilian imports of agricultural and food products averaged \$10.5 billion in recent years. While Brazil is the largest South American market, it is only the third or fourth largest market for U.S. agricultural and food exports to the region, depending on the year. U.S. agricultural and food exports to Colombia at \$2.5 billion in 2017, Peru at \$1.2 billion, and Chile at \$972.3 million each exceeded those to Brazil. By contrast, Brazil was the leading destination of U.S. agricultural and food exports to South America in 2013 with \$1.9 billion in purchases. It is important to note that

the United States has preferential trading arrangements (PTA) with Chile, Colombia and Peru whereas there is no U.S.-Brazil trade agreement. If the United States and Brazil were to enter into a PTA, U.S. agricultural and food exports to Brazil could significantly increase.

U.S. agricultural and food exports to Brazil have fluctuated in recent years. Following years of cyclical growth, total U.S. agricultural exports to Brazil reached a high of \$1.9 billion in 2013 before falling significantly in 2014 and 2015. These exports rebounded somewhat in 2016 to \$873 million then dropped to \$633.8 million in 2017. The high U.S. export years of 2013 and 2014 and much of the rebound in 2016 were in part a result of low supplies of Argentine wheat and marketing efforts by U.S. Wheat Associates to capture a larger share of the market. Table 1 provides an overview of the Brazilian market.

Table 1. Selected Brazilian Market Characteristics

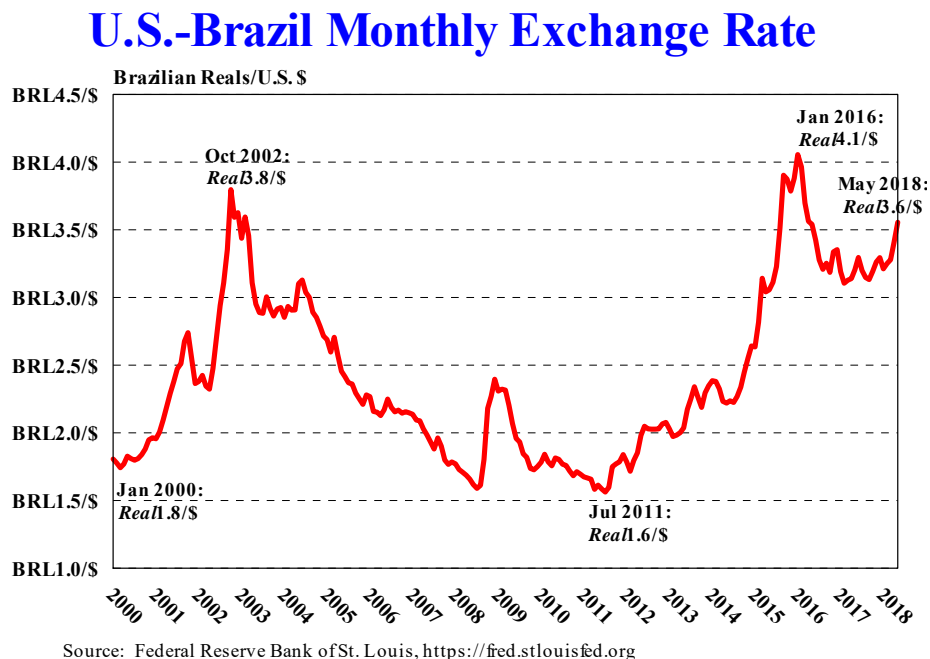
Category	2005	2017	Average Annual Growth from 2005-2017
Population (mil)	188.4	207.4	0.8%
Gross Domestic Product (\$ bil)	\$736.6	\$2,081.3	15.2%
Per Capita Income	\$3,910	\$10,035	13.1%
Brazilian Ag Imports from the United States (\$ mil)	\$228.3	\$633.8	14.8%
Bulk	\$27.2	\$110.9	25.6%
Intermediate	\$100.6	\$279.2	14.7%
Consumer-oriented	\$100.5	\$243.7	11.9%
Ag-Related	\$8.7	\$803.3	761.1%
Ag Inputs	\$655.0	\$1,522.2	11.0%

Sources: USDA/FAS GATS, World Bank and Instituto Brasileiro de Geografia e Estatística

Two overriding situations are currently impacting the Brazilian market. One is the recent political turmoil complete with a change in regime due to the impeachment of a sitting president and corruption charges involving past-presidents and other past and current political leaders. The other is the accompanying economic turmoil that may have in part led to the political crisis, but has also led to a worsening of the economic situation within Brazil including the falling *Real*, Brazil's currency. Still, many see Brazil as an exciting place in which to do business, whether exporting to the largest market in South America for food and agricultural products or investing in the expansion of Brazil's economy.

The fact remains that Brazil does indeed have the largest population in the Western Hemisphere outside of the United States. Further, many Brazilians have significant purchasing power. While Brazil's per capita exchange rate GDP was \$10,035 per person during 2017, purchasing power parity (PPP) was \$15,500 per person. PPP goes beyond an exchange rate calculated GDP by accounting for differences in prices for an assortment of products. Thus, 207 million consumers with an average purchasing power of \$15,500, even if that is down in recent years, continue to make Brazil an attractive market. However, falling Brazilian incomes combined with a *Real* that has fallen in value from 1.6 *Real*/\$ in 2011 to 4.1 *Real*/\$ in January 2016, and sat at about 3.6 *Real*/\$ in May 2018, has decreased Brazil's ability to purchase U.S. and other countries' agricultural and food products, particularly consumer-oriented products (Figure 3).

Figure 3.

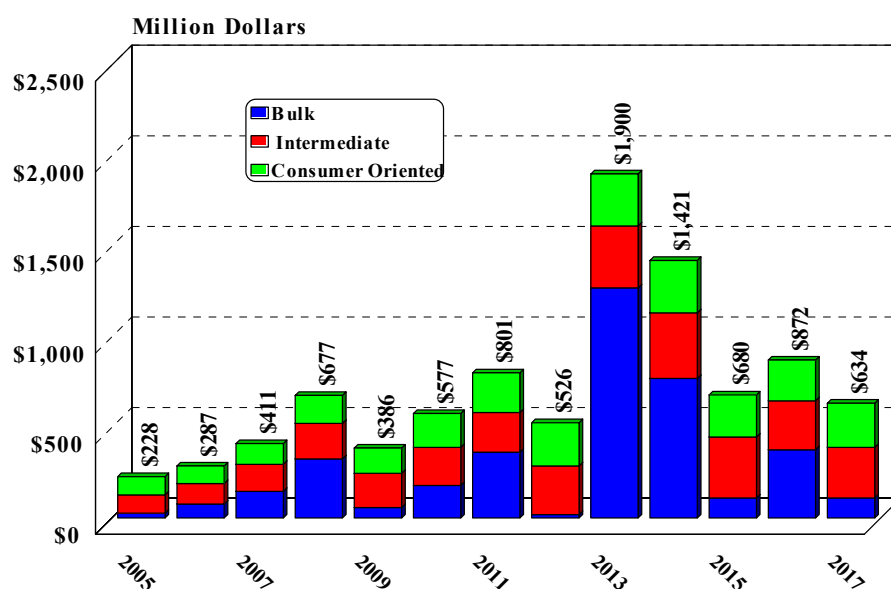


It is uncertain how long will it take before Brazil fully returns to the market size and growth it experienced from 2010-2014. It has been noted that Brazil along with the rest of MERCOSUL is returning to the negotiating table with the European Union in an effort to reignite the prospects for a preferential trading agreement between the two groups. MERCOSUL (sometimes noted as MERCOSUR) is the common market formed by Brazil with the countries of Argentina, Paraguay, Uruguay, and Venezuela, though Venezuela is currently suspended for failing to meet membership requirements. If the MERCOSUL-EU negotiations are successful, that will provide new exporting opportunities for Brazil in Europe and for the Europeans in Brazil. If Brazil is also able to lower its unemployment rate from about 12.5 percent, the inflation rate from about 8.5 percent, and stabilize the *Real*, Brazil could return to its prior path as a growing market sooner rather than later.

U.S. agricultural exports to Brazil of intermediate and consumer-oriented food products have been relatively stable over the past ten years with intermediate products typically outpacing consumer-oriented products (Figure 4). However, bulk exports consisting mainly of wheat and cotton significantly fluctuate and in some years exceed those of intermediate and consumer-oriented exports combined while in other years are relatively low. The main consumer-oriented products include dairy products such as whey proteins and non-fat dry milk, a wide variety of prepared foods, chocolate, eggs, snack foods – especially corn chips – and processed vegetables. The primary intermediate products include protein concentrates, feeds, sweeteners such as beverage preps, glucose, and fructose, seeds for grains and a wide variety of vegetables, and products used in the food production process including enzymes and beverage aromas. Thus, Brazil is a viable market for a wide array of U.S. agricultural and food products. Figures 5 and 6 illustrate the variety of exports for the last two years and how the composition of agricultural and food exports can change from year to year.

Figure 4.

U.S. Ag and Food Exports to Brazil, 2005-2017



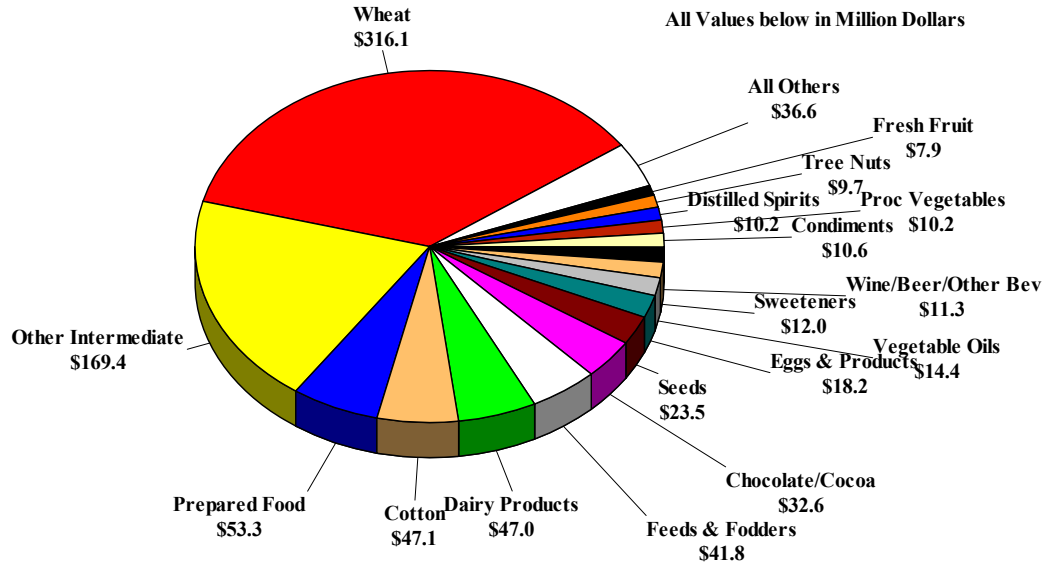
Source: Global Ag Trading System (GATS), FAS/USDA

There is potential to significantly increase U.S. exports to Brazil as U.S. exporters typically account for about ten percent of the Brazilian import market for agricultural and food products. U.S. exports capture much larger shares of nearby markets such as Colombia and Peru, and a consistently growing share in Chile. Further, the recent economic downturn has hurt Brazil's ability to purchase consumer-oriented products. As Brazil's economy rebounds and incomes increase, Brazil will be able to import more U.S. consumer-oriented and other value-added products. In fact, Brazilians have an affinity for U.S. branded products as was evident when Brazilian grocery stores and Brazil's Associação Paulista de Supermercados (APAS) supermarket trade show were toured.

Figure 5.

U.S. Agricultural and Food Exports to Brazil, 2016

2016 Total: \$871.9Million

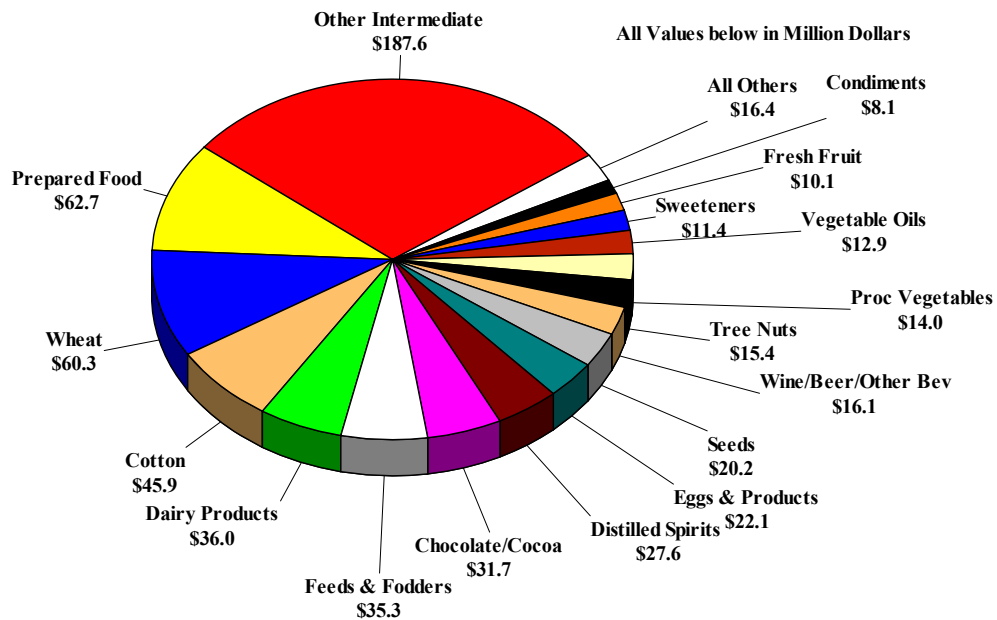


Source: Global Ag Trading System (GATS), FAS/USDA; Note: Other Intermediate includes a wide array of products, led by enzymes, protein concentrates, odiferous mixtures for beverage production, and bull semen.

Figure 6.

U.S. Agricultural and Food Exports to Brazil, 2017

2017 Total: \$633.8Million



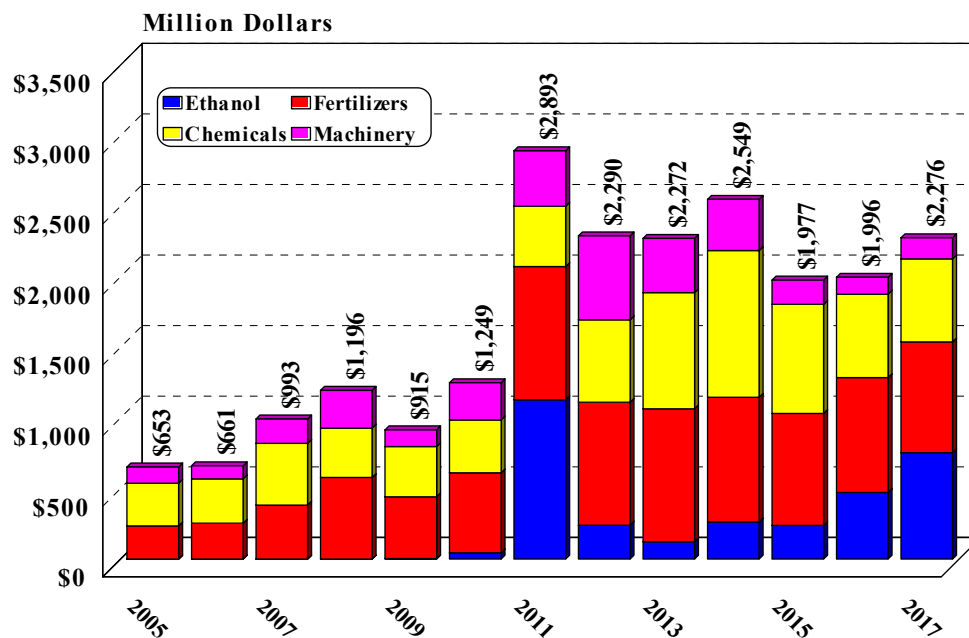
Source: Global Ag Trading System (GATS), FAS/USDA; Note: Other Intermediate includes a wide array of products, led by enzymes, protein concentrates, odiferous mixtures for beverage production, and bull semen.

Further highlighting Brazil's market potential for consumer-oriented products is the relatively low amount Brazilian consumers spend on food per year. Brazilians on average spent about 15.7 percent of their income in 2016, which ranks as 28th out of 86 countries reported by the USDA Economic Research Service. The only Latin American country which spends a lower percentage on food is Chile at 15.3 percent. By comparison, the lowest in the world is the United States at 6.3 percent. However, as the Brazilian economy and per capita income are expected to rebound over the next couple of years, Brazil's ability to purchase consumer-oriented food products will increase and the percent of Brazilian income spent on food will likely decrease.

Agriculture-related U.S. exports to Brazil mainly consist of ethanol and agricultural inputs including fertilizers, agricultural chemicals, and agricultural machinery (Figure 7). Brazil is a large consumer of ethanol and U.S. exports of ethanol to Brazil directly help the U.S. corn producer as most U.S. ethanol is produced using corn. During 2017, the value of U.S. ethanol exports to Brazil exceeded total U.S. agricultural and food exports to Brazil. Currently, the law requires a mixture of 27 percent of ethanol in gasoline. The Brazilian government has been discussing whether to increase this percentage to 40 percent by 2030. At the same time, Brazil's imports of large quantities of U.S. fertilizers, chemicals, and machinery have helped Brazil expand its productive capacity and to compete globally with the United States in many products.

Figure 7.

U.S. Ag-Related and Input Exports to Brazil, 2005-2017

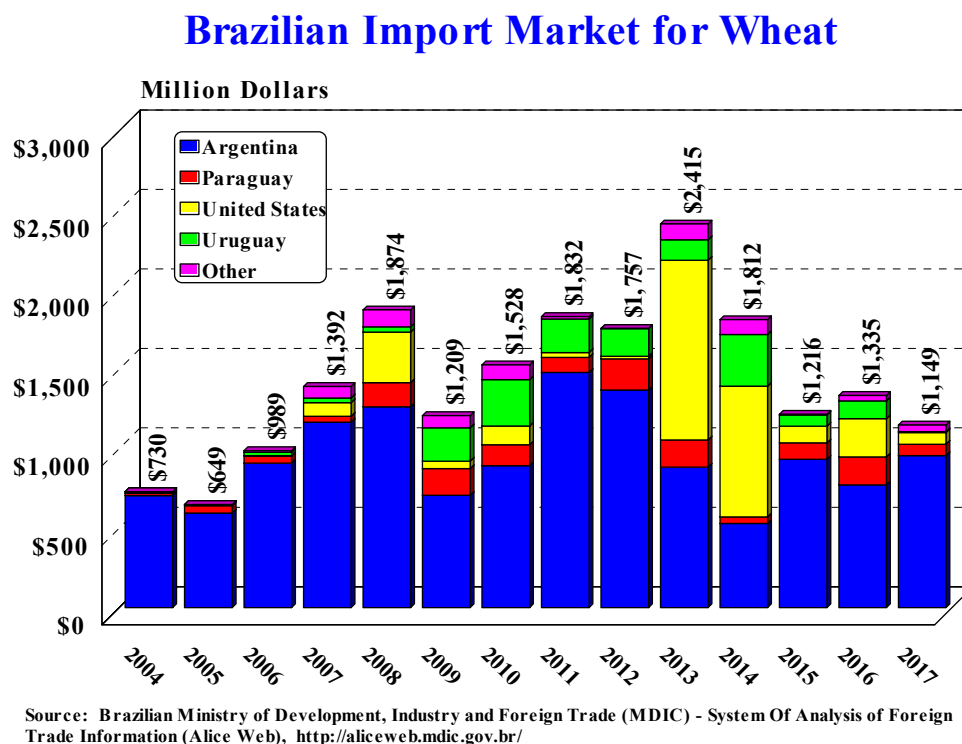


Source: Global Ag Trading System (GATS), FAS/USDA

Competition in the Brazilian Agricultural and Food Market

The United States actively participates in the Brazilian market for both wheat and cotton. Brazilian demand for imported wheat has exceeded \$1.1 billion per year since 2007, reaching a high of \$2.4 billion in 2013, a year in which U.S. wheat exports to Brazil reached a high of \$1.1 billion (Figure 8). During 2017, a year in which Brazilian wheat imports were the lowest since 2006, the U.S. share of these exports was also low at \$60.3 million, or 5.2 percent. U.S. wheat exports compete with exports from Argentina, Paraguay, and Uruguay, all with geographic advantages, and all being members of MERCOSUL who face zero tariffs. However, many Brazilian millers prefer U.S. wheat and as more Brazilian millers discover the quality and reliability of U.S. wheat for milling, they may import more U.S. wheat to blend with the lower quality domestic wheat in order to meet baking specifications. To the extent that U.S. wheat can overcome these disadvantages reveals the competitiveness and quality of U.S. exports.

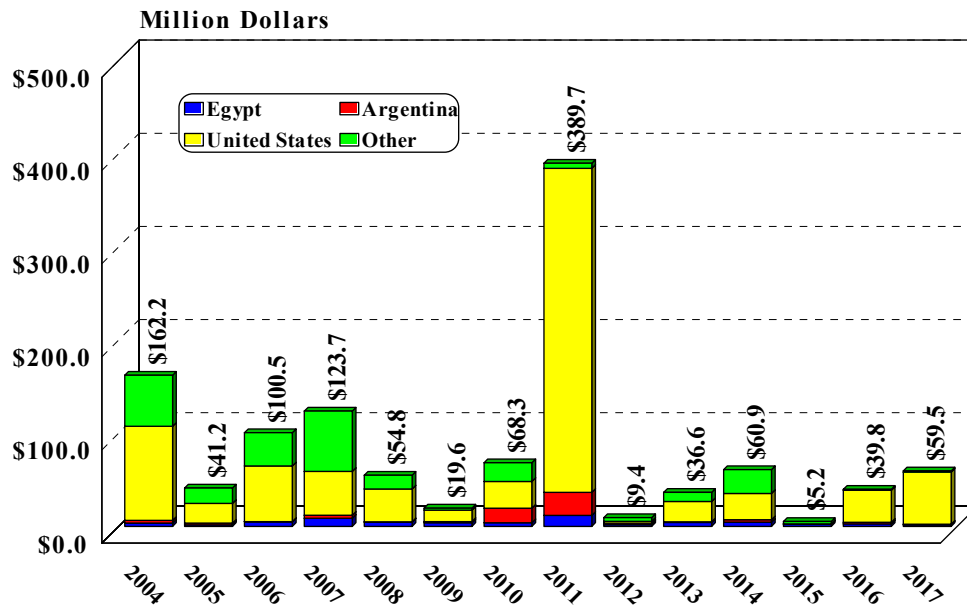
Figure 8.



While Brazil is not a major producer of wheat, it is a significant producer of cotton. Still, Brazil imports cotton from time to time and often these imports come from the United States. While Brazil's 2011 cotton imports of \$389.7 million was an anomaly, U.S. cotton was the leading supplier as it is in most years (Figure 9). Competition for the Brazilian cotton market comes from Argentina and Egypt. The market has been under \$70 million per year since 2008 except during 2011. Brazilian cotton imports did reach a recent high in 2017 at \$59.5 million, and U.S. cotton accounted for \$45.9 million of these imports.

Figure 9.

Brazilian Import Market for Cotton



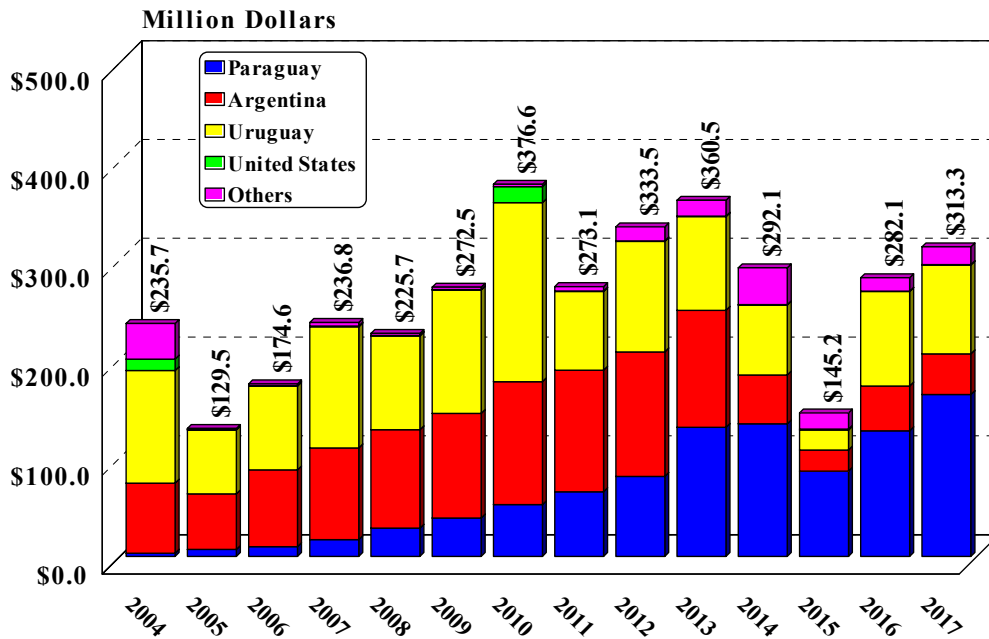
Source: Brazilian Ministry of Development, Industry and Foreign Trade (MDIC) - System Of Analysis of Foreign Trade Information (Alice Web), <http://aliceweb.mdic.gov.br/>

The United States is also a leading exporter of both rice and corn but has been unable to gain a large market share in Brazil. The Brazilian market for imported rice has been at least \$175 million every year since 2006 with the exception of 2015 (Figure 10). While some U.S. rice is shipped to Brazil, MERCOSUL countries dominate the rice market, in part due to previously mentioned tariff and geographic advantages.

