United States Department of Agriculture

REPORT SUMMARY

Agricultural Marketing Service

Feb 2024

UPDATE ON The Impact of Brazil's Infrastructure and Transportation Costs on U.S. Soybean Market Share: An Updated Analysis from 1992-2022 (Summary)

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This paper is an update of the summary of: The Impact of Brazil's Infrastructure and Transportation Costs on U.S. Soybean Market Share: An Updated Analysis From 1992-2019, by Delmy L. Salin and Agapi Somwaru, U.S. Department of Agriculture, Agricultural Marketing Service. The full paper is available at https://dx.doi.org/10.9752/TS290.11-2020.

WHAT IS THE ISSUE?

Since 2013, Brazil's successes in reducing its transportation and production costs, and increasing its planted area have allowed the country to displace the United States as the world's top soybean exporter. Brazil's ongoing efforts to maximize its competitiveness complicate the ability to forecast future U.S. market share, which has fallen from 66 to 38 percent between 1992 and 2022. Higher productivity and a weak currency also worked to Brazil's advantage.

As a result of a comprehensive infrastructure improvement plan between the Brazilian Government and the private sector begun in 2007, Brazil's export-shipping capacity through its northern and southern ports has expanded by more than 80 percent (Soybean Transportation Guide: Brazil 2014-2022).

To consider the impact of Brazil's ongoing advances, this study attempted to estimate how much the U.S. world soybean market share could further decline if Brazil were to become even more competitive while U.S. farm-to-port transportation infrastructure did not significantly improve.

HOW WAS THE STUDY CONDUCTED?

This report follows up on the authors' 2020 report, *The Impact of Brazil's Infrastructure and Transportation Costs on U.S. Soybean Market Share: An Updated Analysis from 1992-2019*. The updated data and analysis take into account the new transportation routes that have emerged in Brazil, as well as possible future infrastructure developments. Using a dynamic econometric model and multivariate sensitivity analysis, the study estimates how global soybean-export market shares would change under two hypothetical scenarios in which Brazil's infrastructure is extensively improved beyond the current level. The hypothetical infrastructure improvement reduces Brazil's freight rate by $18 per metric ton (mt) in the first scenario and $28/mt in the second scenario. Due to data availability, the base estimated model uses ocean freight rates (USDA-AMS) and trade data (USDA-FAS-PSD) for the period between 1992 and 2022 marketing years.[1]

WHAT DID THE STUDY FIND?

As reflected by real-world events, this update demonstrates that despite adverse trade policy interventions in the world soybean market—like China's retaliatory tariffs imposed in 2018—the United States has largely maintained its market share (Gale et al., 2019; Adjemian et al., 2021; Baryshpolets et al., 2022; Tortajada and Zhang, 2022). Although the adverse trade policies might have altered the world soybean production and trade structure, U.S. soybean exporters have attempted to diversify their markets (e.g., expanding into biodiesel) and responded efficiently.

However, despite this apparent U.S. resilience, the study's hypothetical scenarios suggest the world soybean market may be more easily disrupted than it appears. The results of the hypothetical scenarios suggest that, from 2021 to 2022, the U.S. world market share would have declined an additional 5-10 percentage points, if U.S. farm-to-port transportation infrastructure did not significantly improve to keep pace with Brazilian advances (tables 1, 2, and 3).

Under a scenario that hypothetically reduced Brazil's freight-rate by $28/mt, Brazil's global export market share in 2022 would have risen from 51 percent to 68 percent (17 percentage points)—mainly because of Brazil's infrastructure improvements. Under the same scenario, the U.S. world market share in 2022 would have declined from 38 percent to 28 percent (10 percentage points). A 1-percent decline in the U.S. share of the world soybean market would have amounted to just over three-quarters of $1 billion in lost export sales—based on a world soybean trade volume of 170 million metric tons and the December 2023 price of soybeans.