A similar trend persists for Brazilian corn imports with Paraguay and Argentina dominating the market (Figure 11). Further, the prevalence of genetically-modified corn in the United States has also kept U.S. corn out of Brazil in the past though approval for feed was granted to some GM corn varieties in 2016. These approvals were the result of an effort to ease pressures on the Brazilian pork and poultry industries in a situation of tight corn supplies. Also, the USDA Foreign Agricultural Service is pursuing ways to streamline approval of additional U.S. corn varieties for feed purposes.

Figure 10.

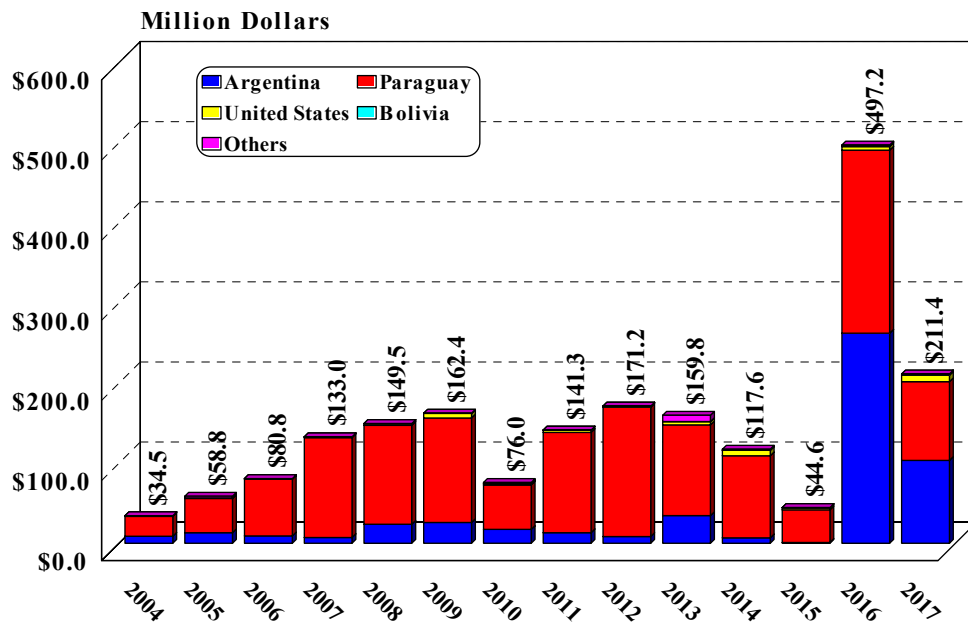
Brazilian Import Market for Rice



Source: Brazilian Ministry of Development, Industry and Foreign Trade (MDIC) - System Of Analysis of Foreign Trade Information (Alice Web), <http://aliceweb.mdic.gov.br/>

Figure 11.

Brazilian Import Market for Corn

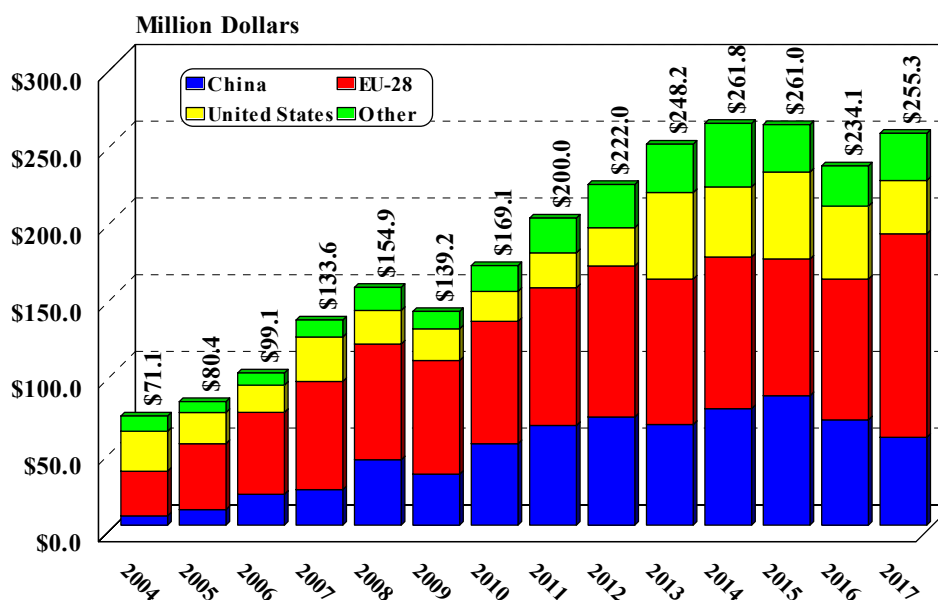


Source: Brazilian Ministry of Development, Industry and Foreign Trade (MDIC) - System Of Analysis of Foreign Trade Information (Alice Web), <http://aliceweb.mdic.gov.br/>

Moving from bulk to intermediate products, U.S. exports of animal feed preparations for livestock and poultry have captured an average of 20 percent of the Brazilian import market each year since 2012 (Figure 12). Major competitors include China and European Union (EU), particularly the countries of the Netherlands, France, and Belgium. When considered as a bloc, the EU is has historically been the leading source of animal feed preparation exports to Brazil. Trade talks between MERCOSUL and the EU began in 2010 and, following a break in negotiations, resumed in March 2017. Talks reconvened in June 2018 with a major focus of the discussions being geographic indicators (GI), which limit how products may be classified based on where the product was produced and with which ingredients. The EU has over 350 products for which they want a GI recognized while MERCOSUL desires GI classifications for about 250 products. If these talks come to a successful conclusion, U.S. feeds and other products will need to overcome new competitive advantages enjoyed by all EU countries with respect to exports to Brazil.

Figure 12.

Brazilian Import Market for Animal Feed Preps



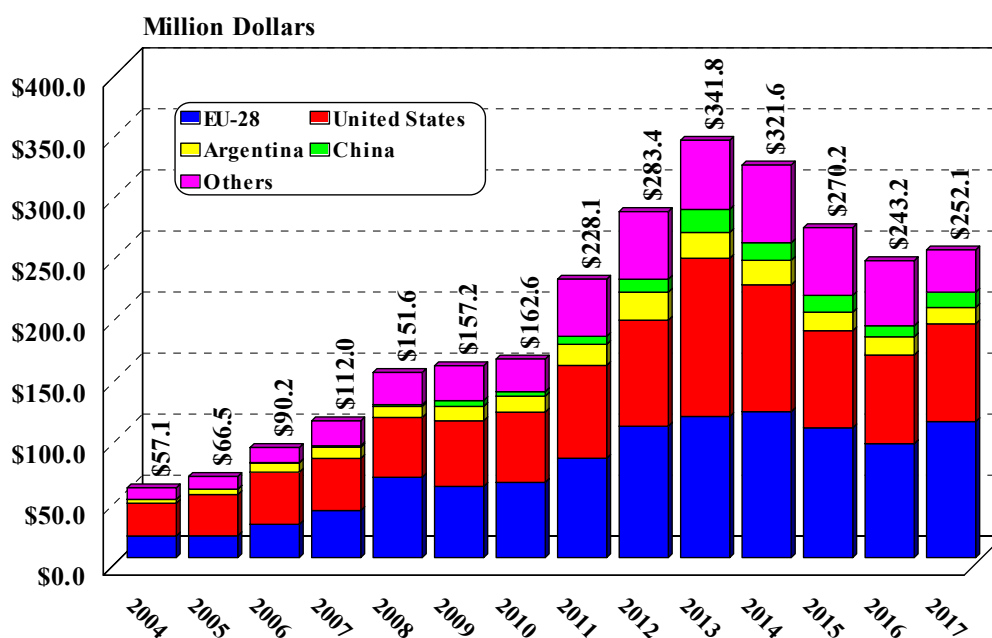
Source: Brazilian Ministry of Development, Industry and Foreign Trade (MDIC) - System Of Analysis of Foreign Trade Information (Alice Web), <http://aliceweb.mdic.gov.br/>

The United States also exports a wide variety of Other Intermediate Products to Brazil totaling \$187.6 million in 2017 and including products such as enzymes, protein concentrates and textured protein substances, odiferous mixtures, vegetable saps, and bovine semen. Other Intermediate Products is the largest single category of products exported from the United States to Brazil.

The United States has a significant presence in the Brazilian import market for many consumer-oriented products, but the competition for market share is intense and global. U.S. exports of total processed food products to Brazil by value are typically second to the market share of the EU (Figure 13). U.S. processed food exports to Brazil last held the largest market share during 2013. Argentina and China also hold consistent albeit smaller market shares. While the Brazilian market was down in 2016 for the third consecutive year, U.S. exports managed to maintain a 30 percent market share even as Brazil's import demand increased slightly in 2017. While the U.S. market share has been higher in the past, it has averaged 32 percent since 2011, the first year Brazil imported more than \$200 million in processed foods.

Figure 13.

Brazilian Import Market for Processed Foods



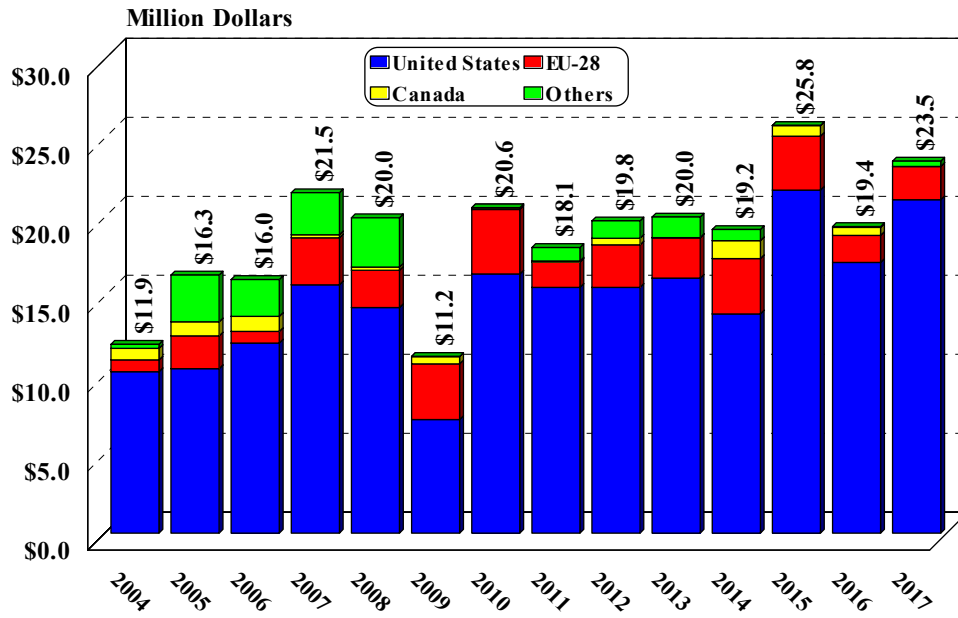
Source: Brazilian Ministry of Development, Industry and Foreign Trade (MDIC) - System Of Analysis of Foreign Trade Information (Alice Web), <http://aliceweb.mdic.gov.br/>

U.S. eggs and egg products dominate the Brazilian import market which is \$20 million annually (Figure 14). Limited competition comes from the EU and Canada.

In chocolates and cocoa-related products, the United States has been third to Argentina and the EU in recent years (Figure 15). The 2016 Brazilian market size of \$106 million was the lowest since 2011, and U.S. exports dropped along with exports from all of its major competitors including not only Argentina but also Switzerland, Belgium and Italy. However, the market rebounded in 2017 to \$146.4 million while the U.S. share of Brazilian chocolate imports remained stable.

Figure 14.

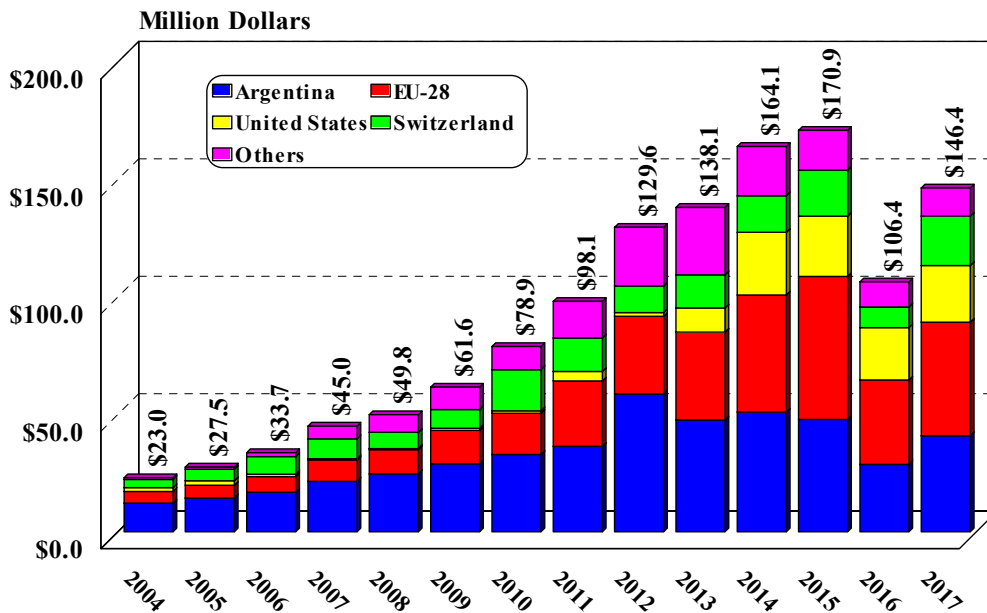
Brazilian Import Market for Eggs



Source: Brazilian Ministry of Development, Industry and Foreign Trade (MDIC) - System Of Analysis of Foreign Trade Information (Alice Web), <http://aliceweb.mdic.gov.br/>

Figure 15.

Brazilian Import Market for Chocolate/Cocoa Products

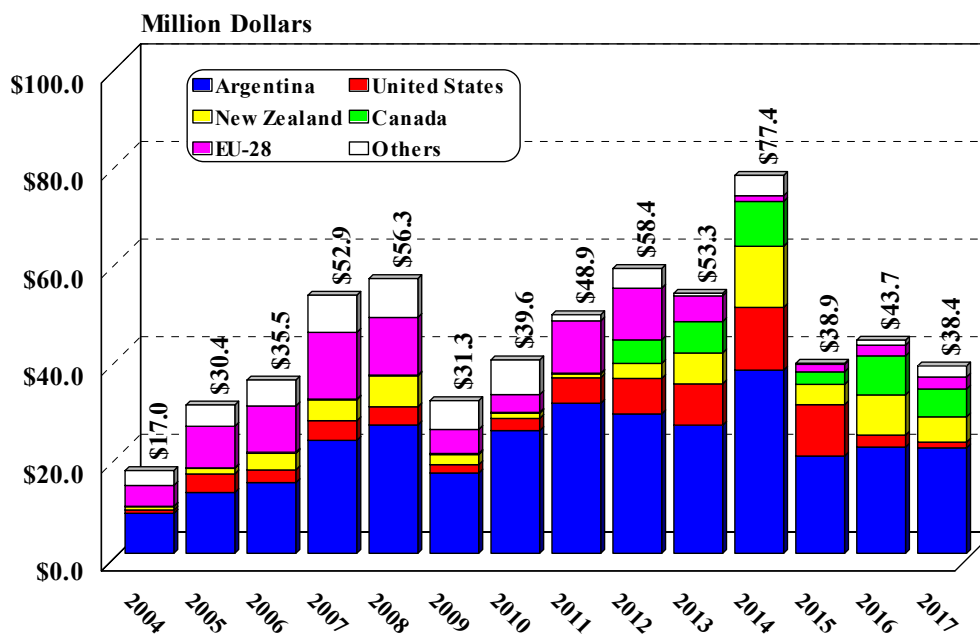


Source: Brazilian Ministry of Development, Industry and Foreign Trade (MDIC) - System Of Analysis of Foreign Trade Information (Alice Web), <http://aliceweb.mdic.gov.br/>

The final value-added import market to be analyzed here is the Brazilian market for whey products, with an average of about \$40 million over the past three years (Figure 16). This is down significantly from the 2011–2014 average. The U.S. share of the Brazilian whey market fluctuates considerably. During 2017, U.S. whey exports to Brazil fell to \$1.2 million, the lowest since 2009. Argentina dominates the market in most years with New Zealand, Canada, and the EU, which account for the vast majority of EU whey exports to Brazil, also being major competitors.

Figure 16.

Brazilian Import Market for Whey Products



Source: Brazilian Ministry of Development, Industry and Foreign Trade (MDIC) - System Of Analysis of Foreign Trade Information (Alice Web), <http://aliceweb.mdic.gov.br/>

Finally, even though Brazil is a major participant in global beef markets, it is also an import market for specialty cuts of beef. Brazil has imported an average of about \$281 million in fresh and frozen beef since 2011, with a high of \$389 million in 2014 before falling in 2015 and 2016. The Brazilian beef import market is dominated by its MERCOSUL neighbors Paraguay, Uruguay and Argentina while the U.S. share has been negligible. However, The United States exported \$7.5 million worth of beef to Brazil in 2017, up from an average of \$965,000 during 2011–2016. One reason for this recent increase is that Brazilian middle- and upper-class consumers appreciate high-quality beef, and U.S. beef can meet this demand when allowed.

It is important to point out that Brazilian imports of most of the consumer-oriented products discussed above have decreased over the last several years. This is in large part due to the economic recession experienced in the country in which per capita income has declined. A

Case Study A: Brazil-U.S. Food Price Comparison

During the course of this project, fifteen grocery stores throughout Brazil were visited by the research team to determine average prices paid by middle- and upper-income Brazilians for a basket of products selected by the research team. Grocery stores visited in Brazil included Pao de Acucar, Walmart, Carrefour, AsaSul, Santa Luzia, and St. Marche which were located in the states of Bahia, Maranhao, Minas Gerais, Rio de Janeiro, Sao Paulo, and in Brasilia. For comparison purposes, a basket of similar products was priced at grocery stores in Lake Charles, Louisiana and Brazos County, Texas at Albertsons, Aldi, HEB, Kroger, Market Basket, and Walmart. It was found that for a similar basket of goods, Brazilians pay approximately 25 percent more than U.S. consumers with further processed products typically priced higher in Brazil while less processed products are priced higher in the United States (Table 2). If Campbell's soup were excluded, the total expenditures are closer but U.S. consumers would still pay about 9.9 percent less.

Note: the green highlight below indicates a higher average price for the product in Brazil while a yellow highlight indicates a higher average price in Louisiana/Texas. Also, according to www.bestplaces.net, the grocery cost of living index in Lake Charles is 96.3 and for Brazos County is 90.2 whereas the U.S. average is 100. Thus, the prices cited for Louisiana and Texas below are slightly lower than the U.S. average and are likely much higher in some locations such as New York City and San Francisco. Further, in Brazil, an array of federal and state taxes are included in the price. For those prices gathered in Texas and Louisiana, no additional taxes would be levied on any of the products except for the cola and the candy bar. Thirty-one states plus the District of Columbia follow this tax treatment of foods. Thus, the average total price for the basket of products should be fairly representative for each country.

Table 2. Prices for a Similar Basket of Groceries, Brazil and U.S., Spring–Summer 2017

<u>Products</u>	<u>Brazil (Avg \$ Price)</u>	<u>Louisiana/Texas (Avg \$ Price)</u>
White Rice	\$0.51	\$0.85
Pinto Beans	\$0.75	\$1.11
Beef	\$5.23	\$6.35
Whole Chicken, Fresh	\$1.02	\$1.17
Coca Cola (2 L Bottle)	\$2.07	\$1.74
White Bread Loaf	\$1.71	\$1.17
Spaghetti	\$1.65	\$1.36
Heinz Ketchup (397 G)	\$2.58	\$1.40
Heinz/Hunt's Yellow Mustard (255 G)	\$3.55	\$1.41
Hellman's Regular Mayonnaise (340 ML)	\$2.11	\$2.62
Kellogg's Corn Flakes (200G)	\$2.37	\$1.70
Whole Milk, Refrigerated (1 L)	\$1.70	\$0.90
Whole Milk, Shelf Stable (1 L)	\$1.30	\$2.03
Papaya	\$0.69	\$0.67
Loose White Potatoes	\$0.50	\$0.85
Pineapple (Each)	\$2.56	\$2.50
Loose Yellow Onions	\$0.52	\$0.71
Loose Roma Tomatoes	\$0.85	\$1.12
White Eggs (Dozen)	\$2.20	\$0.98
Snickers (Bar)	\$0.81	\$0.92
Campbell's Soup (Can)	\$5.84	\$1.36
Total Price for One Item or Lb. Purchased	\$40.51	\$32.92
Total w/o Campbell's Soup	\$34.67	\$31.56

Unless noted, prices converted to per/lb. basis. Brazilian prices were converted to U.S. dollars using the daily exchange rate.

stronger U.S. dollar contributed as well. Dollar appreciation makes all products priced in dollars more expensive for foreign buyers. The situation has been exacerbated by the accompanying depreciation of the Brazilian *Real* against most currencies, which has made imported products generally more expensive, while incomes are also lower.

Case Study A on the previous page illustrates what many Brazilians pay for a basket of groceries as compared to a similar basket of groceries in the United States. Part of the reason for higher prices in Brazil is the depreciation of the *Real*, but tax codes, labor laws, and other factors affect Brazilian costs and prices.

Brazilian Packaging, Labeling, and Other Import Requirements

The process for importing into Brazil is somewhat similar to importing into the United States in that there are several federal agencies which could be involved depending on the product being shipped. Also, as members of the World Trade Organization, Brazil food laws, including sanitary and phytosanitary (SPS) measures, are science-based as required by the SPS agreement and CODEX.

The two most essential agencies involved for food and agricultural exports into Brazil are the Ministry of Agriculture, Livestock, and Food Supply (MAPA) and the National Agency of Sanitary Surveillance (ANVISA) within the Ministry of Health. MAPA covers most products including meats, most beverages, fruits and vegetables, wheat flour, seeds, feeds, live animals, and most other intermediate products, and bulk commodities such as wheat, corn, cotton, and rice and soybeans. ANVISA covers selected consumer-oriented products not covered by MAPA, including processed foods, energy drinks and selected other beverages, and certain intermediate products such as sugar, sweeteners, additives, and ingredients.

As a member of MERCOSUL, Brazil and its fellow members have no tariffs between its members and a common external tariff applied to all other countries and typically approach other trade policies as a group. As a result, MERCOSUL places U.S. exporters at a disadvantage when exporting to Brazil as shippers of competitive products from Argentina, Paraguay, and Uruguay face fewer restrictions than U.S. shippers.

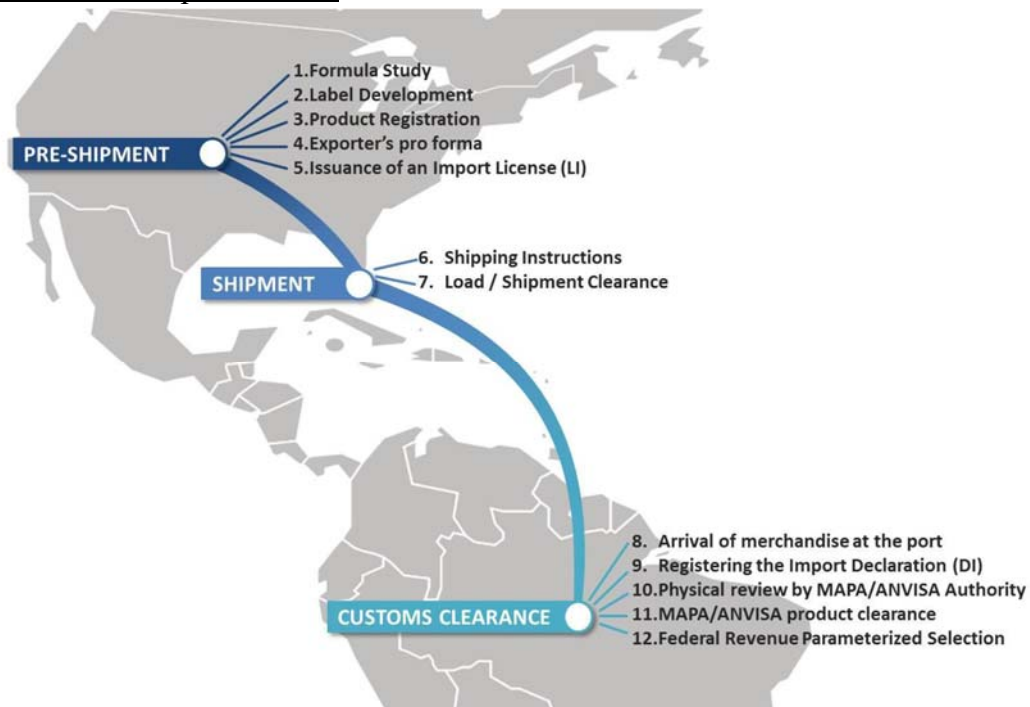
To illustrate the disadvantage to MERCOSUL suppliers that U.S. exporters face and the generally high costs associated with shipping product to Brazil, consider that the approximate tariff that U.S. processed food products face in Brazil is about 27 percent, which is added to the Cost, Insurance and Freight (CIF) price of the shipment. Further, there are other fees for items such as import licenses, port expenses, and administrative fees unique to Brazil. Many of those fees, plus the CIF price and the tariff are subject to a state value added tax called the ICMS, which is about 18 percent in Sao Paulo where most products enter Brazil. Thus, a shipment of

processed food product that a U.S. exporter prices at \$50,000 before freight can cost up to \$92,633 for the Brazilian importer to receive, or about 85 percent higher than the U.S. export price. A trade agreement between the United States and Brazil resulting in lower tariffs, the main component increasing costs, would allow U.S. exports to Brazil to become much less expensive. However, as part of MERCOSUL, Brazil must negotiate any agreements as part of that bloc which would complicate any such negotiations.

Finally, there are many intricacies and details for exporting to Brazil which have not yet been noted. This includes specific food laws, labeling requirements, packaging regulations, and laws addressing additives, pesticide tolerances, and other issues. The USDA Foreign Agricultural Service (FAS) GAIN reports BR16024 dated January 4, 2017, and BR17013 dated January 8, 2018, authored by FAS staff in Sao Paulo contain detailed information on Brazilian food laws, labeling requirements, import laws, and other pertinent regulations related to the Brazilian agricultural and food market, as well as contact information for Brazilian agencies and USDA FAS personnel. These reports can be found online at the website addresses noted in the reference section of this report.

While there is no need to replicate that information here, one graphic from BR17013 is particularly helpful in summarizing the Brazilian import process (Figure 17). Note that there are numerous steps to the process and all must be followed so that the import clearance process into Brazil can proceed with a much lower probability of delays.

Figure 17. Brazil Import Process



Source: USDA Foreign Agricultural Service (FAS). *GAIN Brazil Exporter Guide 2017 Report*.

SECTION 2. Brazil as a Competitor in Global Agricultural and Food Markets

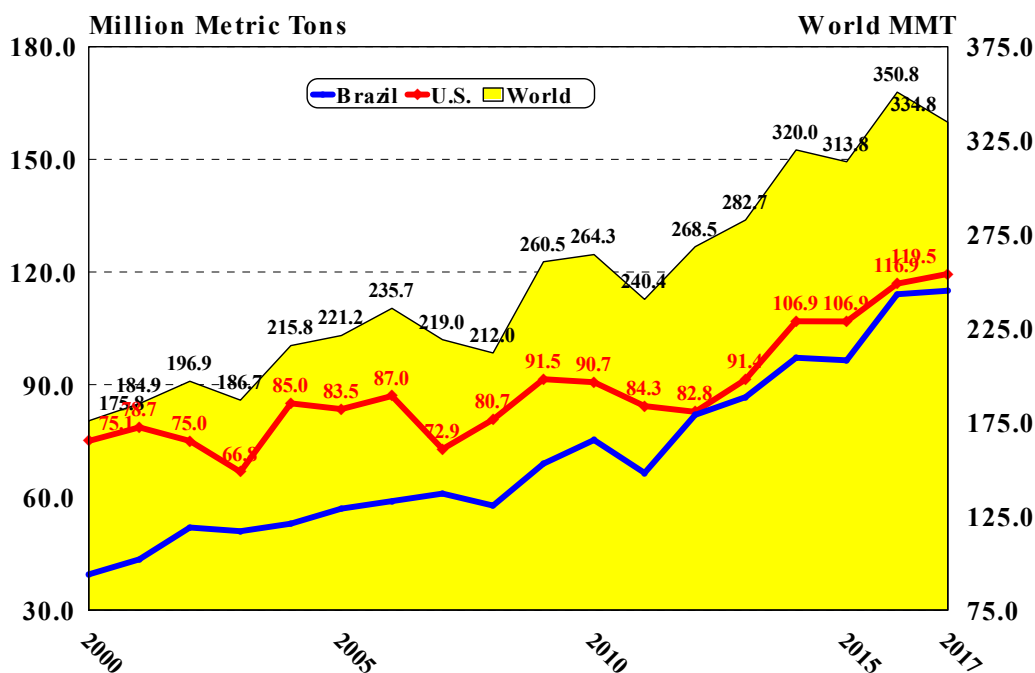
Brazil has significant productive capacity in many commodities traded around the world and which compete with U.S. commodities. This includes soybeans, corn, cotton, beef, poultry meat, and orange juice. Brazil is also the world's largest producer of coffee; however, the United States does not compete in the global market for coffee and, as mentioned above, is a major importer of Brazilian coffee. The following discussion centers on several aspects of Brazilian agricultural production which compete with U.S. commodities.

Brazilian Agricultural Productive Capacity

Brazil has been a major soybean producer for decades, with 2017 production of 114 million metric tons (MMT), nearly tripling production from the beginning of the 21st century (Figure 18). While Brazilian average soybean yields were 48.9 bushels/acre in 2017, yields have fluctuated slightly with an upward trend (Figure 19). Much of Brazil's growth has come from a substantial increase in harvested acres, growing 152 percent from 34.4 million acres in 2000 to 86.7 million acres in 2017. For comparison purposes, U.S. production of soybeans totaled 119.5 MMT in 2016 with an average yield of 49.1 bushels/acre on slightly less than 89.5 million acres, which is 23 percent above harvested acres during 2000.

Figure 18.

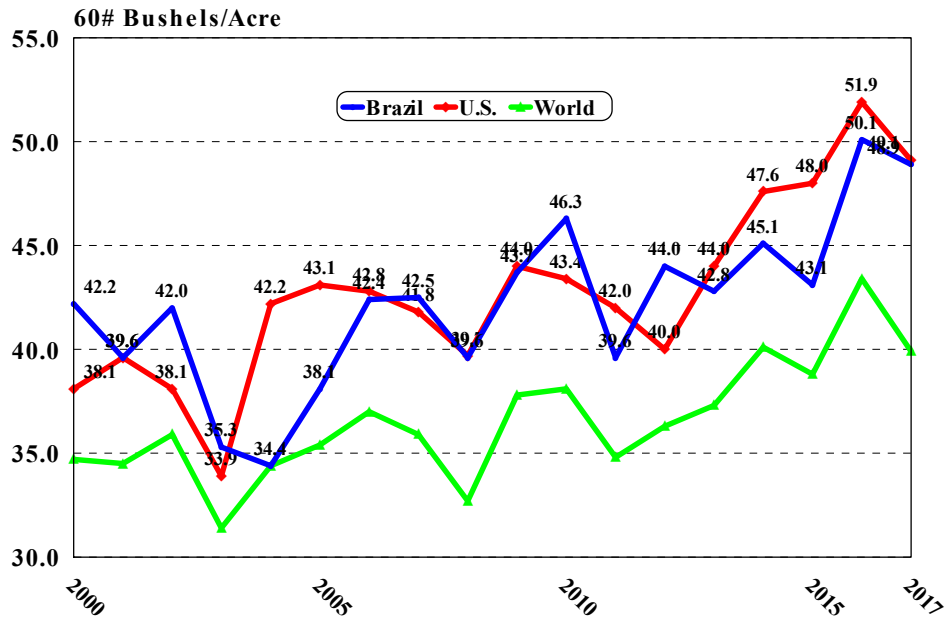
Soybean Production in the U.S., Brazil and the World



Source: PS&D View, FAS/USDA

Figure 19.

Soybean Yields in the U.S., Brazil and the World



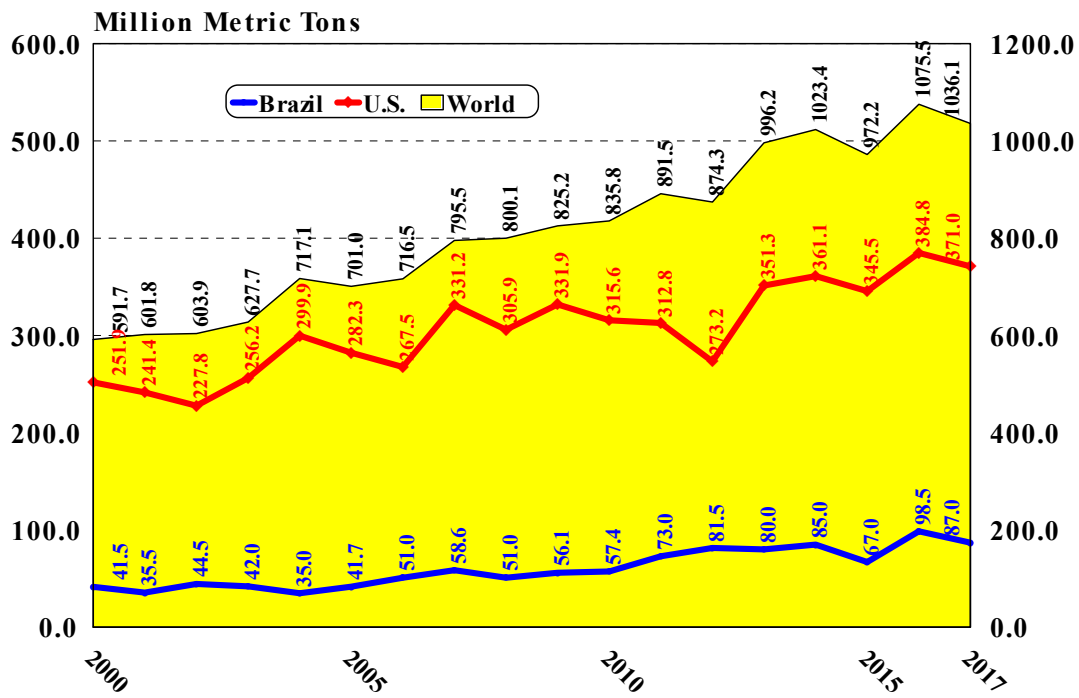
Source: PS&D View, FAS/USDA

Brazil has also become a major corn producer with 2017 production of 87.0 MMT, more than doubling production at the beginning of the 21st century but down twelve percent from 98.5 MMT in 2016 (Figure 20). Much of this production growth is due to an increase in average yield from 51.0 bushels/acre to 81.1 bushels/acre (Figure 21). Although corn yield is growing, Brazil's corn production is typically a second season crop after soybeans, which in part explains why their corn yields have not grown even more. For comparison purposes, U.S. production of corn totaled 371.0 MMT in 2017 with an average yield of 176.7 bushels/acre. However, the second corn crop, referred to as Safrinha in Brazil, is now the dominant production season for corn, increasing from twelve percent of total annual corn production during the 1999/2000 marketing year to 85 percent during 2016/17. Case Study B on page 22 discusses the expanded use of corn to produce ethanol in Brazil.

Brazil is also an important producer of cotton, producing 8.7 million 480-pound bales in 2017 (Figure 22). While Brazilian cotton production has been down in recent years, their 2017 production was well above their 2000-2016 average. By comparison, U.S. cotton production has averaged 17.4 million bales over the same period. While U.S. cotton production is much higher than Brazilian production, Brazil's yields are typically 50 to 60 percent higher than yields in the United States. In 2017, Brazil yielded 2.98 bales per/acre, while the U.S. cotton yields were 1.85 bales/acre (Figure 23). Finally, while there is an upward trend in both Brazilian and U.S. cotton yields, Brazil's yields are increasing at a higher rate U.S. yields. As a result, Brazil will likely be a competitor in the global cotton market for the foreseeable future.

Figure 20.

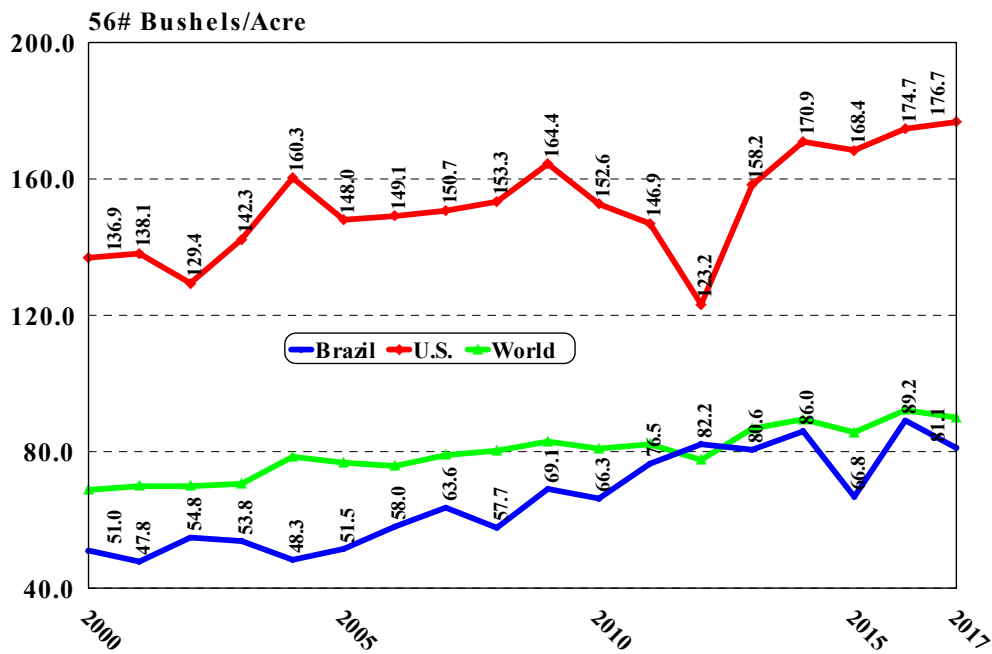
Corn Production in the U.S., Brazil and the World



Source: PS&D View, FAS/USDA

Figure 21.

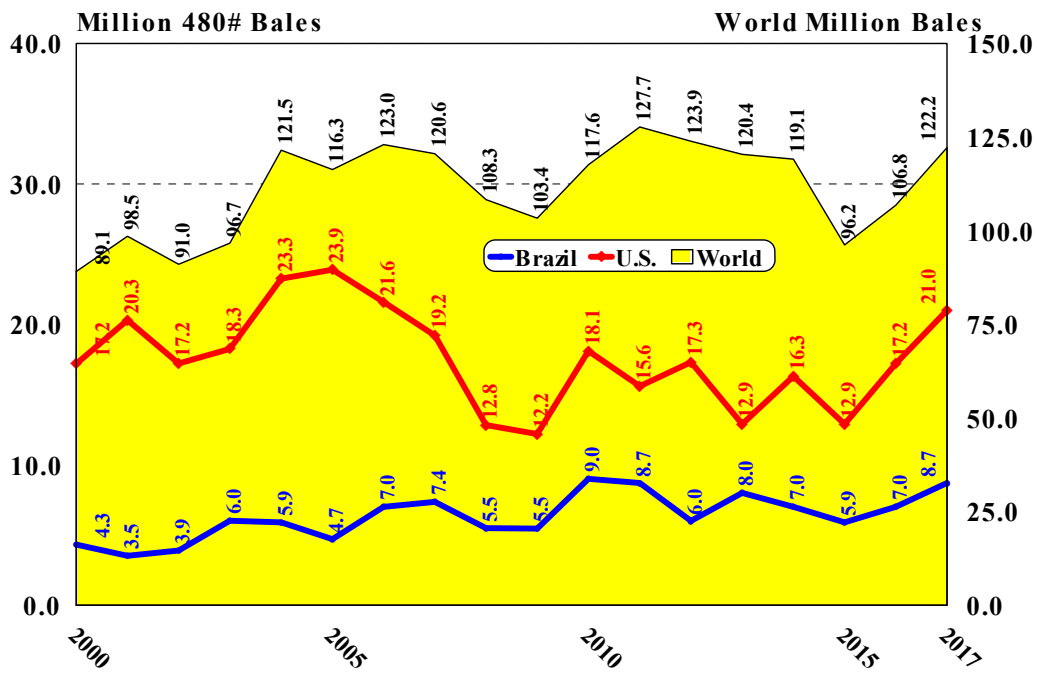
Corn Yields in the U.S., Brazil and the World



Source: PS&D View, FAS/USDA

Figure 22.

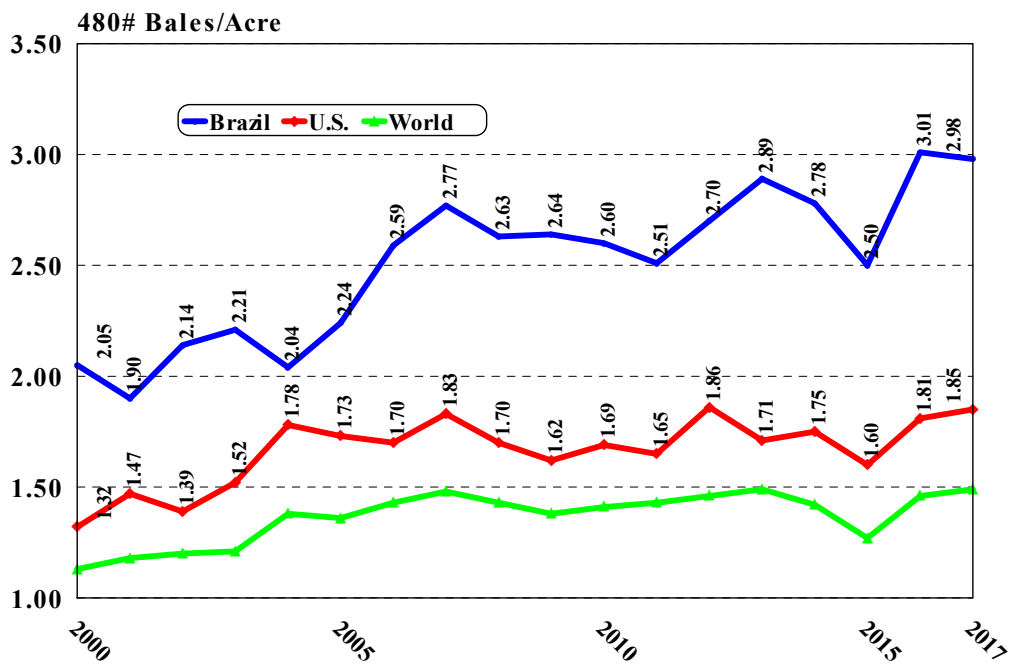
Cotton Production in the U.S., Brazil and the World



Source: PS&D View, FAS/USDA

Figure 23.

Cotton Yields in the U.S., Brazil and the World



Source: PS&D View, FAS/USDA

Case Study B: Ethanol Changes in Brazil

The United States and Brazil are both large producers of ethanol. Together, U.S. and Brazilian ethanol account for 84 percent of world ethanol production. U.S. ethanol is produced mainly from corn, 15.8 billion gallons in 2017, while Brazil produced 7.1 billion gallons of ethanol mostly from sugar cane. In 2017, Brazil processed 646 million tons of sugarcane and had the capacity to process 701.1 million tons in 368 operating mills. Due to Brazil's recent slow economic growth and other factors, 76 mills are not operating but could re-open if conditions changed.

The United States and Brazil also trade ethanol. U.S. imports of 248 million gallons of ethanol from Brazil during 2017 were valued at \$583.9 million while U.S. exports of 428 million gallons of ethanol to Brazil were valued at \$733.6 million that same year. These U.S. imports of ethanol allow U.S. companies to meet of guidelines regarding the use of ethanol from non-corn sources. U.S. ethanol exports to Brazil flow mainly to northern Brazil where ethanol is needed but is located in an area that is far away from the main Brazilian ethanol production areas. These shipments were made possible in large part to Brazil withdrawing their ethanol import tariff in 2010. U.S. ethanol now accounts for about 98 percent of its Brazilian ethanol imports with most entering Brazil through the northeastern state of Maranhao, which now accounts for 78 percent of Brazilian ethanol imports. In August 2017, the country imposed a quota of 600 million liters of ethanol (158.5 million gallons) and a tariff of 20 percent above this quantity in an effort to slow U.S. ethanol exports to Brazil. However, Brazil imports of U.S. ethanol have remained strong in the year since this quota and tariff were imposed.

Although Brazil faces competition from U.S. corn-based ethanol, there has been recent construction of three corn ethanol mills in Mato Grosso, a Midwest state, with another fifteen corn ethanol mills plants under construction in the country. Based on these ongoing ethanol mill construction projects, Brazilian corn ethanol production is expected to grow from 158 million gallons per year to 793 million gallons per year in the next five years. With most of this increased production will occur in Brazil's Midwest, which is much closer to northern Brazil when compared to sugarcane ethanol production. Thus, there is the potential for Brazilian corn ethanol to displace U.S. corn ethanol imported via northern Brazil.

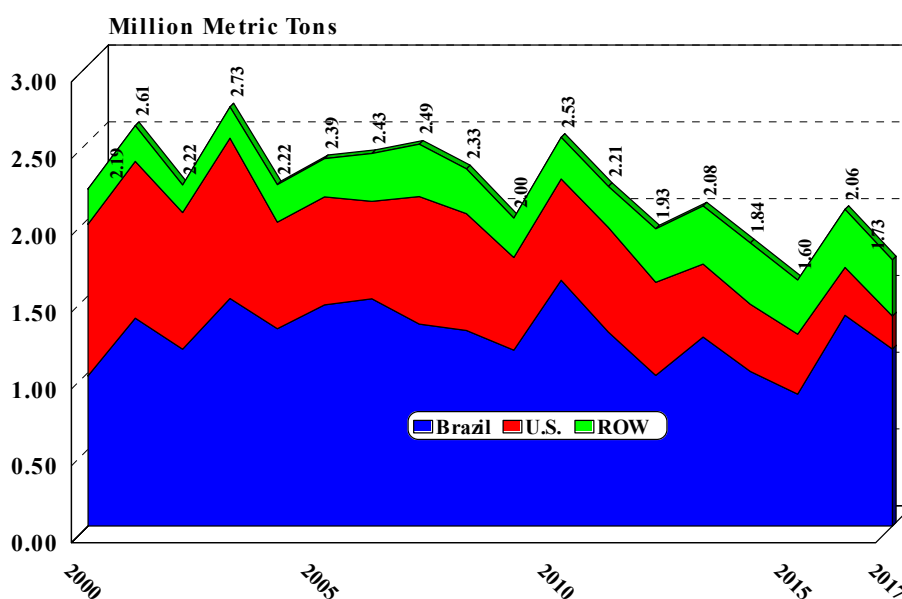
Another potential impact of Brazil increasing the use of corn as a feedstock for ethanol production is that it could increase Brazil's demand for corn. If more corn is used to produce ethanol while at the same time Brazil continues to expand its use of feedlots for cattle feeding, a deficit in corn could occur in Brazil. Even though Argentina and Paraguay dominate the Brazilian corn import market, the expansion of Brazil's cattle feeding industry coupled with increased use of corn to produce ethanol may create an opportunity for U.S. corn exporters to ship more product to Brazil. (For more on innovations in the Brazilian beef cattle industry, please see Case Study D on page 54)

Before discussing Brazil's productive capacity in other commodities, it is important to note that investors and exporters in the United States have played a role in at least part of Brazil's growth in corn, soybeans, cotton, and other commodities. As noted, U.S. exports of inputs such as fertilizers, chemicals and machinery to Brazil have grown over the years, allowing Brazilian agriculture to grow and compete with the United States. U.S. companies have also invested millions in Brazilian crop production, processing, and technology. These investments occur not only because Brazil has significant and growing productive capacity, but because the investment amount required is relatively low when compared to similar opportunities in the United States.

Brazil is the world's leading producer of orange juice, accounting for an average of 56 percent of global production since 2000 and reaching 66 percent in 2017 (Figure 24). The United States accounts for most of the remainder, averaging 31 percent over the entire seventeen-year period but only a quarter since 2010 and twelve percent in 2017.

Figure 24.