Further research is needed to understand the economic and infrastructure-based factors that determine soybean movements from farms to markets to export ports. To begin to flesh out this understanding, data and analysis are needed on how cash prices interact with future prices; how storage costs interact with transportation costs; and how U.S. freight rates for truck, barge, rail, and ocean interact with foreign competitors. Further research should also address how U.S. agricultural exports would respond to improved lock and dam maintenance in the inland waterway system; expanded export capacity in the Pacific Northwest; improved rural bridges that connect farms with the original point of sale; and an enhanced intermodal system, with expanded, nationwide use of containerized shipments.

[1] 2022 is the 2021/22 soybean marketing year. The soybean marketing year runs from September 2021-August 2022 in the United States; and from October 2021-September 2022 for Brazil and Argentina.

Table 1. Market shares data: actual and for Brazil's sensitivity analysis.[1]

Actual market shares					Brazil market shares, sensitivity analysis[1]	
Year	United States (%)	Brazil (%)	Argentina (%)	Other* (%)	Scenario 1 (%)	Scenario 2 (%)
1992	66.2	13.8	11.4	8.5	16.2	20.1
1993	71.6	13.8	7.5	7.0	16.0	20.6
1994	57.7	19.6	10.9	11.8	22.9	28.5
1995	71.3	11.1	8.1	9.5	13.0	16.2
1996	73.0	10.9	6.6	9.4	12.7	15.9
1997	66.3	23.2	2.1	8.5	26.8	33.6
1998	60.5	22.3	7.2	10.0	25.9	32.5
1999	57.7	23.5	8.1	10.6	27.3	34.1
2000	58.1	24.3	9.0	8.6	28.1	35.3
2001	50.5	28.8	13.6	7.1	33.6	42.5
2002	54.9	27.5	11.3	6.3	32.3	40.0
2003	46.5	32.1	14.1	7.3	37.7	47.2
2004	43.1	36.5	12.1	8.3	42.7	53.2
2005	46.1	31.1	14.8	8.1	36.2	46.0
2006	40.2	40.7	11.4	7.7	48.0	56.5
2007	42.9	33.1	13.5	10.5	38.8	47.6
2008	40.1	32.2	17.6	10.1	38.0	46.4
2009	45.4	39.1	7.3	8.2	45.9	55.4
2010	44.3	31.0	14.2	10.5	36.4	44.7
2011	44.8	32.8	10.1	12.3	38.4	46.7
2012	40.5	39.5	8.0	12.0	46.4	55.9
2013	36.0	41.7	7.7	14.6	48.9	59.3
2014	39.5	41.5	7.0	12.0	48.8	59.2
2015	39.7	40.0	8.4	12.0	47.1	57.4
2016	39.8	40.9	7.5	11.8	48.2	59.8
2017	39.9	42.7	4.8	12.6	50.2	61.6
2018	37.9	49.6	1.4	11.1	58.5	67.8
2019	32.0	50.2	6.1	11.7	58.6	67.9
2020	27.6	55.6	6.0	10.8	64.9	72.6
2021	37.3	49.4	3.1	10.1	57.7	67.6
2022	38.0	51.3	1.9	8.9	58.9	68.2

[1]Scenario 1: This scenario assumes the completion of the paved highway BR-163, connecting Sorriso, Mato Grosso (MT) to Miritituba, Pará (PA). It also assumes completion of the North-South (EF-151) Railroad (FNS) linking the northeastern port of Itaquí-Sâo Luis, Maranhão, and the southern port of Santos, São Paulo. In this case, transportation costs will likely be reduced by $18/metric ton.

[1]Scenario 2: Assumes that BR-163, North-South (EF-151) Railroad (FNS), and Ferrogrão Railroad (EF-170), connecting Sorriso to Miritituba, are built. The scenario also assumes that the southern ports of Santos, Paranaguá, Rio Grande, and Sao Francisco do Sul have modernized their facilities to compete for cargo with the Northern Arc ports. In this case, transportation costs will likely decline by $28/metric ton.

*Other competing countries include Paraguay and Canada.

Sources: Columns 1 through 5, USDA, Foreign Agricultural Service Production, Supply, and Distribution (PSD) Database, 2022, while Year in terms of marketing year. Columns 6 and 7— sensitivity analysis results were calculated by USDA, Agricultural Marketing Service, and Economic Consulting.