FCOJ Production in the U.S., Brazil and the Rest-of-World



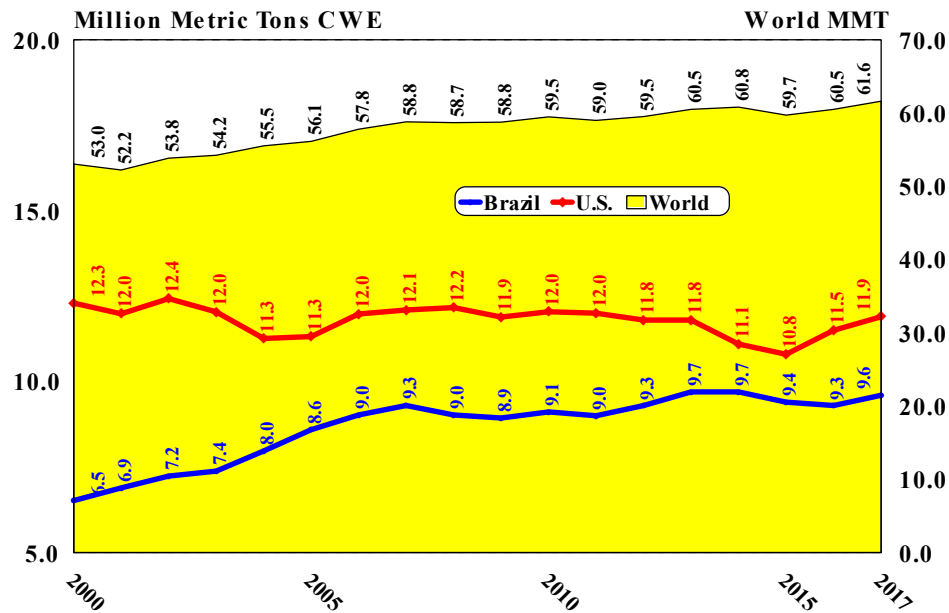
Source: PS&D View, FAS/USDA

Brazil is also one of the largest producers of beef and broilers in the world. On a carcass weight equivalent (CWE), Brazilian beef production grew from 6.5 MMT in 2000 to 9.7 MMT in 2014 before stabilizing at 9.6 MMT in 2017 (Figure 25). Meanwhile, U.S. beef production has dropped slightly throughout the same time period, though it did increase slightly during 2016 and 2017 (Figure 26). Both Brazilian and U.S. broiler meat production has increased over the same time period – Brazil from 6.0 MMT to a high of 13.2 MMT in 2017 and the United States from 13.7 MMT to a high of 18.7 MMT in 2017. As a result, U.S. beef and poultry exporters are

facing ever-growing competition from Brazilian exporters. Brazilian pork production, which is about one-third of U.S. pork production, continues to grow as well (Figure 27).

Figure 25.

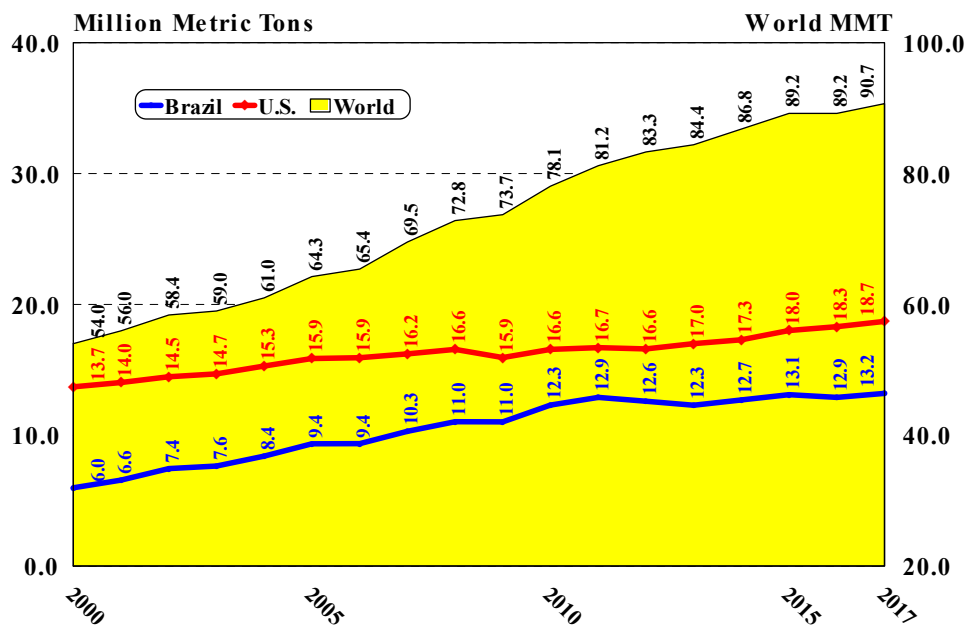
Beef Production in the U.S., Brazil and the World



Source: PS&D View, FAS/USDA

Figure 26.

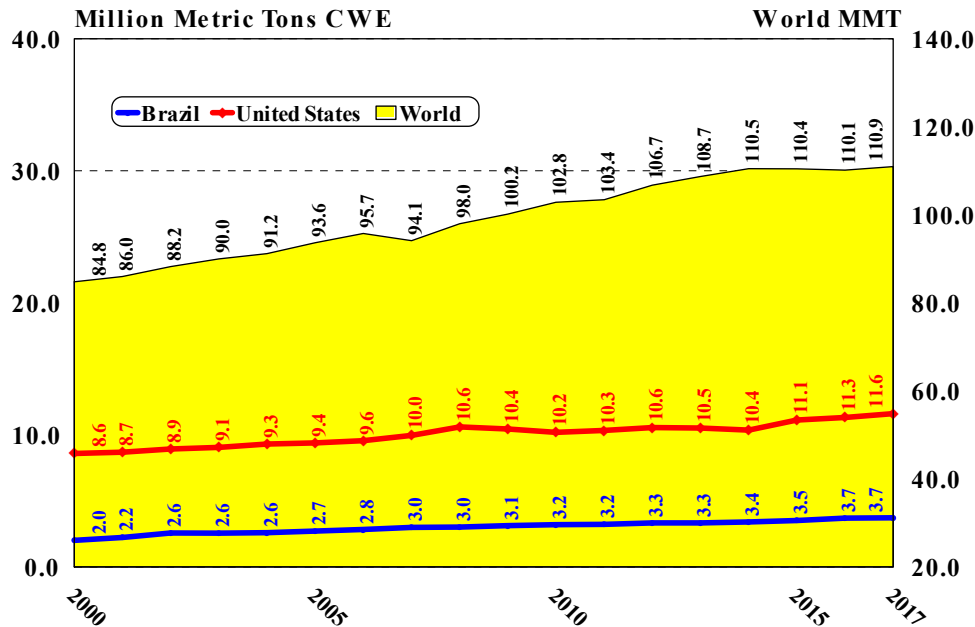
Broiler Production in the U.S., Brazil and the World



Source: PS&D View, FAS/USDA

Figure 27.

Pork Production in the U.S., Brazil and the World



Source: PS&D View, FAS/USDA

Competition from Brazil in International Markets

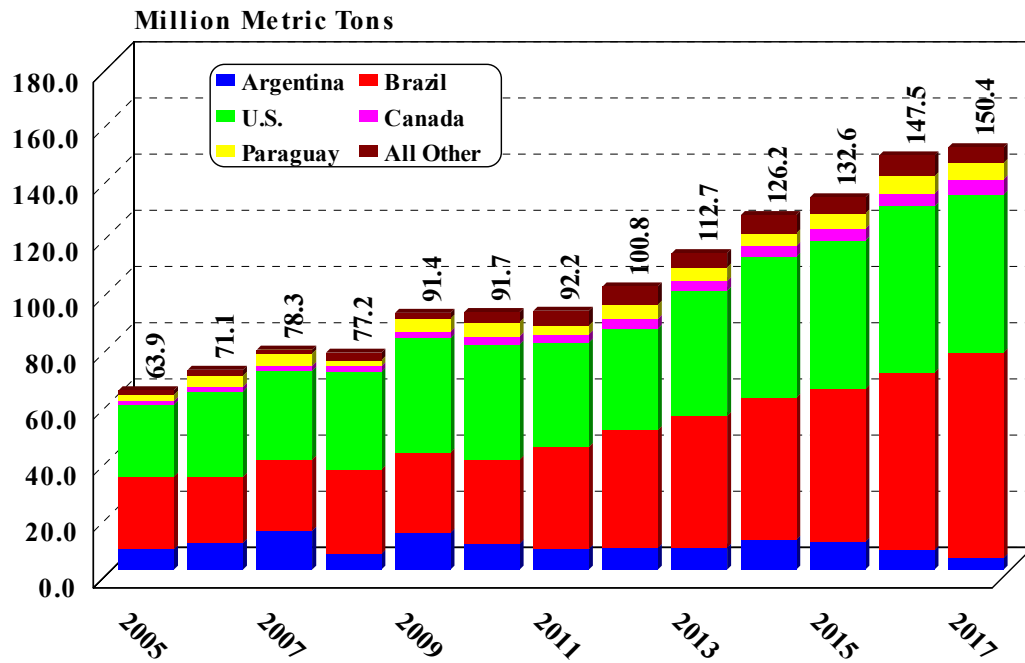
Brazil is considered a major competitor to U.S. agriculture and has a stronger impact on the development of U.S. agricultural programs and policies than almost any other country. As already discussed, Brazil is among the world's leaders in the production of soybeans, poultry, beef, cotton, corn, and orange juice. Thus, Brazil exports many of these same products.

Brazil has been among the world's leading corn, soybean and cotton exporters for numerous years. Brazil has been the leading soybean exporter each year since 2012 ahead of the United States (Figure 28). Prior to 2012, Brazil was second behind the United States but Brazilian exports grew consistently each year faster than U.S. exports grew. In 2017, Brazil exported 73.1 MMT of soybeans compared to U.S. exports of 56.2 MMT. Brazil and U.S. soybean exports compete for the Chinese market and have done so for fifteen years or more (Figure 29). Brazilian and U.S. soybean exports also compete in the European Union.

In addition to soybeans, Brazil is also a major competitor to U.S. soybean meal (SBM) and soybean oil (SBO) exports. During 2017, Brazil exported 14.2 MMT of SBM and 1.3 MMT of SBO while U.S. exports of SBM totaled 10.6 MMT and with SBO exports 1.1 MMT. While none of the top five markets for the two countries overlap for either product, Brazil and the United States compete most in the Thailand SBM market and the Chinese SBO market.

Figure 28.

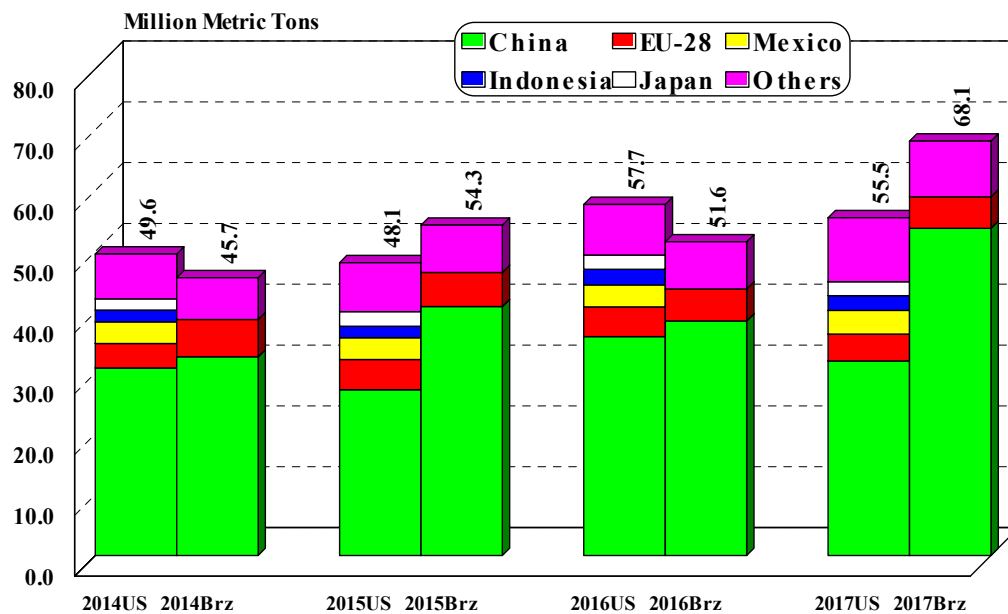
World Soybean Exports



Source: PS&D View, FAS/USDA

Figure 29.

U.S. & Brazil Exports of Soybeans, 2014-2017



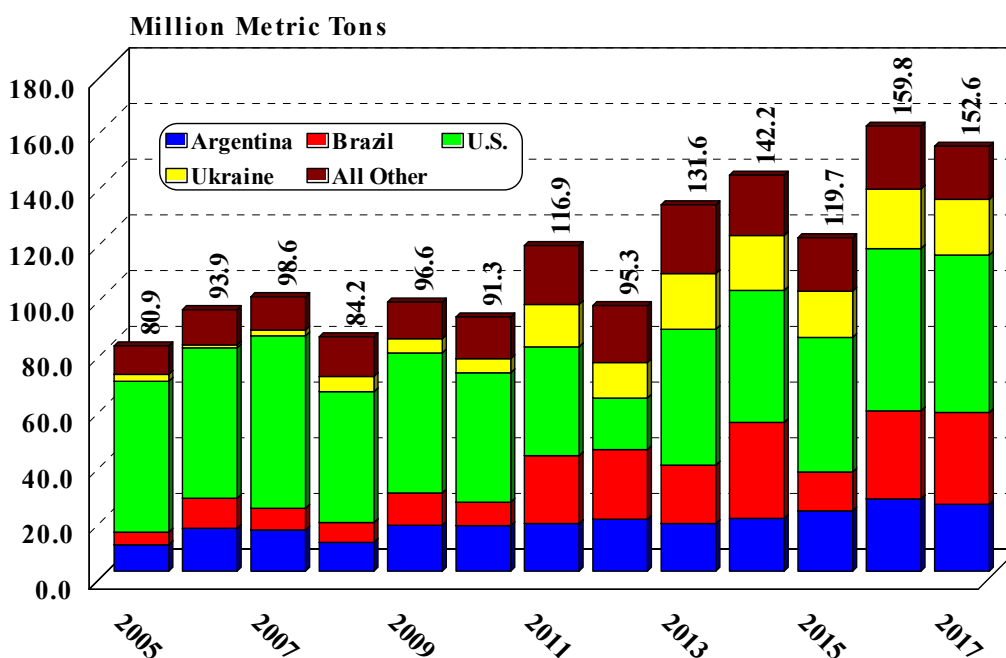
Source: USDA Global Agricultural Trade System, FAS/USDA & AGROSAT, MAPA, Brazil

Brazilian corn exports in recent years have alternated between number two and three with Argentina, with both being behind the United States (Figure 30). For instance, world exports of corn totaled 152.6 MMT during 2017, with U.S. exports totaling 56.5 MMT followed by Brazil (33.0 MMT) and Argentina (24.0 MMT). By contrast, Brazilian corn exports were 4.5 MMT in 2005 while U.S. exports were 54.2 MMT. This illustrates significant growth in Brazilian corn exports. Further, while Brazil and U.S. corn exports were shipped to many of the same markets during 2017, U.S. corn exports had a larger share in Mexico, Japan, South Korea, and Taiwan while Brazil had more shipments in Egypt and the European Union (Figure 31).

In cotton, Brazil is often the third or fourth leading world exporter behind the United States, India, and sometimes behind and sometimes ahead of Australia (Figure 32). To compare, during 2017, U.S. cotton growers exported 14.9 million bales of cotton while producing 20.9 million bales, or 71 percent, while Brazilian cotton exports were 4.2 million bales with production of 8.7 million bales, or 45 percent of production. Both countries hold large amounts of cotton stocks either in warehouses or on the farm, though Brazil holds more. This could be a greater competitive challenge to U.S. cotton exporters in the future. Brazil and U.S. cotton exports compete in Vietnam, China, Turkey, and Indonesia although the United States holds a substantial advantage in those markets (Figure 33).

Figure 30.

World Corn Exports



Source: PS&D View, FAS/USDA

Figure 31.

U.S. & Brazil Exports of Corn, 2014-2017

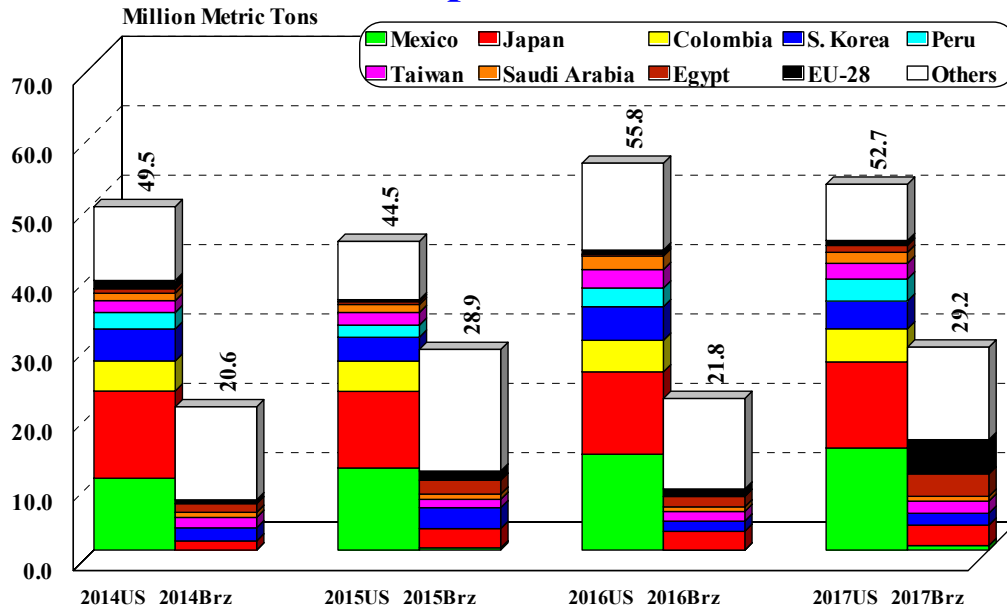


Figure 32.

World Cotton Exports

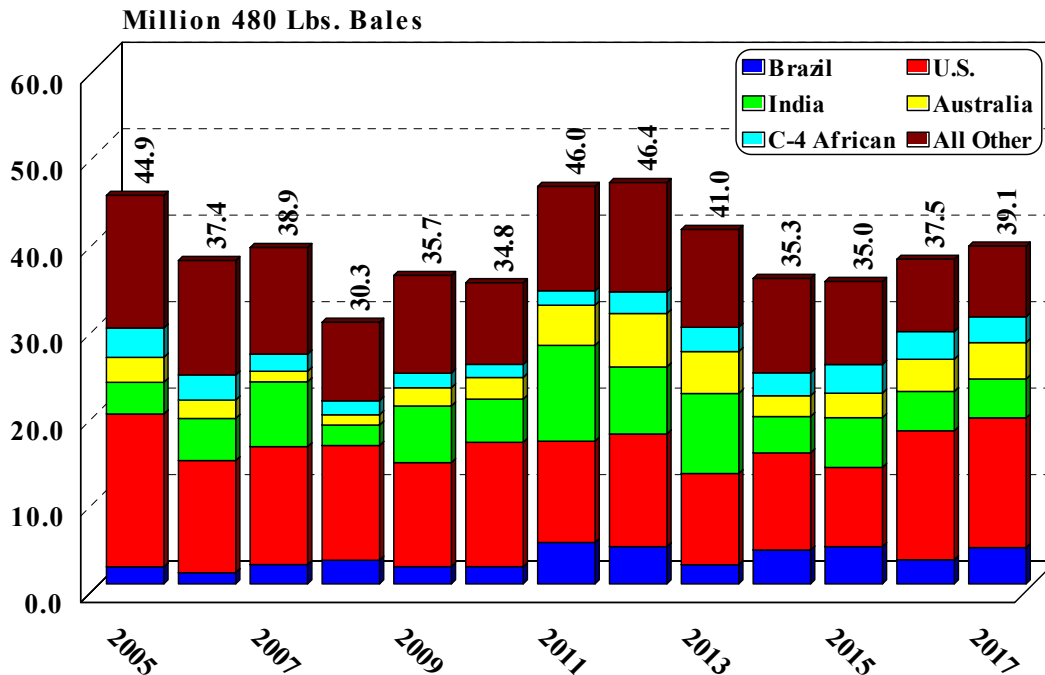
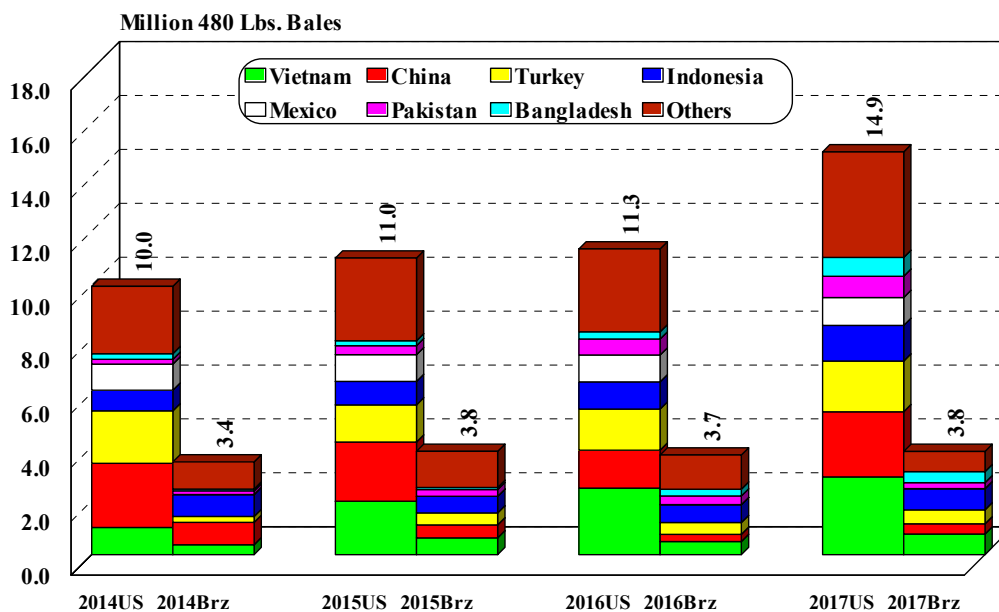


Table 33.

U.S. & Brazil Exports of Cotton, 2014-2017



Source: USDA Global Agricultural Trade System, FAS/USDA & AGROSAT, MAPA, Brazil

As noted, Brazil and the United States are also highly competitive in both beef and poultry meat exports, and both are among the world's leading meat exporters. In 2017, Brazil beef exports were 1.86 MMT, just ahead of India (Figure 34). The United States is typically the fourth leading beef exporter and shipped 1.3 MMT in 2017. U.S. beef exports compete with Brazilian exports in Hong Kong and, to a lesser extent, China. After that, they focus on separate markets.

In the global broiler meat market, Brazil is typically the leading supplier with U.S. exports coming in second, together making up about 63 percent of world exports in 2017 (Figure 35). However, Brazil and the United States share no major markets for their broiler exports.

In the global pork market, Brazil is typically the fourth leading supplier with U.S. exports coming in second (Figure 36). Brazil pork exports have been growing recently, reaching 786 TMT in 2017. For comparison purposes, U.S. pork exports reached 2.6 MMT in 2017. Brazil and U.S. pork exports compete in China and Hong Kong, and to a lesser extent in Singapore.

Taken together, Brazil and the United States export similar amounts of beef, poultry, and pork, over 5.5 MMT each in 2017 (Figure 37). While they often focus on different markets for meat exports, they could become fierce competitors in the international market for meats.

Figure 34.

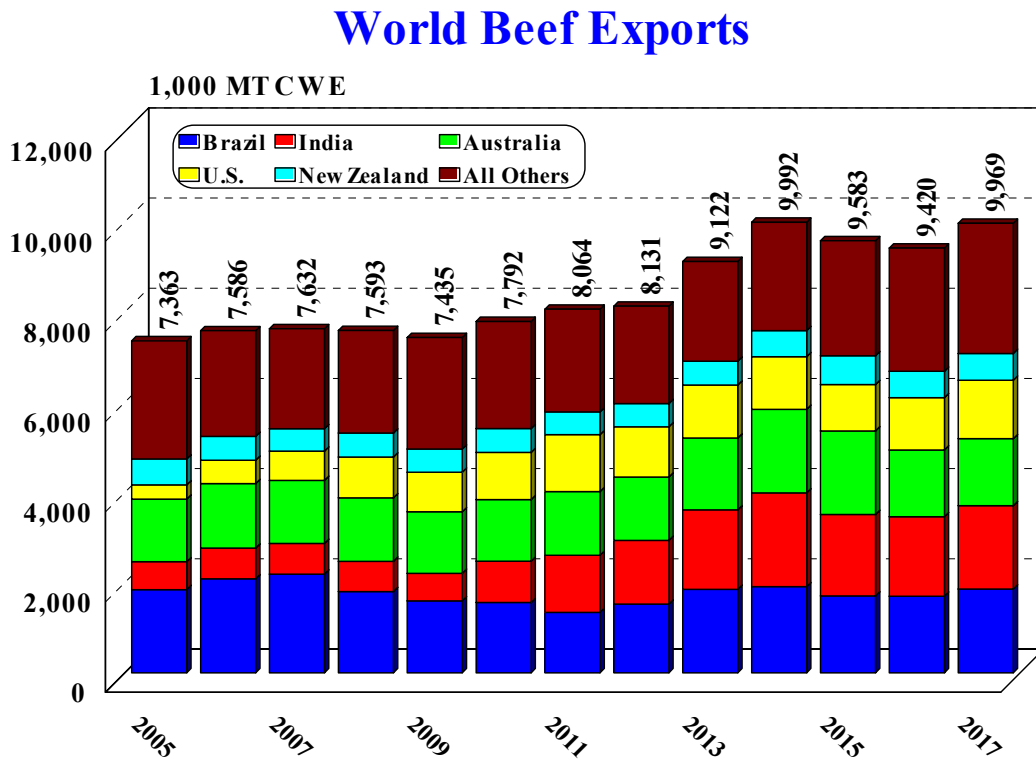


Figure 35.

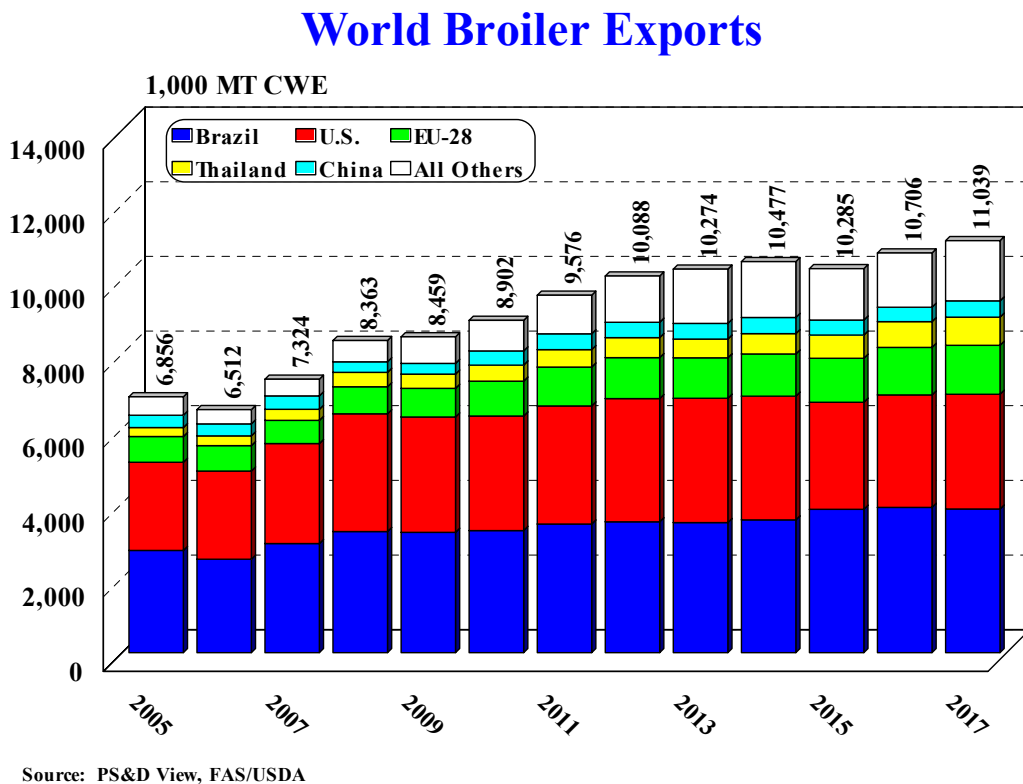
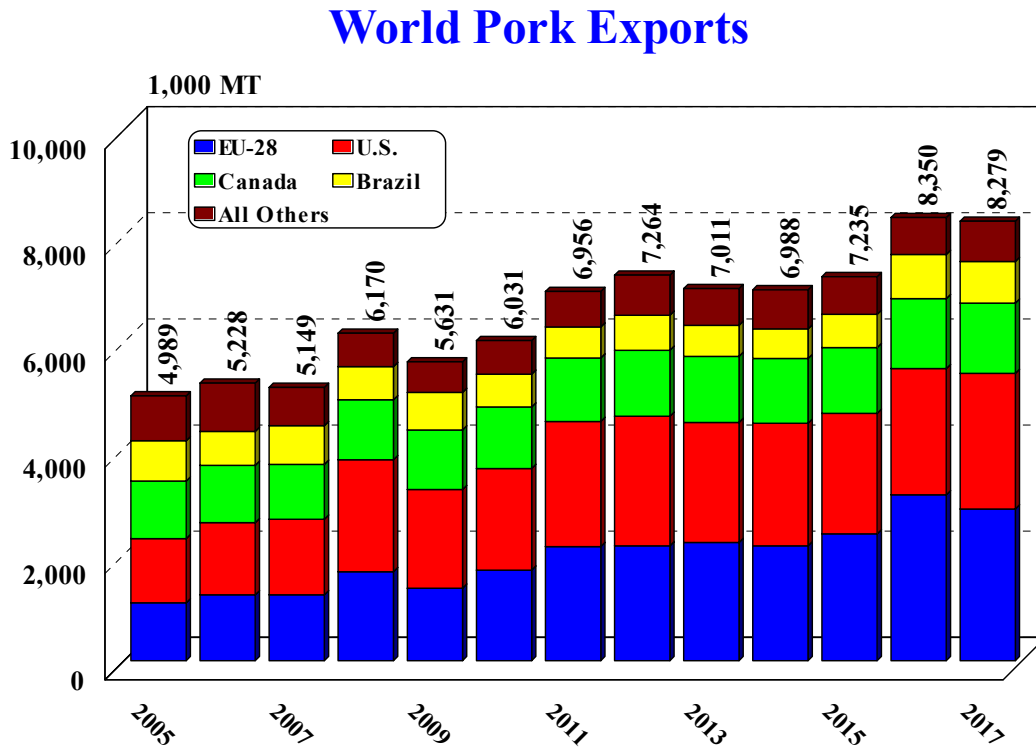


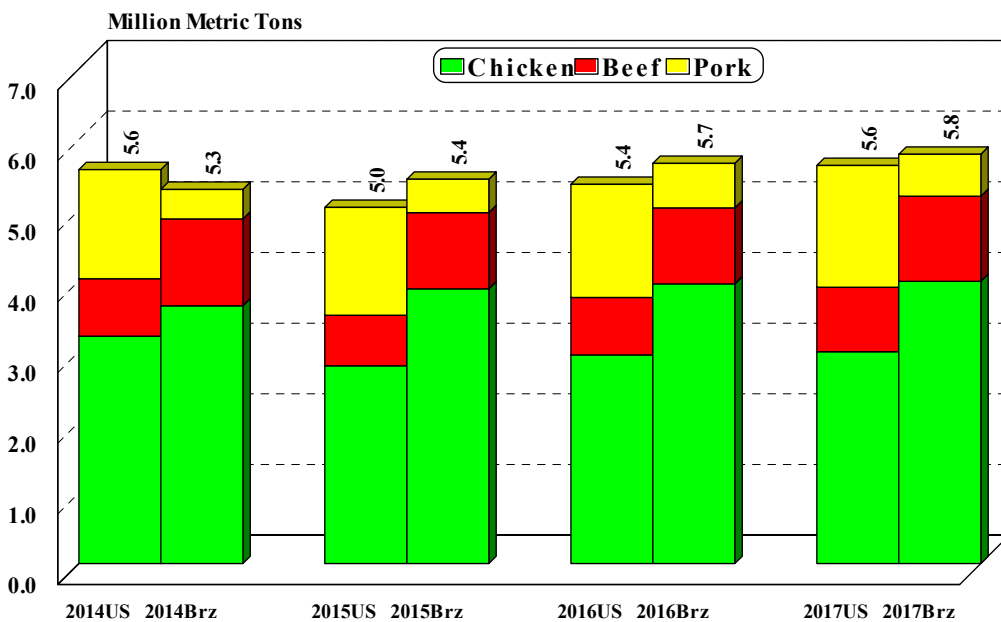
Figure 36.



Source: PS&D View, FAS/USDA

Figure 37.

U.S. & Brazil Exports of Meats, 2014-2017

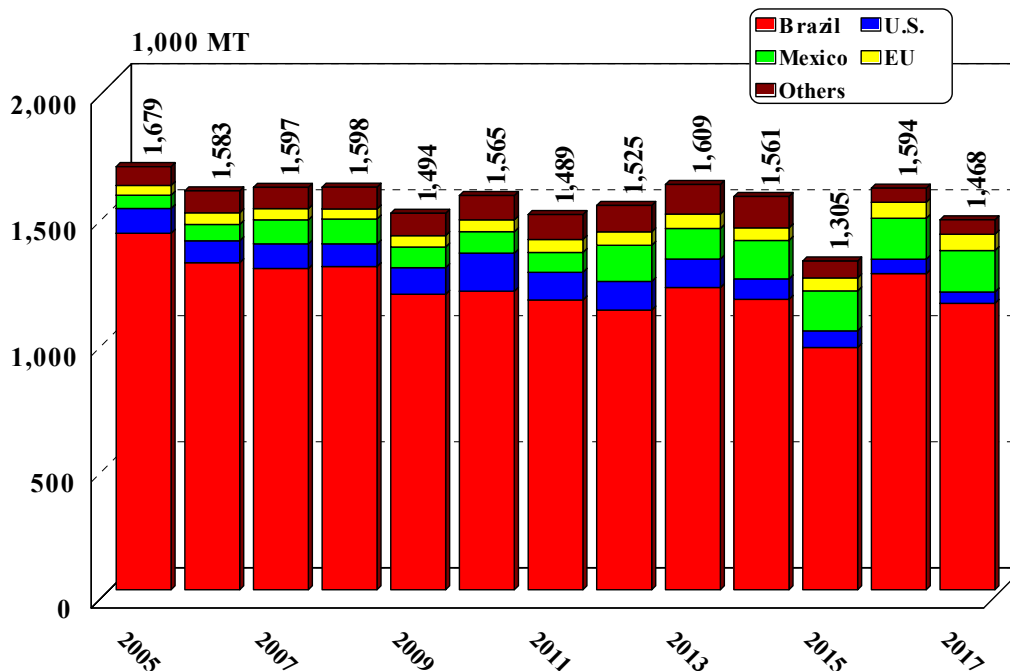


Source: USDA Global Agricultural Trade System, FAS/USDA & AGROSAT, MAPA, Brazil

The final product to be discussed here is orange juice. By a large margin, Brazil is the world's leading orange juice exporter, and while the United States produces and exports orange juice, it is also a well-established market for Brazilian orange juice (Figure 38). Mexico is the second leading exporter of orange juice and provides limited competition to Brazil.

Figure 38.

World Orange Juice Exports



Source: PS&D View, FAS/USDA

SECTION 3. Cross-Cutting Issues in Brazil

There are many issues unique to Brazil which make their agricultural and food market largely untapped and which hinder their ability to compete in world markets. Two such issues are Brazil's transportation infrastructure and the complex web of governmental policies and regulations. The following subsections will address these cross-cutting issues.

Transportation Infrastructure and Investment in Brazil

Brazil, a country with 3.2 million square miles (mi²) of land area, has a transportation infrastructure consisting of 982,365 miles of roadways, 31,069 miles of waterways, and 17,733 miles of rail (Table 3). While Brazil appears to have an adequate infrastructure based on absolute numbers, they fall behind other large countries like China, India or Argentina when considering the density of infrastructure. For example, Brazil has only 5.5 miles of railroad per 1,000 mi² of

land area, while India, China, and Argentina have, respectively, 37.1, 33.0, and 21.7 miles of railroad per 1,000 mi². Brazil also lags behind India, the United States, and China when considering roadway density. Brazil is most similar to Russia when considering roadway, rail, and waterway density.

Table 3. Infrastructure Extension and Density for Selected Countries

	Brazil	U.S.	Argentina	Russia	China	India
<i>Distance</i>						
Railroad*	17,733	182,412	22,939	54,157	118,850	42,579
Roadways*	982,365	4,092,730	143,769	797,460	2,551,591	2,919,838
Waterways*	31,069	25,482	6,835	63,380	68,351	9,010
<i>Density</i>						
Railroad**	5.5	51.6	21.7	8.6	33.0	37.1
Roadways**	304.4	1,158.8	136.1	126.1	708.6	2,543.5
Waterways**	9.6	7.2	6.5	10.0	19.0	7.8
Land area***	3,227,096	3,531,905	1,056,642	6,323,482	3,600,947	1,147,956

Source: CIA World Fact Book

* in miles; ** density infrastructure, miles of infrastructure per 1,000 miles² of land area; *** miles²

Not only does Brazil have a low level of infrastructure density relative to other large countries, but also the quality of existing infrastructure is inadequate. According to Global Competitiveness Report the Brazilian infrastructure quality is ranked 116 out of 138 countries (Table 4).

Table 4. Infrastructure Quality Rank for Selected Countries

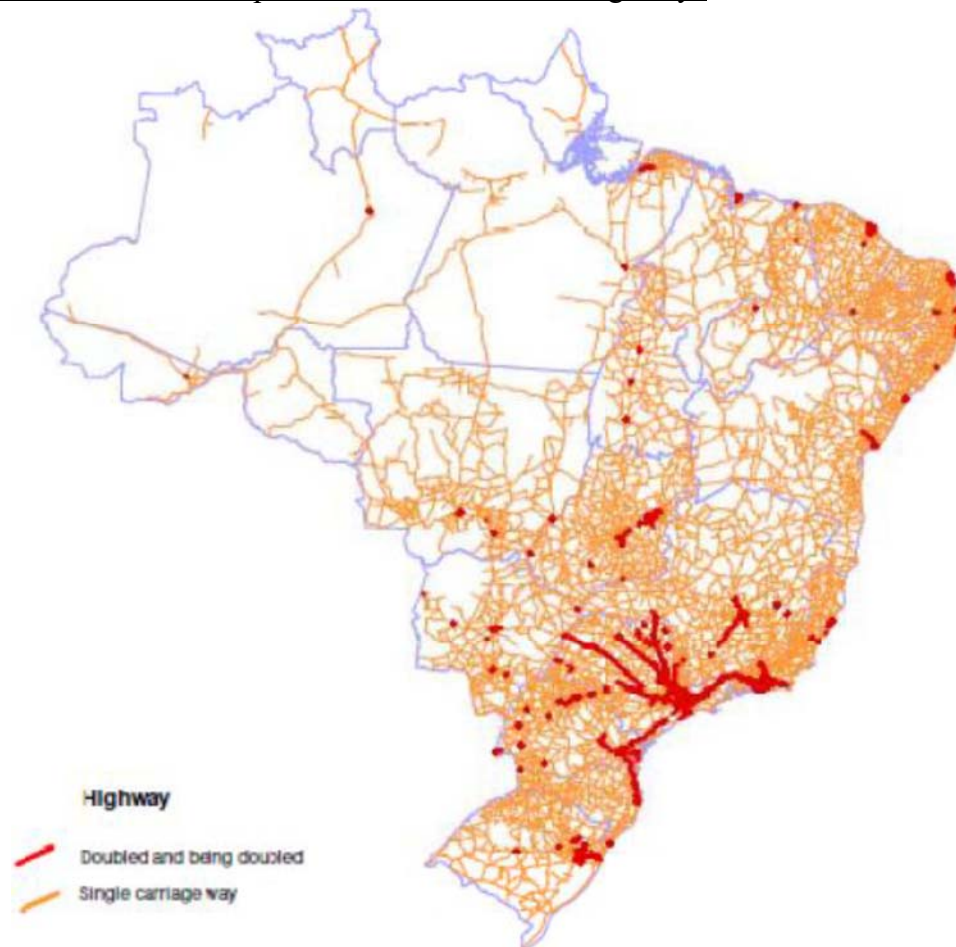
	Brazil	U.S.	Argentina	Russia	China	India
Roads	111	13	103	123	39	51
Railroads	93	13	87	25	14	23
Ports	114	10	79	72	43	48
Overall Infrastructure	116	12	109	74	43	51

Source: Global Competitiveness Report, World Economic Forum (2017)

According to research conducted by the National Conference for Transport in 2015, most types of infrastructure suffer from lack of maintenance, lack of investment and labor issues whether it be lack of skilled labor or difficulty in hiring crews. Highways also suffer from lack of paving, an aging fleet, and low density while rails suffer from physical and operational bottlenecks, and a lack of integrated expansion. Inland navigation and ports have high taxes and tariffs, difficulty in obtaining credit, lack of terminals and flagged vessels.

Figure 39 illustrates the limited nature of Brazil's highway infrastructure showing only a small portion of the highway currently being or planned to be double-lane in a particular direction. All other highways are single-lane in each direction resulting in dangerous situations and slow transport times throughout most of the country. One of these is BR163, a north-south highway which runs from Rio Grande do Sul in southern Brazil to the port area near Santarem in northern Brazil. The portion of this highway which is crucial to agriculture runs through Mato Grosso do Sul, Mato Grosso, and Para for about 2,500 kilometers, or 1,525 miles. It is single-lane in each direction, in disrepair, and there remains about 90 km (55 miles) which are still unpaved resulting in safety hazards and long delays, particularly during the rainy season during which many loads of grain in double- and triple-trailer loads are hauled north to the Atlantic ports. This highway alone creates some of the most prominent inefficiencies in the Brazilian agricultural transportation system. However, once the final 90 km of this highway is paved, industry analysts estimate a ten dollar decrease in grain transportation costs from central Mato Grosso to the barge loading facilities in Miritituba on the Tapajós River, and travel time from central Brazil will decrease from three days to 1½ days.

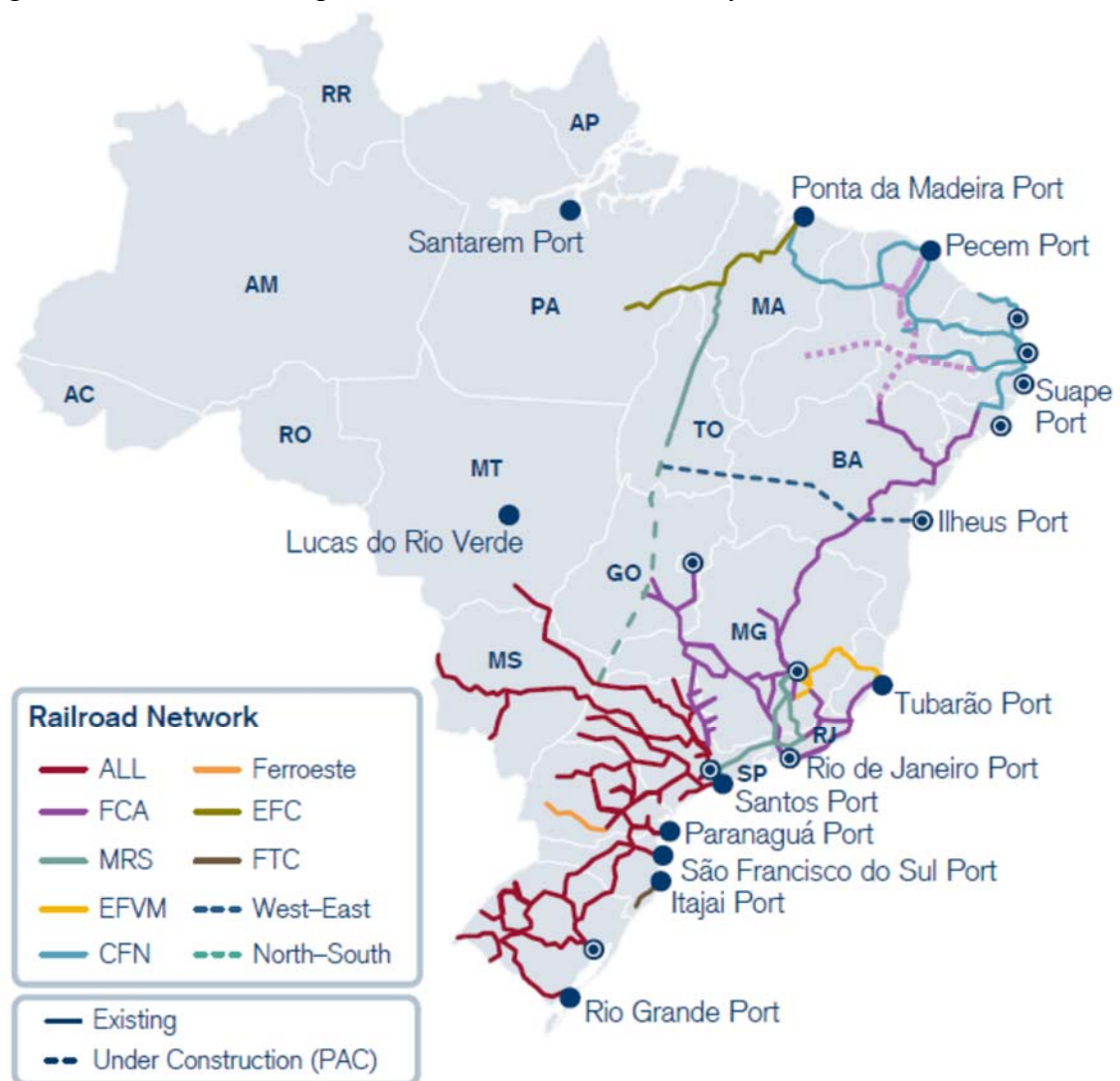
Figure 39. Brazilian Transportation Infrastructure: Highways



Source: Brazil, Ministry of Transportation, PNLT (2011) (from ABIOVE)

Figure 40 illustrates the limited nature of Brazil's rail infrastructure considering Brazil is such a vast country. While several rails under construction are shown, an additional rail being planned will be sponsored and funded by the large grain companies, including Amaggi, ADM, Bunge, Cargill and Dreyfuss. This rail, often called the *ferrogrão* or the "grain rail," will originate in Mato Grosso and proceed north to the Tapajós River so as to avoid BR163 and more efficiently access the northern ports. If built, the *ferrogrão* is expected to ship one-half of the soybeans and corn produced in Mato Grosso. By 2040, that means that of the 65.0 MMT of grains and oilseeds exported from Mato Grosso, 32.5 MMT would move on the *ferrogrão* to northern Brazilian ports. There is also discussion about building a rail from Brazil to the west coast of South America through several different countries. However, most stakeholders felt that the construction of such a rail was unlikely.

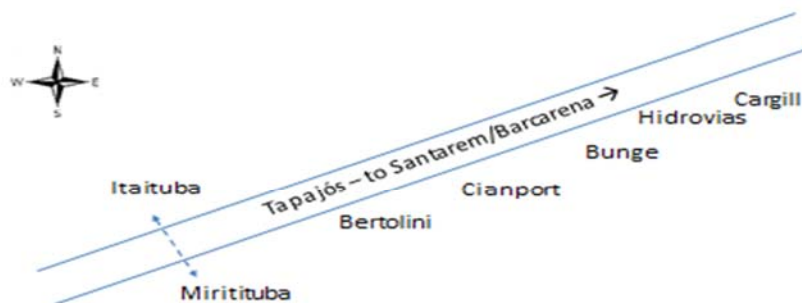
Figure 40. Brazilian Transportation Infrastructure: Railways



Source: Brazil, Ministry of Transportation, PNLT (2011) (from ABIOVE)

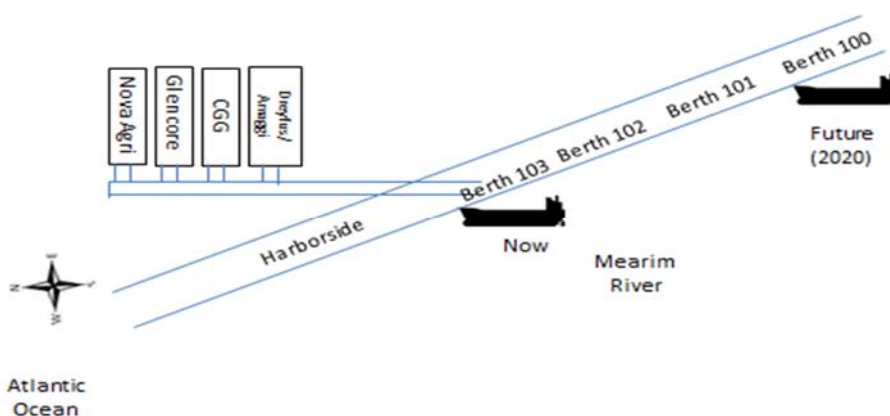
(Figure 42). These investments illustrates private sector willingness to mitigate their own transportation issues and that they have confidence that their investments will be rewarded. Another example of this optimism is increasing private sector investments in the northern port areas near Santarem, Belem, and, as shown in Figure 43, Sao Luis. In these new investments, competitors often form joint ventures to share costs and increase the potential for benefits. The long-term export capacity resulting from investments in Miritituba and in the Norther Arc ports is estimated to be between 44–56 MMT.

Figure 42. Inland Waterway Facilities at Itaituba/Miritituba Serving the Northern Arc Ports



Source: Center for North American Studies, Texas A&M University

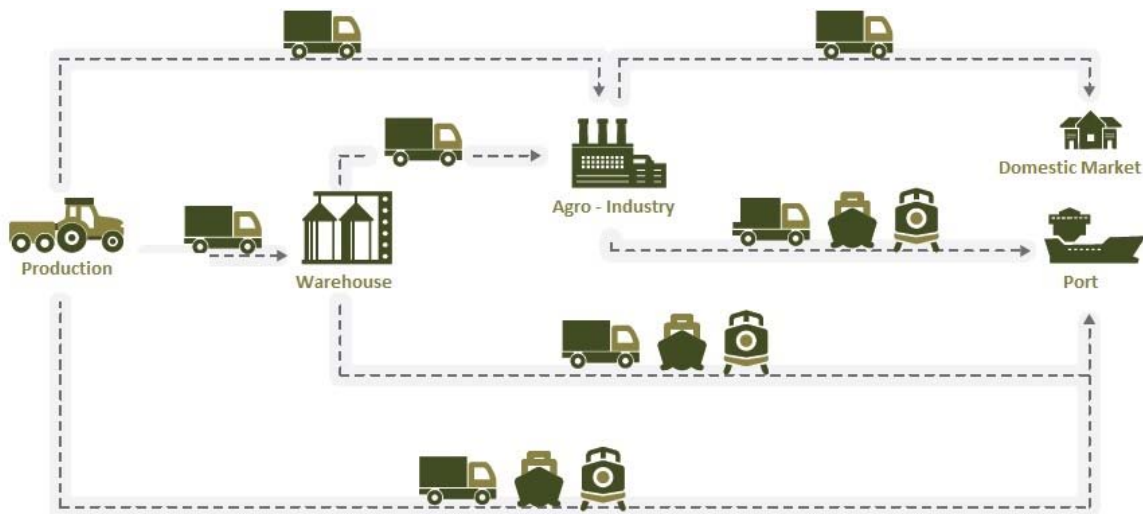
Figure 43. Example of Private Sector Investment in Sao Luis, Brazil



Source: Center for North American Studies, Texas A&M University

To illustrate the agricultural transportation process in Brazil, the case of shipping soybeans is highlighted. The Brazilian National Conference for Transport (CNT) describes the soybean and grain distribution logistics in two major steps illustrated below (Figure 44). The first step consists in the road transport of harvested grain from the farm directly to either on-farm warehouses or off-farm warehouses belonging to the government, cooperatives, or other companies. Due to the absence of paved rural roads, this first step, in general, has high costs.

Figure 44. Brazilian Grain and Soybean Distribution Logistics



Source: Adapted from CNT (2015)

The second step concerns road transportation from the warehouse to the processing industry. The product is then transported by truck on roads that are mostly paved with asphalt to the domestic market or to the export market over highways, waterways, railways or a combination of these. Grain is often shipped directly from the farm to the port of export for shipment overseas.

The comparative perspective between the United States and Brazil, the two largest soybean producers and exporters, point out that the United States has a large share of soybeans, 45 percent, moving through inland waterways, while Brazil ships only 9 percent on inland waterways (Table 5). Brazil uses truck to transport a majority of soybeans, 65 percent while United States ships only 20 percent of their soybeans via highway. The remainder of the soybeans in each country travel on rail – 26 percent in Brazil and 35 percent in the United States.

Brazilian and U.S. soybeans travel, on average, approximately 620 miles from production to the ports, but 80 percent of U.S. shipments goes by water and rail while only 35 percent of Brazilian production goes by water and rail.

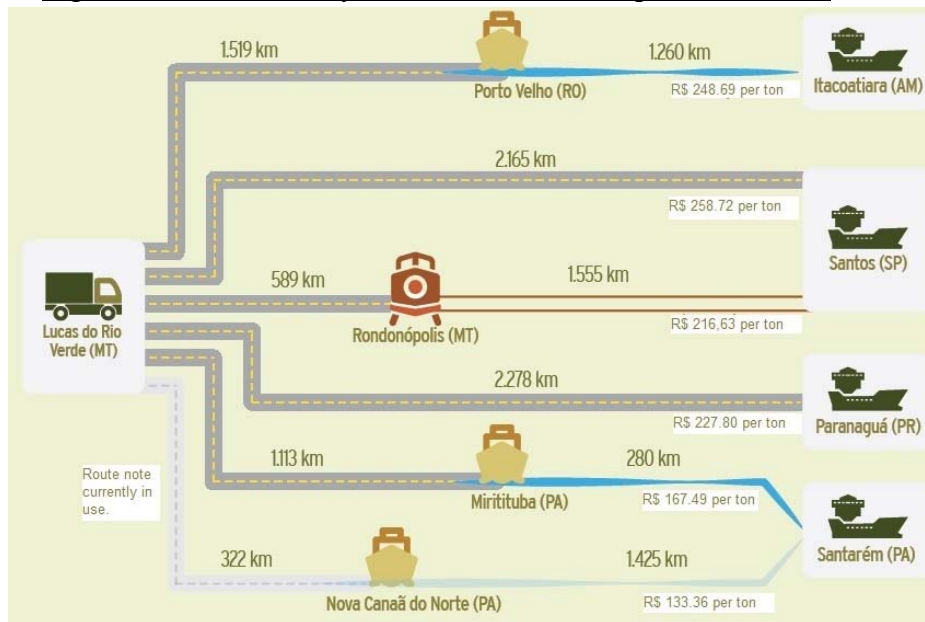
Table 5. Soybean Transportation in Brazil and the United States

Approximate Shares of Transportation by Mode	Brazil	U.S.
Inland Water	9%	45%
Rail	26%	35%
Truck	65%	20%
Average distance to the port	621 miles	621 miles

Source: Adapted from Abiove and CNT (2015), and USDA Agricultural Marketing Service Data cited are from 2013.

In 2015, CNT simulated the transportation cost of Brazilian soybean from the city Lucas do Rio Verde (MT) to four different ports: Itacoatiara (AM), Santos (SP), Paranaguá (PR) and Santarém (PA). The results are summarized in Figure 45. The least expensive route has the grain traveling truck for 322 km (200 miles) to Nova Canaã do Norte, at which point it uses inland water transport to reach the Port of Santarém 1,425 km (885 miles) further. That cost was estimated at R\$133.36, or about \$61.83 per ton (\$1.68 per bushel) based on exchange rates at the time. The next lowest route involves trucking the soybeans a 2½ times further to Miritituba before using inland waterway to get to Santarém. The most expensive route involves trucking the soybeans 2,165 km (1,345 miles) to Santos at nearly twice the cost of the least-cost option.

Figure 45. Brazilian Soybean Simulated Transportation Costs



Source: Adapted from CNT (2015)

Even though there may be problems associated with Brazilian transportation infrastructure as discussed above, agricultural and food products continue to flow into and out of Brazil, and throughout the country. There are numerous infrastructure corridors which allow Brazil to compete in the international markets and distribute imported products (Figure 46). Like most other countries, Brazil can assuredly improve its transportation infrastructure. Nonetheless,

Brazil continues to ship large volumes of agricultural products throughout the country and is competitive enough to maintain large shares in global markets. As more public and private sector investment occurs in highways, rails, inland waterways and ports, such as the R\$146.4 billion (\$41 billion) included in the *Plano Plurianual* for 2016-2019 infrastructure investment, Brazil's international trade corridors will become more efficient.

Figure 46. Export Corridors in Brazil
Corredores de Exportação – Resultados



Source: Gerência de Estudos Técnicos e Econômicos, GETEC - FAEG

Another area of infrastructure in which Brazil can improve is the availability of cold storage. Brazilian industry representatives indicated Brazil had 19.0 million cubic meters (mcm), or 671.0 million cubic feet (mcf), of cold storage capacity for the entire country in 2018. This amounts to 0.092 cubic meters (cm) (3.24 cubic feet (cf)) per person. Approximately half of this capacity is proprietary, owned by meat packing houses, supermarkets, frozen foods companies, dairy products, and concentrated juices. The other half of this capacity is available for rent to a wide array of clients for both shorter and longer terms.

To put Brazilian cold storage capacity in perspective, the United States, with roughly 53 percent more population, has 114.85 mcm (4,055.4 mcf) of capacity or 0.438 cm (15.5 cf) per person. Brazil's capacity per person, however, is much greater than countries such as Mexico, Panama, and Peru, but only one-third the capacity in Uruguay, Canada, and India while being

about half that of Greece, Tunisia, and Sweden. However, Brazil is expanding their cold storage capacity, growing from 5.71 mcm (201.66 mcf) of capacity in 2010 to 16.05 mcm (566.7 mcf) in 2014 to current levels. This represents growth of 233 percent since 2010 and 18 percent since 2014. As Brazilian cold storage capacity is expected to continue growing, more consumer-oriented products which require an efficient cold chain can be imported by Brazil.

Governmental Policies and Regulations in Brazil

In Brazil, there is a vast array of laws and regulations covering taxation, labor, crop insurance, and the environment. When taken together these laws raise the cost of doing business in Brazil and with Brazilian businesses. These cost increases are often referred to by Brazilians as well as others as the “Brazil Tax.” As the Brazil at 2040 research team met with dozens of entities within Brazil throughout the spring and summer of 2017, many conversations were had regarding the “Brazil Tax,” and many of the thoughts regarding policies and regulations are included below.

Taxation

Brazil’s tax code is complex. According to The Brazilian Institute of Tax Planning (IBPT) the government has issued an average of 34 new tax rules per day since the National Constitution of 1988. There are many taxes affecting agriculture. One tax impacting value-added agriculture is the Tax on the Circulation of Commodities and Services (ICMS). The ICMS is set by each state separately and is imposed when a product moves across state lines. It is basically a state-based VAT which can only be reclaimed if the product is exported. As a result, it is more efficient to export soybeans from Mato Grosso than to ship the soybeans to Sao Paulo for crushing and have the meal and oil remain in Brazil. Other taxes impacting agriculture are the Worker's Social Integration Program (PIS), the Contribution to Social Security Financing (Contribuição Social Seguridade Social - CSLL), the Industrialized Products Tax (IPI), income tax, contribution to the National Institute of Social Security (INSS), Rural Workers Assistance Fund (Funrural) and the Social Contribution on Net Income (CSLL).

Total taxes and contributions paid by businesses sum up to 68.4 percent of the profits in Brazil. Further, IBPT (2015) estimates a typical Brazilian who follows all tax laws pays 41.4 percent of their earnings in taxes. The tax burden as a percentage of GDP corresponds to 32.7 percent according to Brazilian IRS Receita Federal (2015). These are just three of the reasons why tax avoidance is relatively high in Brazil and that World Bank Doing Business (2018) ranks Brazil 184th out 190 countries in paying taxes.

While there is a desire by many to improve Brazil’s taxation system, government union lobbies and recipients of social program benefits, both of whom benefit from the system, are

Case Study C: Brazilian Import Duty Drawback System

The Brazilian drawback system is a customs system that provides tax incentives for Brazilian companies when buying inputs, domestically or internationally, to manufacture goods for export. It provides an opportunity for U.S. exporters to ship to Brazilian firms who may wish to utilize the system. The Brazilian drawback system has two modalities: suspension and exemption. Law N° 11.945 supports the first scheme and Law N° 12.350 supports the second scheme. Suspension occurs before the final product is exported and exemption happens after the final product is exported.

When a Brazilian exporter acquires inputs abroad the government grants fiscal suspension/exemption on the following taxes: i) Import Duty (II); ii) Excise Tax (IPI); iii) Social Contributions (PIS/COFINS); iv) State Value-Added Tax (ICMS); and v) Additional Freight for the Renewing of the Merchant Marina (AFRMM). In essence, this system allows Brazilian processors to import inputs, use those inputs in the production of value-added processed products, and then avoid the stated taxes by re-exporting the final product. Furthermore, the regime does not discriminate among commercial segments, does not distinguish between the qualifications of the beneficiary, and there is no restriction on the destination of the final product.

Different U.S. and Brazil crop seasons and price fluctuations throughout the year may lead, under the Brazilian drawback system, to export opportunities to U.S. producers. In fact, some U.S. cotton producers have taken advantage of this scheme. Perhaps U.S. rice, wheat, corn, or other exporters could identify processing partners within Brazil who could use imported U.S. product as inputs for processed products which will then be headed back to the international market.

According to Brazilian Secretariat of Foreign Trade, (SECEX), the Brazilian imports through drawback in 2017 correspond to 5 percent of total imports, \$7.5 billion. Specifically, Brazil imported all cocoa and 56.9 percent of corn via drawback system in 2017. Moreover, in 2017, 23 percent of total Brazilian exports used the drawback system, that is, \$50.1 billion (SECEX, 2018).

Secex - Secretaria Brasileira de Comercio Exterior. Dados Consolidados de Drawback. Access: 04/22/2017. <http://www.mdic.gov.br/index.php/comercio-exterior/drawback/drawback-suspensao-integrado>

very powerful. Still, ideas being considered to amend Brazil's tax regime include the creation of a Super State Revenue, Value-added Tax (VAT), which will bring together ICMS, IPI, PIS, Cofins and ISS, and a progressive income tax. Overall, tax reform under discussion in the Brazilian Congress will attempt to maintain the tax burden at the same level including the revenue share for the nation, states and municipalities in the first five years, hoping to diminish fiscal warfare, and reduce tax waivers and evasion. Case Study C highlights a provision of Brazilian tax code which could benefit U.S. exporters.

Labor

Over the past three decades, Brazil expanded protections for employees at great cost to employers and the taxpayer. In response, the current administration responded with a new labor law (Nº 13467/2017) which brought a code more adapted to the realities of the producer and empowered collective bargaining agreements and union agreements. Recent labor regulation changes that could help industry to better achieve their goals include:

1. The discontinuation of the requirement for companies, including agricultural producers, to pay employees for commuting costs as well as counting commuting times as work hours. Before, due to the lack of public transportation common in rural areas, the producer was burdened with commuting costs for their employees and the traveled hours, often counting as overtime. Now, the commute time does not count as working hours, which reduce the company costs.
2. The new regulation allows contracts to provide flexibility in beginning and ending dates for intermittent work, typically used for employees at harvest time. Before, seasonal contracts had fixed start and end dates regardless of how weather and other factors impacted the harvest times. Further, contract negotiation may now be done directly with the employee when previously the use of an intermediary job agency was required.
3. The allowance of an agreement on hours worked per day provided they do not exceed 220 hours per month. Thus, during crop season, an employee can work 12 hours without receiving overtime. Before, the law required 8 hours a day and 44 a week as the standard measure after which overtime pay resulted on both a daily and weekly basis. In addition, the minimum requirement for lunch time was reduced from one hour to 30 minutes.

Stakeholders interviewed for this project indicated the greatest obstacle keeping businesses from attaining their optimistic dreams are labor laws and that labor laws need to provide more flexibility to the employers. While there have been recent labor reforms, unions remain powerful and can cause disruptions on both the farm and at ports.

Finally, many believe there is a need to reform the pension system – a critical component of labor law. Many of the taxes mentioned above help fund employee pensions, but an insufficient amount is collected to cover current and future pension commitments so there is growing debt associated with pensions. Thus, reform may be needed to limit Brazil's public debt.

Crop Insurance

Less than 20 percent of Brazilian agricultural area has some kind of insurance coverage since crop insurance in Brazil is more appropriate for the southern states and is not as applicable to Midwestern states where much of the soybeans and grains are produced. One reason for this is that the production environment is much more volatile in southern Brazil than in the Midwest. The premium is three to eight percent of expected revenue depending primarily on expected

yield, which is the item that is actually being insured. The amount of coverage and other risk factors help to determine the premium charged as well. The limited subsidy is another reason there is a low crop insurance participation rate. Also, there is no consistent policy as the subsidy changes each year, and in some years the authorized crop insurance subsidy is not fully funded.

The Brazilian Agriculture and Livestock Plan for the agricultural year 2018/2019 total R\$191.1 billion (\$53.1 billion). Of this, R\$600 million (\$167 million) is allocated to crop insurance premium subsidies while R\$151.1 billion (\$38.7 billion) is used for rural finance. Many analysts think the crop insurance premium subsidy is inadequate. Policymakers are considering changing the agricultural policy from rural finance to revenue crop insurance, but revenue-type programs are typically costly and require a higher premium subsidy to induce farmers to participate. The requirement of insurance to obtain a government-subsidized interest rate in finance also has faced political resistance.

Environmental Law

The new Brazilian Forest Code (Nº 12651/2012) decentralized environmental management and created new programs to increase the accountability of land and soil management (Rural Environmental Registry–CAR) and to recover native vegetation (Environmental Recovery Program–PRA). This creates a progressive system of environmental compensation, and the first financial instrument to encourage forest conservation: Reserve Quota Environment (Cota de Reserva Ambiental–CRA). According to the law, every rural property must maintain an area with native vegetation cover. For example, the legal reserve area (ARL) Legal Amazon biome is 80 percent for each private agricultural property in Mato Grosso State, the largest crop producer. Thus, only 20 percent of the land can be used for agriculture in Mato Grosso. The ARL in Cerrado biome is 35 percent, while the ARL is 20 percent for other biomes.

The law also requires a Permanent Preservation Area (APP). The APP is a protected area, covered or not by native vegetation, with the environmental function of preserving water resources, landscape, geological stability, and biodiversity, facilitating the genetic flow of fauna and flora, protecting the soil and ensuring the well-being of human populations.

A study of the economic impacts of 2012 forest code with general equilibrium model (TERM-BR) concluded that the new law would reduce the national GDP in 0.19 percent, while the old code reduced the national GDP by 0.37 percent (Diniz, 2013). Another study shows that 66.3 percent of Brazil's land area is designated for the protection and preservation of native vegetation. In fact, 20.5 percent of Brazil's land, 176 million hectares (434 million acres) is protected inside private farms, that is, more than double the amount of cultivated land and 9 percent of all land (Embrapa/GITE, 2018). Finally, as a signatory of the Paris Climate

Agreement COP 21, Brazil has a mandate to further reduce emissions by 2050 to meet goals of the agreement.

SECTION 4. What the Future Holds

One of the primary purposes of this project was to look forward to the short-term, midterm and beyond to 2040. Proven methodologies were used to forecast what Brazil may look like as both a customer and a competitor in the future. While forecasts of this nature are rarely able to precisely reveal the future, the research team believes that the resulting ranges of future scenarios are reasonable.

Brazil as a Customer for U.S. Agricultural and Food Products

To analyze export trends of U.S. agricultural products to Brazil, a risk-based simulation model for main agricultural products was developed based on 2001–17 data. The model defined, parameterized, simulated, and validated relevant risky variables; in this case export trends. These stochastic (random) values were then used to forecast future value traded. The stochastic variables were first de-trended and a multivariate empirical (MVE) distribution was used to estimate the parameters. A MVE distribution has been shown to appropriately correlate random variables based on their historical correlation. The results were probability distributions of forecasted variables that were used as stochastic baselines of future trade values for 2018–22.

The results were summarized in stoplight charts for several agricultural product groups. The red portion of the chart shows the probability of the value of the exported commodity to be below a lower target value. The yellow portion of the chart is the probability of being between a lower and upper target value. Finally, the green portion is the probability of being above an upper target value. In general, the lower and upper target values are set as the average and maximum commodity traded values, respectively, during 2013–17.

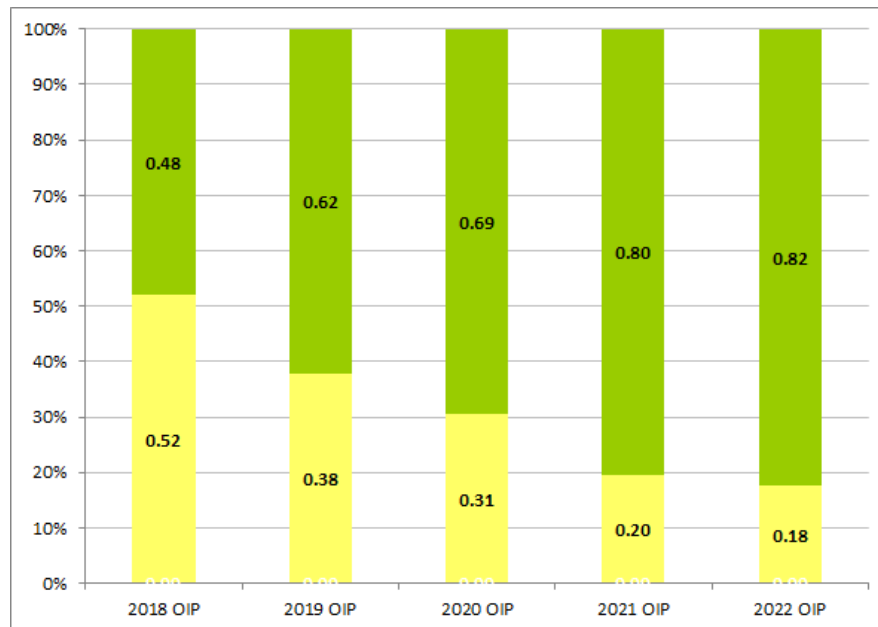
These analyses were performed for each main U.S. product or product grouping exported to Brazil. Included are exports of Other Intermediate Products, Prepared Foods, Whey Products, Feeds & Fodders, Chocolate & Cocoa Products, Eggs and Products, Planting Seeds, Rice, Wheat and Cotton.

Other Intermediate Products

Other intermediate products (OIP) exports to Brazil show a positive trend for the next five years (Figure 47). The probability of the value of OIP exports to be lower than the average of the last five years (\$124 million) was zero percent through the 2018–22 period. Moreover, the probability of U.S. OIP exports being higher than \$212.9 million (maximum value of the last five

years) was 48 percent in 2018. This estimate increased to 82 percent in 2022. Moreover, the probability of OIP exports to be between the lower and upper target value was 52 percent in 2018 and went down to 18 percent in 2022.

Figure 47. Probabilities of U.S. OIP Exports to Brazil being < \$124 Million and > \$212.9 Million



Note: Green=above max Value; Yellow=between max and min value; Red=below min value

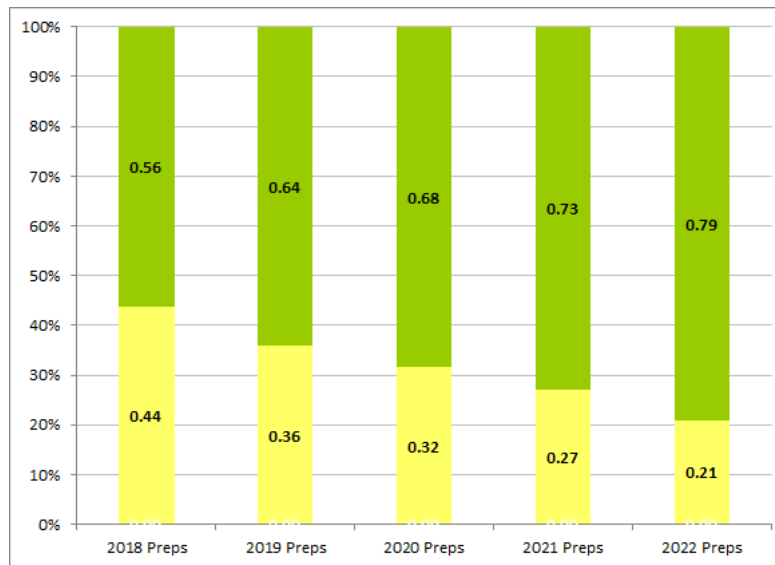
Prepared Foods

Prepared foods exports to Brazil also has a positive trend over the next five years with zero percent chance of export values falling below the average of the last five year, \$41.4 million, over the 2018–22 period (Figure 48). Also, the probability of exports being higher than \$66.6 million went from 56 percent in 2018 to 79 percent in 2022.

Whey Products

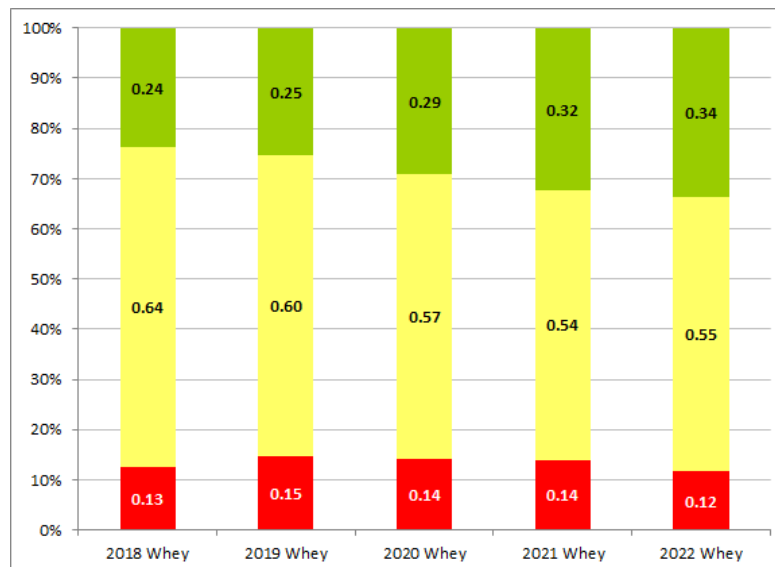
Whey products have shown an increase in exports to Brazil over the past several years. The simulation estimated that the probability that U.S. exports exceed the maximum target level of \$38 million rises from 24 percent in 2018 to 34 percent in 2022, while the probability of being below the minimum target level of \$13.4 million reduced slightly from 13 percent in 2018 to 12 percent in 2022 (Figure 49).

Figure 48. Probabilities of U.S. Prepared Foods Exports to Brazil being < \$41.4 Million and > \$66.6 Million



Note: Green=above max Value; Yellow=between max and min value; Red=below min value

Figure 49. Probabilities of U.S. Whey Products Exports to Brazil being < \$13.4 Million and > \$38 Million



Note: Green=above max Value; Yellow=between max and min value; Red=below min value

Feed & Fodders

Feed and fodder exports to Brazil also has a positive trend over the next five years with 17 percent chance of export values falling below the average of the last five years, \$31 million in 2018 while in 2022 the probability went down to 5 percent (Figure 50). Also, the likelihood of exports being higher than \$72.4 million went from 33 percent in 2018 to 39 percent in 2022.

Figure 50. Probabilities of U.S. Feed & Fodders Exports to Brazil being < \$31 Million and > \$72.4 Million

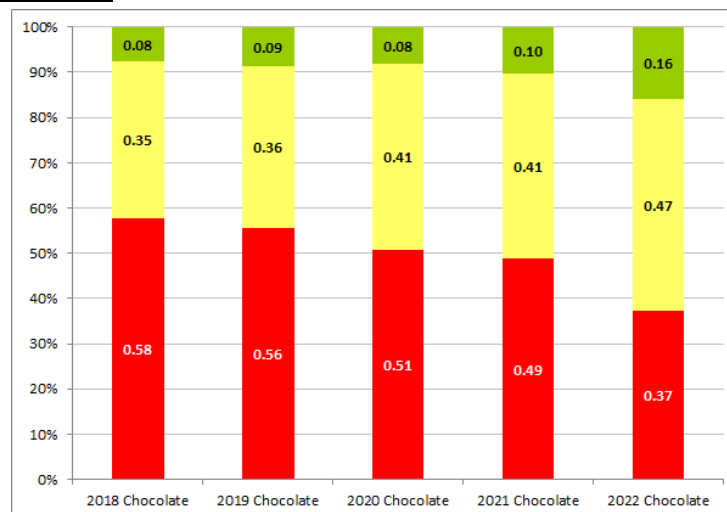


Note: Green=above max Value; Yellow=between max and min value; Red=below min value

Chocolate & Cocoa Products

Chocolate and cocoa products have shown an increase in exports over the past several years as well. The simulation estimated that the probability that U.S. exports to Brazil exceed the maximum target level of \$12.1 million went up from 8 percent in 2018 to 16 percent in 2022, while the probability of being below the minimum target level of \$12.1 million decreased from 58 percent in 2018 to 37 percent in 2022 (Figure 51).

Figure 51. Probabilities of U.S. Chocolate & Cocoa Products Exports to Brazil being < \$12.1 Million and > \$44.4 Million

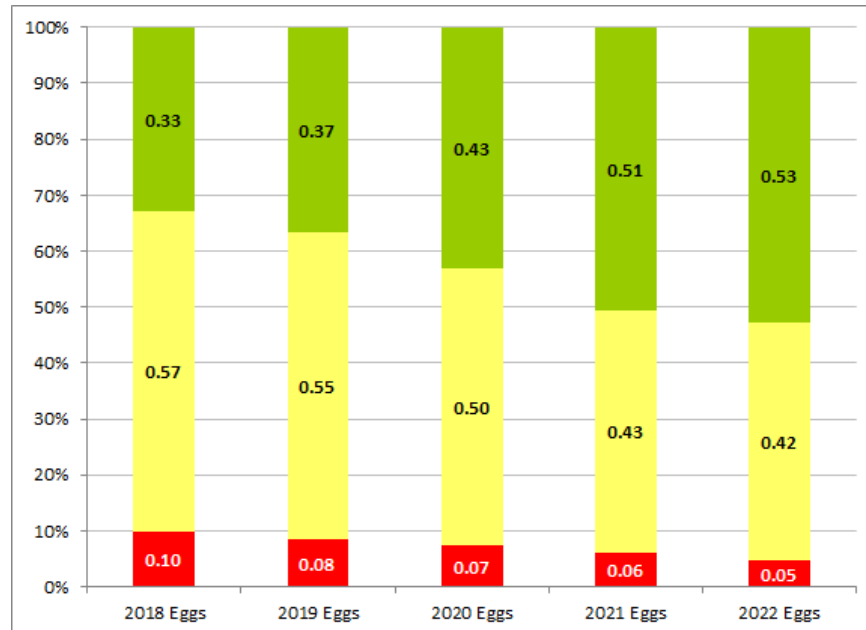


Note: Green=above max Value; Yellow=between max and min value; Red=below min value

Eggs & Products

Eggs and products exports to Brazil has a positive trend over the next five years with 10 percent chance of export values falling below the average of the last five years, \$11.7 million in 2018 while in 2022 the probability went down to 5 percent (Figure 52). Also, the probability of exports being higher than \$22.4 million went from 33 percent in 2018 to 53 percent in 2022.

Figure 52. Probabilities of U.S. Eggs & Products Exports to Brazil being < \$11.7 Million and > \$22.4 Million

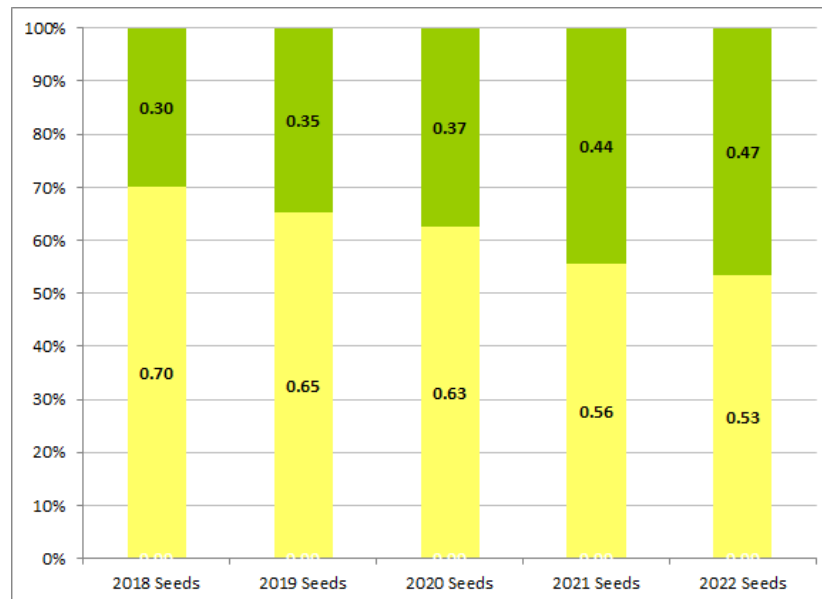


Note: Green=above max Value; Yellow=between max and min value; Red=below min value

Planting Seeds

U.S. planting seed exports to Brazil also has a positive trend over the next five years with zero percent chance of export values falling below the average of the last five year, \$14.3 million, over the 2018–22 time period (Figure 53). Also, the probability of exports being higher than \$29.2 million went from 30 percent in 2018 to 47 percent in 2022.

Figure 53. Probabilities of U.S. Planting Seeds Exports to Brazil being < \$14.3 Million and > \$29.2 Million

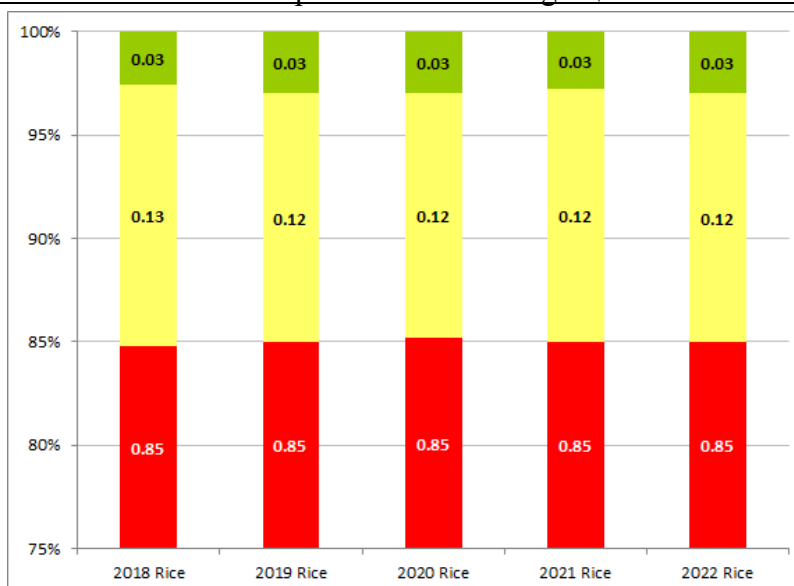


Note: Green=above max Value; Yellow=between max and min value; Red=below min value

Rice

U.S. rice exports to Brazil will likely be flat over the next five years with an 85 percent chance of export values falling below the average of the last five year, \$6.5 million, over the 2018–22 period (Figure 54). Also, the probability of exports being higher than \$81.1million remained at 3 percent for the next five years.

Figure 54. Probabilities of U.S. Rice Exports to Brazil being < \$6.5 Million and > \$81.1 Million



Note: Green=above max Value; Yellow=between max and min value; Red=below min value

Wheat

Wheat exports to Brazil reached a peak of \$1.2 billion in 2013 and a low point of \$60.3 million in 2017, showing a wide variability (Figure 55). Over the next five years, simulated forecasts were flat with 75 to 76 percent probability of exported values to be below \$190.2 million with only a 3 percent chance of values going over \$1.2 billion.

Figure 55. Probabilities of U.S. Wheat Exports to Brazil being < \$190.2 Million and > \$1.2 Billion

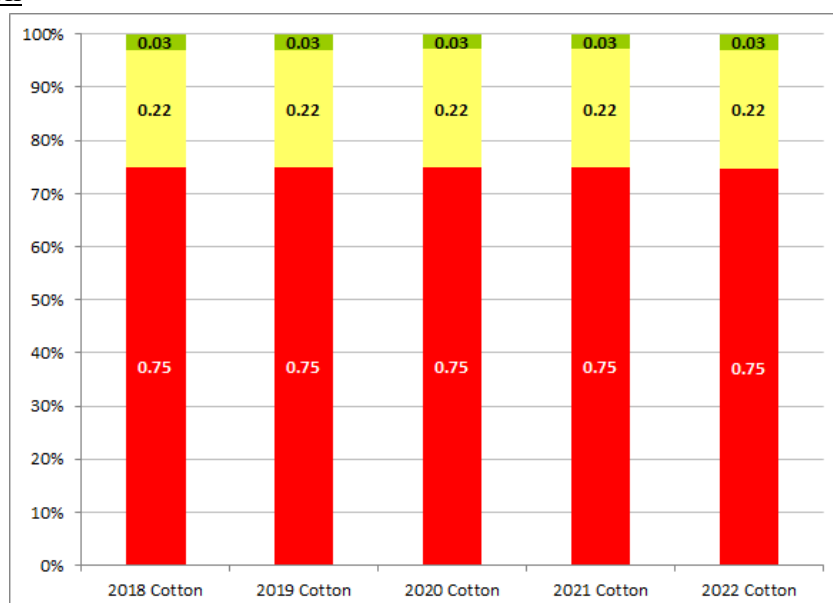


Note: Green=above max Value; Yellow=between max and min value; Red=below min value

Cotton

Lastly, U.S. cotton exports to Brazil followed a similar pattern relative to wheat exports. Over the next five years, simulated forecasts are flat with 75 percent probability of exported values to be below \$51.3 million while only a 3 percent chance of values going over \$321.5 million (Figure 56).

Figure 56. Probabilities of U.S. Cotton Exports to Brazil being < \$51.3 Million and > \$321.5 Million



Note: Green=above max Value; Yellow=between max and min value; Red=below min value

As shown above, there are many products, mostly consumer-oriented and intermediate products, which have a higher likelihood of seeing increased U.S. shipments to Brazil over the next five years. Beyond 2022, the ability to increase agricultural and food exports to Brazil rely on many factors. One important factor is reforming Brazil's taxation system so that imported products are not beyond the reach of middle class consumers. This includes not just tariffs but also the various national, state and local taxes levied on Brazilian businesses and consumers.

Another important factor is whether Brazil successfully negotiates trade agreements with competitors to the United States such as the European Union, and whether or not Brazil and the United States decide to enter into trade negotiations. So long as competitors for Brazil's import market for bulk products enjoy tariff advantages over the United States, including Brazil's MERCOSUL partners of Argentina, Paraguay, and Uruguay, U.S. wheat, corn and rice exports to Brazil will be at a disadvantage. If EU products are able to gain an advantage through the successful conclusion of their negotiations with Brazil, that could put U.S. intermediate and consumer-oriented exports to Brazil at a disadvantage. Thus, the United States may want to consider entering into trade agreement negotiations with Brazil, as Brazil has the population with enough purchasing power to be a significant market for U.S. agricultural and food products. To accomplish this, the other MERCOSUL partners would need to be included in the negotiations.

Finally, as Brazil is able to improve their infrastructure, including additional cold storage, imported products will be able to more efficiently move from the ports throughout the country and, where necessary, be stored in suitable conditions. This will further help to increase the

expansion of western-style grocery chains, including the previously mentioned Pao de Acucar, Walmart, and Carrefour. A visit to the APAS Supermarket Trade Show in Sao Paulo during May 2017 and to the various supermarkets showed the availability of numerous U.S. brands, some imported and while others produced in Brazil, demonstrating an affinity by Brazilians for U.S. food products. This, along with improved infrastructure and increased cold storage, will likely create additional export opportunities for U.S. agricultural and food products.

Brazil as a Competitor in Global Agricultural and Food Markets

As shown above in the section on Brazilian Agricultural Productive Capacity, Brazil's harvested area, yield, and production in numerous commodities have generally expanded over the last several decades. A key to this is the expansion of land with many acres of pastureland being converted to cropland. Some of this expansion has come with the support of the federal government and certain state governments. When coupled with improvements in technology which increase yields, the further expansion of cropland would continue to increase Brazil crop production to higher levels and put competitive pressure on selected U.S. agricultural exports.

Land expansion and adapted technology explain to a large extent the Brazilian agricultural miracle. The country crop area expanded from the South States with Mata Atlantica biome to the Midwest States (Mato Grosso, Mato Grosso do Sul, and Goias) with Savannah (Cerrado) biome during the 70's and 80's. The Cerrado soil is deficient in essential nutrients and prone to degradation. National institutions including Embrapa and federal universities, and state institutions, in cooperation with the productive sector, developed technology packages specific for Cerrado environment. One example is the reduced or no tillage system that increases the productivity and allows two crops during one year. This led to an increase in grain production of 340 percent from 1999 to 2017. In livestock, the relatively recent technique of pasturing the Nelore breed beef cattle on *Brachiaria* grass helped Brazil to become a global beef competitor. Brazil is also increasing their use of cattle feedlots (see Case Study D).

Another potential area for significant growth in crops may occur as livestock production becomes more intensive and pastureland previously dedicated to livestock becomes available to crops. A study by a consortium of Brazilian research institutes developed the GLOBIOM-Brazil model to investigate how Brazil's Forest Code will shape future land use. The results show that croplands in Brazil will expand over the next 25 years, growing from 56 million hectares (mha) (138 million acres (ma)) in 2010 to 92 mha (227 ma) in 2030 and 114 mha (282 ma) in 2050. Thus, crop area more than doubles when compared to 2010. The model also forecasts a significant decrease in pastureland as ranchers become more efficient and require less land to produce more cattle. Pasture use will decrease by 10 mha (25 ma) by 2030 compared to 2010 and 20 mha (49 ma) by 2050. By 2030, there will be 230 million head of cattle in Brazil, 57 percent more than in 2000, and these cattle will require thirty percent less area per head to produce.

Case Study D: Increased Beef Production in Brazil

Throughout the course of research for this project, numerous visits were made to Brazil to meet with stakeholders and examine first-hand the improving techniques in Brazilian agricultural production. These improvements were on full display during visits to two very different beef production operations in the states of Goias and Mato Grosso.

Outside of Goiania, Goias, project researchers toured Fazenda California, a Brazilian cattle feedlot. While feedlots are not the norm for Brazil as most cattle are finished on pasture, feedlots are becoming more commonplace. Fazenda California has the capacity to feed 15,000 head of cattle at any one time, using ten feeding lines at 1,500 head per line capacity. On the day of the visit, about 20,000 head were on the premises indicating some were grazing and some were being prepared for shipment to the packer. The feedlot typically feeds a mix of 70 percent silage and 30 percent grain and nutrients for about 90 days. They use strict measurements when mixing their feed and have developed their own feed-management software to make sure feed is consistently mixed. This software is also available to other feedlots.

The feedlot typically conducts two to three feeding cycles per year but can accommodate up to four cycles per year indicating a 60,000 head/year capacity. The feedlot has a second location in Mato Grosso on 168,000 hectares (ha) (415,000 acres) from where half the cattle they feed are shipped. The feedlot feeds both the classic Brazilian Zebu-type (Nelore) cattle and a Zebu-Angus mix that looks a similar to Black Angus but with a small hump. As this feedlot expands as is their plan, and others adopt similar feeding techniques, Brazil will be able to produce more beef while using the same or fewer acres. Further, their process results in higher-end beef cuts that are comparable to U.S. beef exports.

Agropecuaria Grendene, an integrated cattle breeding operation outside of Cáceres, Mato Grosso, displayed a different technique for increasing beef production while using fewer acres. This operation keeps 5,000 purebred Nelore cattle on more than 30,000 ha (74,000 acres), but they are severely limited on the amount of land they can use due to Brazilian preservation/conservation laws.

The area experiences a five-month long dry season from May to September during which feeding costs often increase significantly. To address this situation, they began an integrated approach to pasture growth during 2014 by planting soybeans, corn, and sorghum in an effort to restore nutrients/nitrogen into the soil. Soybean yields are about 52 bushels/acre, corn yields are about 60 bushels/acre, and the sorghum is used for silage and represents additional income opportunities. The integration occurs early in the calendar year. A few weeks after the corn and sorghum crops are planted or immediately after the soybean harvest, *Brachiaria* grass is planted on the same plot of land. The grass grows well following the soybeans, and particularly well with shade protection from the grains.

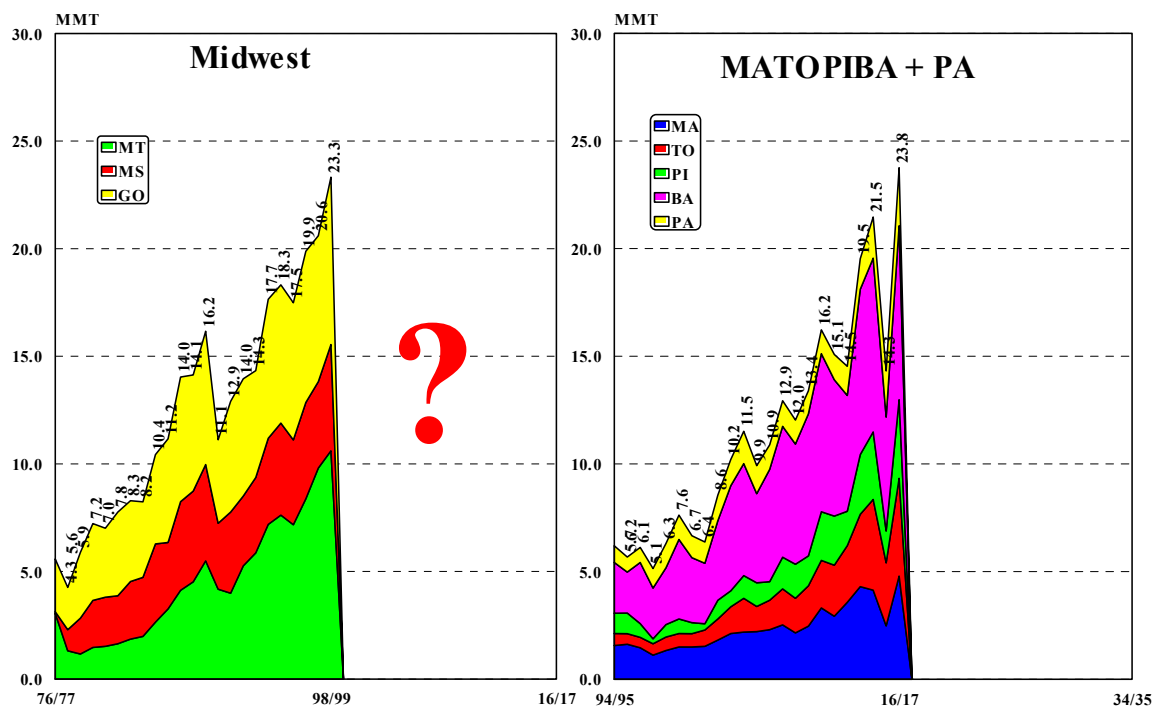
The resulting grass lasts nearly the entire dry season. As a result, they have increased beef cattle concentration from one head/hectare to five head/ha. Some who are using this technique under experimental conditions are able to graze as many as eight head/ha, representing a 700 percent growth in cattle production on the same amount of land. With the growing use of the above and other innovative techniques in Brazil, cattle and beef production will continue to grow enabling Brazil to better compete with U.S. beef exports.

Currently, land expansion is occurring in MATOPIBA and Para (MATOPIBA+PA). MATOPIBA is an acronym for Maranhao, Tocantins, Piaui and Bahia states, most of which consists of the Cerrado biome. Brazilian institutions have been developing technological packages specific to the region. For example, Embrapa has a group of scientists working on a project called MATOPIBA. Also, farmers, through producer associations, are investing in technologies to increase productivity via an irrigation and water management project with international partners.

The recent expansion in the MATOPIBA+PA and Para region has been similar to the expansion in the Midwest twenty years earlier. Grain production in the Midwest was around 23 million metric tons in 1999 while grain production in MATOPIBA+PA was about 23 million metric tons in 2017 (Figure 57). Grain production in the Midwest now exceeds 100 million metric tons. Although there are challenges, the Brazilian production increase in Midwest states suggests that the country could overcome these challenges and allow MATOPIBA+PA to realize continued growth over the next twenty years, whether that growth is the same or slower growth than the Midwest expansion (Figure 58).

Figure 57.

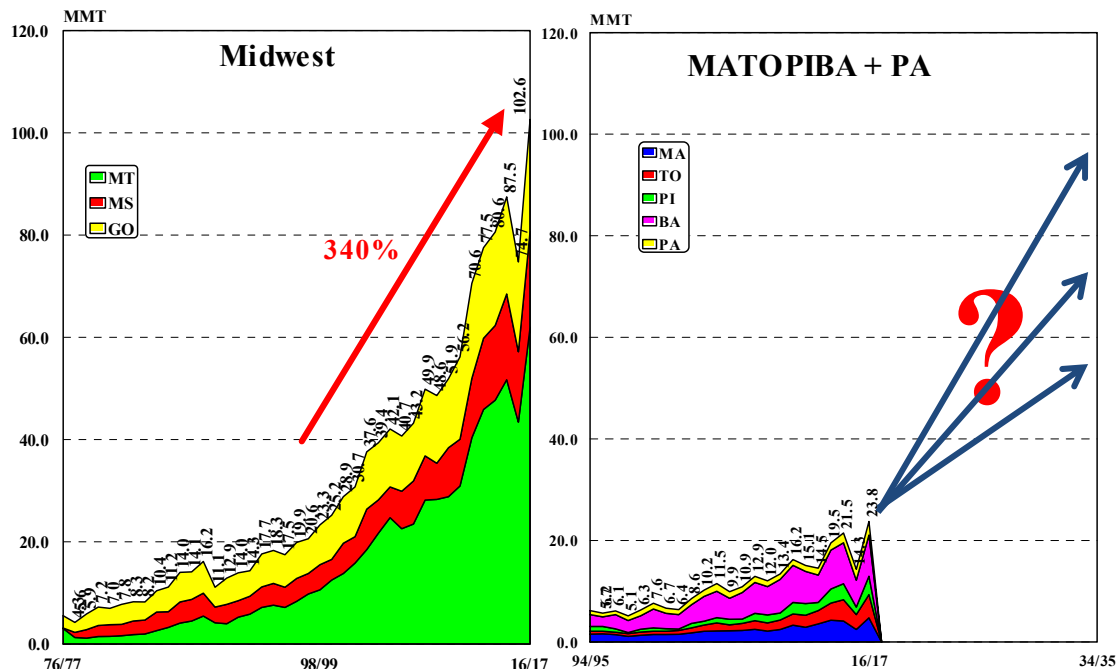
Brazilian Agricultural Production by Region, Pre-Boom



Source: MAPA, Brazil

Figure 58.

Brazilian Agricultural Production by Region, Post-Boom



Source: MAPA, Brazil

Brazil's Agriculture Sector by 2040

This section looks even further into the future of Brazil's productive capacity for selected important commodities. Brazil's agriculture sector is one of the largest and most dynamic in the world, generating an average annual growth of 3.4 percent for the past two decades. While there has been expansion in the agricultural frontier area reflecting the country's vast land resources, output gains for most products have derived largely from increases in productivity. With a scenario of continuous economic growth through 2040, Brazil's agricultural sector is expected to keep evolving to meet increased domestic consumption and foreign demand. In particular, shifts in production patterns, increased use of new technologies, increased investments in production agriculture, agro-food industries, and infrastructure developments are likely to occur over the next few years.

Brazil's trade projections to 2040 are based on a dynamic model of Brazilian agriculture—used to derive USDA's long-term projections. The model incorporates economic relationships and assumptions concerning trends in area harvested, yields, and consumption. Brazil's agricultural production and trade projections also reflect domestic policies in place by March 2018 and the increasing use of technology to allow for changes in agricultural

productivity. The stock of arable land includes the expected continuation of a long-term growth trend in land devoted to permanent crops (perennials) and fallow lands.

For the analysis of Brazilian agriculture in 2018-40, two significant issues affecting agriculture in the short and medium term are incorporated: the 2014-16 Brazil's economic recession and a higher *Real*/\$ exchange rate, and use these to construct the 2040 scenario. Estimated domestic market supply and demand responses to the recovery from the recession include higher per-capita income, lower inflation, lower interest rates, and the continuous devaluation of the *Real*. In the near term, GDP growth in 2018 at nearly 1.7 percent and projected to be 2.7 percent for 2019 confirm that Brazil's economy is on the path to recovery from the 2014-16 economic recession.

Table 6. Brazil: Selected Economic Indicators 2018-40

	2018	2025	2030	2040
GDP (constant US\$ billions)	2,286.6	2,858.9	3,231.6	3,678.5
Per Capita GDP (US\$)	10,948	13,099	14,424	15,645
Real Exchange Rate (%)	2.49	2.68	2.67	2.66
CPI change (%)	4.15	3.90	4.04	3.66
Interest rate (%)	8.94	7.90	7.06	5.13

Source: Research results using Banco Central do Brasil, 2018.

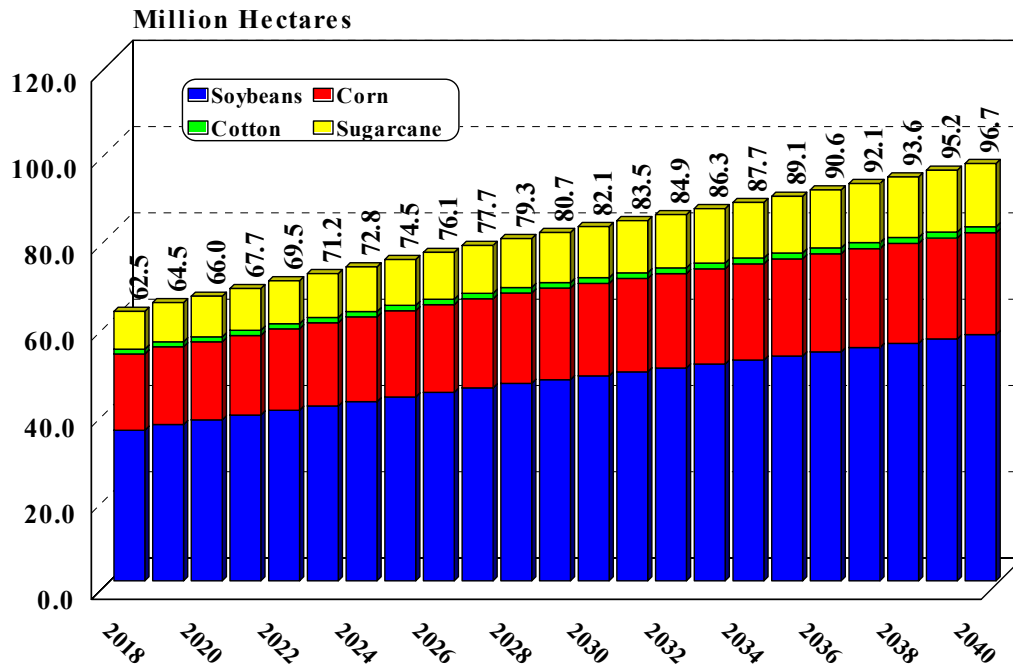
USDA's long-term projections to 2028 reflect the continuing depreciation of the *Real* through 2022 and a slight appreciation thereafter through 2027 before remaining relatively stable. GDP growth rises to an average 3.3 percent per year during 2019-23, followed by a 3.1 percent annual growth through 2028, and a 2.3 percent annual growth through 2040. Consequently, five million hectares of new land is brought into production, while double cropping increases total harvested area by 17 million hectares by 2028, and an additional 15.6 million hectares in 2029-40 (Figure 59). Soybean area is expected to rise 2.2 percent per year to reach 57 million hectares by the end of the projection period; corn and cotton area expand 1.3 percent and one percent annually, respectively.

As a result of gains in yields and ample area, total soybean production increases by an additional 127 million tons, to reach 235 million tons in 2039/40; corn production increase by an additional 75 million tons by the end of the projection period (Figure 60).

Brazil's soybean exports are expected to rise 3.8 percent per year to reach 143 million tons in 2039/40. Corn exports rise 2.2 percent annually to reach 55 million tons by the end of the projection period (Figure 61). Tables 7–9 show Brazil's harvested area, production and export projections for soybeans, corn, cotton and sugarcane/sugar, all of which compete with U.S. exports.

Figure 59.

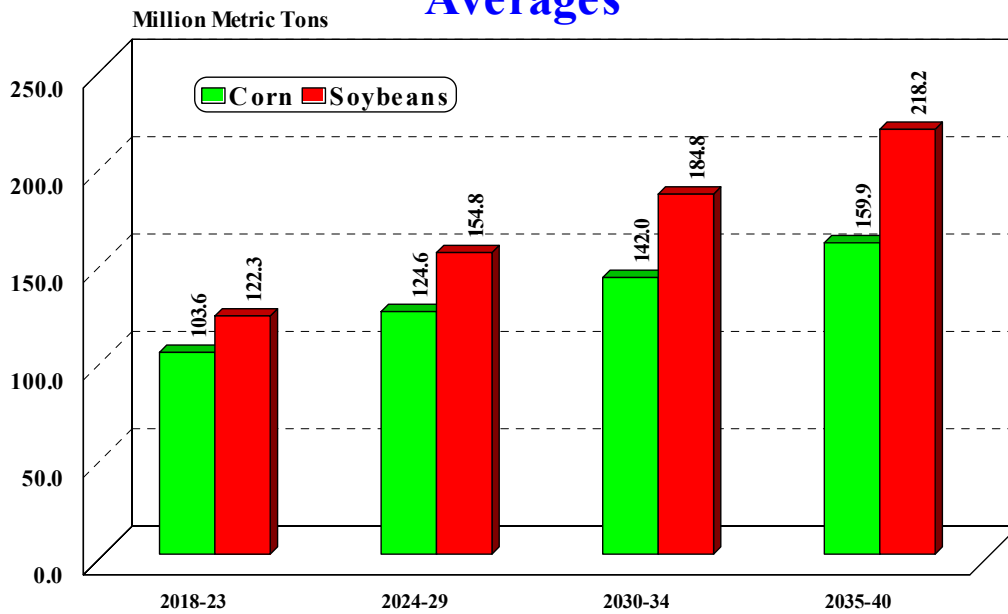
Baseline: Brazil Area Harvested, Selected Crops



Source: Economic Research Service, USDA, Research Results

Figure 60.

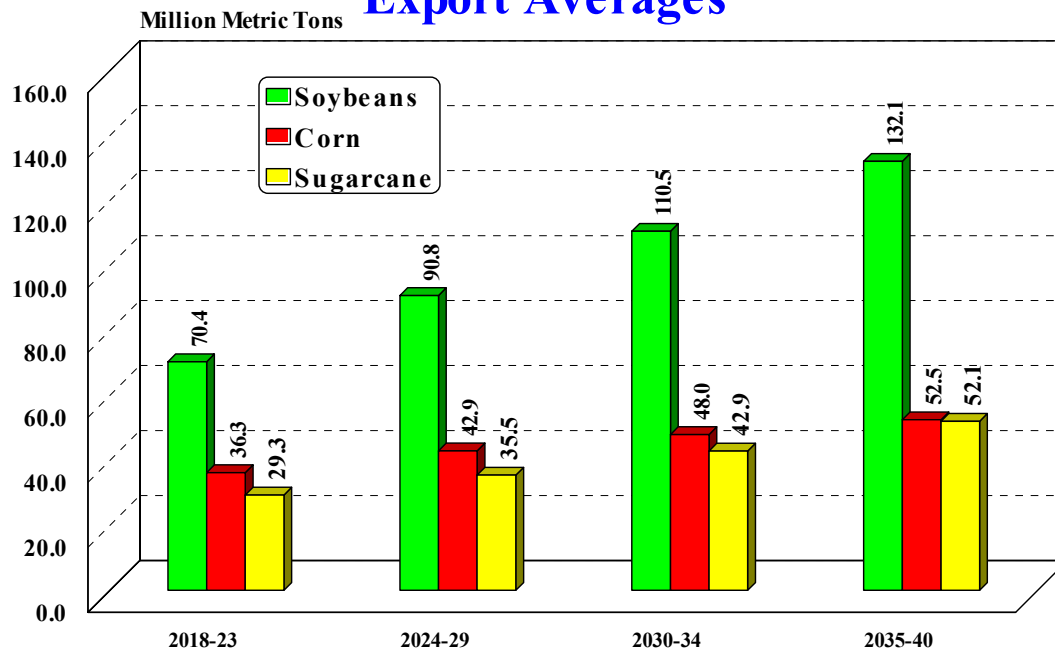
Brazilian Soybean and Corn Production Averages



Source: Economic Research Service, USDA, Research Results

Figure 61.

Brazilian Soybean, Corn and Sugar Export Averages



Source: Economic Research Service, USDA, Research Results

Table 7. Brazilian Area Harvested, Major Crops, 2018–40

Area Harvested, 1,000 Hectares				
	Soybeans	Corn	Cotton	Sugarcane
2018	34,900	17,700	1,100	8,766
2019	36,223	18,024	1,152	9,080
2020	37,299	18,091	1,176	9,391
2021	38,417	18,447	1,193	9,670
2022	39,544	18,866	1,207	9,913
2023	40,524	19,310	1,219	10,135
2024	41,519	19,651	1,232	10,377
2025	42,620	19,986	1,245	10,607
2026	43,699	20,313	1,257	10,850
2027	44,720	20,649	1,271	11,096
2028	45,751	20,951	1,284	11,347
2029	46,624	21,223	1,295	11,588
2030	47,524	21,436	1,306	11,836
2031	48,427	21,654	1,317	12,088
2032	49,333	21,867	1,327	12,345
2033	50,248	22,082	1,336	12,606
2034	51,168	22,295	1,346	12,873
2035	52,113	22,508	1,355	13,147
2036	53,075	22,726	1,365	13,428
2037	54,053	22,946	1,374	13,716
2038	55,045	23,167	1,384	14,012
2039	56,053	23,388	1,393	14,316
2040	57,074	23,607	1,403	14,628

Source: USDA, Economic Research Service, research results.

Table 8. Brazilian Production, Major Crops, 2018–40

	Production, TMT			
	Soybeans	Corn	Cotton	Sugarcane
2018	108,000	95,000	1,698	645,000
2019	114,315	99,698	1,817	672,241
2020	119,832	101,404	1,881	699,614
2021	125,219	104,703	1,940	724,903
2022	130,785	108,464	1,998	747,818
2023	135,737	112,520	2,055	769,420
2024	140,793	115,947	2,114	792,801
2025	146,486	119,429	2,173	815,485
2026	152,180	122,833	2,232	839,399
2027	157,699	126,396	2,295	863,870
2028	163,365	129,772	2,359	888,988
2029	168,468	133,004	2,416	913,682
2030	173,760	135,935	2,474	939,125
2031	179,171	138,956	2,531	965,190
2032	184,706	141,997	2,588	991,950
2033	190,379	145,103	2,645	1,019,360
2034	196,180	148,253	2,702	1,047,553
2035	202,187	151,459	2,760	1,076,632
2036	208,367	154,743	2,819	1,106,627
2037	214,705	158,097	2,878	1,137,579
2038	221,204	161,509	2,938	1,169,523
2039	227,868	164,978	2,999	1,202,486
2040	234,694	168,493	3,061	1,236,487

Source: USDA, Economic Research Service, research results.

Table 9. Brazilian Exports, Major Crops, 2018–40

	Exports, TMT			
	Soybeans	Corn	Cotton	Sugar
2018	65,000	34,000	816	28,690
2019	66,403	35,589	925	28,806
2020	69,296	35,972	1,055	29,380
2021	71,104	36,150	1,225	28,038
2022	73,357	37,136	1,334	29,390
2023	77,115	38,652	1,530	31,723
2024	81,366	40,152	1,629	32,364
2025	85,253	41,152	1,681	33,862
2026	89,086	42,151	1,692	34,982
2027	92,734	43,326	1,708	36,027
2028	96,425	44,751	1,728	37,146
2029	99,831	45,920	1,695	38,451
2030	103,429	46,513	1,755	39,891
2031	106,889	47,235	1,814	41,344
2032	110,450	47,945	1,872	42,846
2033	114,104	48,697	1,931	44,386
2034	117,840	49,466	1,990	45,974
2035	121,726	50,265	2,049	47,616
2036	125,712	51,116	2,109	49,313
2037	129,814	52,008	2,170	51,068
2038	134,032	52,932	2,232	52,883
2039	138,359	53,882	2,295	54,760
2040	142,796	54,848	2,358	56,701

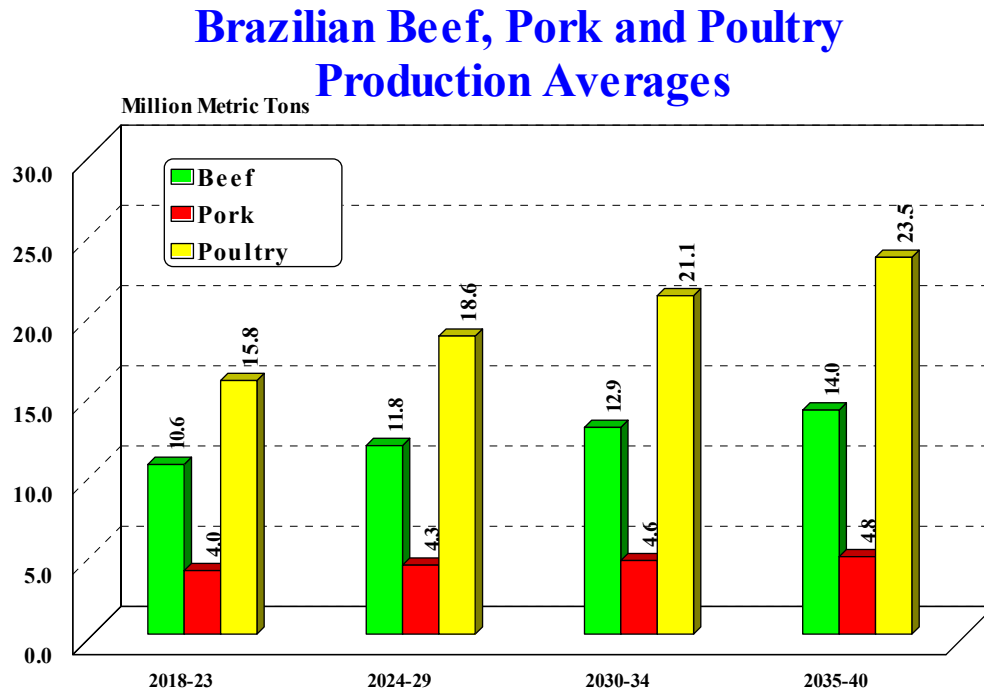
Source: USDA, Economic Research Service, research results.

Brazilian production of meats is also expected to increase significantly by 2040, and if exports of meats maintain their current percentages of production, then U.S. beef and chicken, and pork to a lesser extent, could face increased competition in international markets. Figure 62 shows that the average chicken production increases from an average of 15.8 MMT in the near term to an average of 23.5 MMT by 2040, or about 3.3 percent per year. Further, beef production is forecasted to grow about 2.2 percent per year from a near-term average of 10.6 MMT to an average to a 2035–2040 average of 14.0 MMT per year. Pork production is expected to grow at about 1.4 percent per year. Table 10 shows the entire Brazilian meat forecast through 2040.

One potential impact of growing meat production in Brazil is that they may need to retain greater quantities of grains and soybeans domestically to feed the additional animals required for increased meat production, thus decreasing competition from Brazilian grains in global markets. Further, Brazil may also choose to import greater quantities of feed grains which could help U.S.

exporters. However, as Brazilian soybean, corn and cotton acreage is expected to continue to expand, these crops will compete with livestock for land leading to a decrease in Brazil's cattle herd size. Expanded use of feedlots and integrated production techniques may mitigate the impacts of land competition from crops.

Figure 62.



Source: Economic Research Service, USDA, Research Results

Table 10. Brazilian Meat Production, 2018–40

	Production, TMT		
	Beef	Pork	Poultry
2018	9,700	3,755	14,222
2019	10,092	3,824	14,691
2020	10,291	3,867	15,066
2021	10,473	3,932	15,523
2022	10,664	3,985	16,019
2023	10,862	4,049	16,513
2024	11,070	4,111	17,021
2025	11,260	4,161	17,481
2026	11,458	4,218	17,988
2027	11,657	4,279	18,496
2028	11,849	4,336	18,998
2029	12,057	4,386	18,789
2030	12,259	4,435	19,708
2031	12,465	4,484	20,165
2032	12,674	4,533	20,626
2033	12,886	4,582	21,091
2034	13,099	4,632	21,560
2035	13,314	4,681	22,033
2036	13,530	4,731	22,512
2037	13,748	4,780	22,995
2038	13,967	4,830	23,484
2039	14,188	4,880	23,979
2040	14,412	4,930	24,479

Source: USDA, Economic Research Service, research results.

Summary and Conclusions

Brazil at 2040: Customer and Competitor – an ambitious undertaking. After two years of meetings, research and analysis, is any more known now than before this project began? The short answer is yes; the longer answer is as follows.

Brazil has long been a competitor in the global market to U.S. beef, broilers, soybeans, corn, and cotton. Their productive capacity in these and other products have increased significantly over the past thirty years, and as shown, their production is expected to increase more with an eye towards international markets. More land is being brought into crop production in the Midwest as more efficient livestock production techniques free-up pasture land for crops, and in the MATOPIBA area as the government and other entities are pushing further development of crop production in that area as they did in the Midwest decades ago. More land in crop production using more efficient production techniques along with more efficient livestock production.

There are many challenges that Brazil will face in order to achieve its full production potential. Infrastructure, mainly roads, rail, ports and storage capacity are behind the current production needs. Although some improvements are being made, commodity transportation cost is still high at current production levels. If the expansion into the MATOPIBA occurs, this will increase the pressure for infrastructure improvements. Political stability is crucial as well in order to accomplish the proposed policy reforms. These challenges can be overcome but need to be addressed swiftly, but it is unrealistic to believe the Brazilian government can fund all of the improvements required.

Many private sector entities appear optimistic about Brazil's future as an exporter. There has been increased funding by grain companies into transportation and related infrastructure to more efficiently move product to and through ports, particularly in the north. These companies are also working with each other via joint ventures and other methods of sharing resources. With these factors along with recent and proposed changes to Brazilian agriculture, tax, labor, trade, and environmental policies, there is little doubt that Brazil would become an even fiercer competitor to the United States by 2040.

Brazil's potential as a market for U.S. foods and other agricultural products is often overlooked. Brazil has a large population, many of which have substantial purchasing power and shop at western-style grocery stores like WalMart and Carrefour. Further, there is already a strong presence of U.S.-branded processed foods and other value-added products throughout the country, though imported U.S. products are often higher priced than in the United States and as compared to products produced in Brazil. Further, the United States also exports bulk

commodities such as wheat, cotton, and rice to Brazil though amounts vary greatly from year-to-year.

However, both value-added and bulk U.S. exports are at a significant competitive disadvantage due to Brazil's participation in the MERCOSUL which grants competing products from Argentina, Paraguay and Uruguay tariff-free access. MERCOSUL is also negotiating a trade agreement with the European Union which, if successfully concluded, could provide European nations a competitive advantage over U.S. products, particularly processed food products. While U.S. agricultural and food products will continue to be exported to Brazil for the foreseeable future, it may be in the best interest of United States to negotiate increased market for U.S. products in Brazil to better access their growing market for years to come. With or without this increased access, Brazil will likely be a growing customer for U.S. agricultural exporters by 2040 in addition to being an even stronger competitor.

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Appendix A

CNAS – EMP Brazil at 2040 Project Stakeholder Meeting Organizations

Brasilia:

Brazil Ministry of Agriculture, Livestock and Food Supply – MAPA
EMBRAPA – Brazilian Agricultural Research Institute
Brazilian Ministry of Transportation
EPL – Empresa de Planejamento Logistico Brazilian National Strategic Logistical Planning
CNA – Brazilian Confederation of Agriculture
CONAB – National Food Supply Company

Sao Paulo:

Grupo Segurador BB – MAFRE Brazilian Crop Insurance Industry Leader
ABIOVE – Oilseed Crushing Association
Cargill – Shipper
ADM – Shipper
APAS – Supermarket Tradeshow Association
Santos Port – Brazil’s Busiest Port outside of Sao Paulo
UNICA – Sugar Organization
Informa Economics
ABIEC – Beef Industry Association
Esalq – Agricultural Economics Department, University of Sao Paulo, Piracicaba
Esalq-log – Logistics Research Institute, University of Sao Paulo, Piracicaba
CEPEA – Agricultural Research Institute, Piracicaba

Goias:

Fazenda California
Assocon Brazilian/Goias – Cattle Feedlot Association
FAEG – Goias Agricultural Organization in the CNA Network
Sindicarne – Goias Meatpacking Industry Association
SENAR – Goias Rural Education Organization, Attached to FAEG

Mato Grosso:

AMPA – Mato Grosso Cotton Producer Association
IMA – Mato Grosso Cotton Institute
APROSOJA – Mato Grosso Soybean Producers Association
IMEA – Mato Grosso Ag Econ Research & Extension Association
BrasilcomZ – Cattle Operation Consultant, based in Sao Paulo
Agropecuaria Grendene
ABCZ – Zebu Breed Association

Bahia:

AIBA – Agricultural Producer Organization

IPE – Cattle Organization

Rio de Janeiro:

FGV-IBRE – Institute for Brazilian Economics

Para:

Tefron – Bunge/Amaggi Joint Venture for Grain/Soybean Transport, Barcarena

TGPM – ADM/Glencore Joint Venture for Grain/Soybean Transport, Barcarena

Hidrovias de Brasil – Truck to Barge Grain/Soybean Facility on the Tapajós River, Miritituba

Bertolini – Truck to Barge Grain/Soybean Facility on the Tapajós River, Miritituba

Cargill – Truck to Barge Grain/Soybean Division on the Tapajós River, Miritituba

Cargill – Bulk Ship Loading Facility in Santarem

Maranhao:

Tegram/Nova Agri – Rail/Truck to Bulk Ship Loading Joint Venture, Sao Luis (Itaqui)

Pernambuco:

Economics Department, Federal University of Pernambuco, Recife

AD Diper, Economic Development Agency, Recife

Sindacucar, Sugar Industry Association, Recife