Table 2. Scenario 1: New market shares for conducting sensitivity analysis[1]

Year	United States (%)	Brazil (%)	Argentina (%)	Other[2] (%)
1992	64.5	16.2	11.1	8.3
1993	70.1	16.0	7.2	6.7
1994	55.4	22.9	10.5	11.3
1995	70.2	13.0	7.7	9.1
1996	71.9	12.7	6.4	9.0
1997	63.1	26.8	2.0	8.0
1998	57.7	25.9	6.8	9.6
1999	54.9	27.3	7.7	10.1
2000	55.2	28.1	8.6	8.2
2001	49.3	33.6	10.7	6.3
2002	51.9	32.3	10.1	5.7
2003	45.9	37.7	9.8	6.6
2004	42.2	42.7	8.4	6.7
2005	44.8	36.2	12.4	6.6
2006	35.3	48.0	9.9	6.8
2007	40.4	38.8	11.6	9.1
2008	38.0	38.0	15.3	8.8
2009	40.7	45.9	6.2	7.1
2010	41.8	36.4	12.7	9.1
2011	43.9	38.4	9.8	7.8
2012	36.3	46.4	6.9	10.4
2013	32.2	48.9	6.5	12.4
2014	35.4	48.8	5.8	10.0
2015	35.6	47.1	7.4	10.0
2016	35.7	48.2	6.3	9.9
2017	35.8	50.2	4.0	10.0
2018	32.1	58.5	1.1	8.3
2019	28.2	58.6	4.5	8.7
2020	23.0	64.9	4.4	7.8
2021	32.5	57.7	2.3	7.5
2022	33.3	58.9	1.4	6.5

[1]Scenario 1: This scenario assumes the completion of the paved highway BR-163, connecting Sorriso, Mato Grosso (MT) to Miritituba, Pará (PA). The scenario also assumes completion of the North-South (EF-151) Railroad (FNS) linking the northeastern port of Itaquí-Sâo Luis, Maranhão, and the southern port of Santos, São Paulo. In this case, transportation costs will likely reduce by $18/metric ton.

[2]Other competing countries include Paraguay and Canada.

Source: Sensitivity analysis results were calculated by USDA, Agricultural Marketing Service, and Economic Consulting.

Table 3. Scenario 2: New market shares for conducting sensitivity analysis[1]

Year	United States (%)	Brazil (%)	Argentina (%)	Other[2] (%)
1992	60.8	20.1	10.9	8.1
1993	67.2	20.6	6.0	6.2
1994	52.9	28.5	8.4	10.2
1995	68.6	16.2	7.0	8.2
1996	70.2	15.9	5.8	8.2
1997	57.3	33.6	1.8	7.3
1998	52.6	32.5	6.2	8.7
1999	49.8	34.1	7.0	9.2
2000	50.3	35.3	6.9	7.5
2001	44.3	42.5	7.7	5.5
2002	47.6	40.0	7.6	4.7
2003	38.9	47.2	8.2	5.6
2004	36.2	53.2	5.8	4.8
2005	40.6	46.0	8.7	4.8
2006	31.7	56.5	7.3	4.5
2007	36.7	47.6	8.7	7.0
2008	34.4	46.4	12.2	7.0
2009	34.9	55.4	4.4	5.2
2010	38.0	44.7	9.6	7.7
2011	38.1	46.7	7.1	8.1
2012	32.2	55.9	5.0	6.9
2013	27.1	59.3	5.1	8.5
2014	29.9	59.2	4.0	6.9
2015	30.1	57.4	5.2	7.4
2016	28.9	59.8	4.5	6.9
2017	30.8	61.6	2.7	4.9
2018	27.4	67.8	0.7	4.1
2019	27.3	67.9	2.2	2.6
2020	23.9	72.6	1.2	2.2
2021	28.0	67.6	1.3	3.2
2022	28.4	68.2	0.7	2.7

[1]Scenario 2: Assumes that BR-163, North-South (EF-151) Railroad (FNS), and Ferrogrão Railroad (EF-170), connecting Sorriso to Miritituba, are built. The scenario also assumes that the southern ports of Santos, Paranaguá, Rio Grande, and Sao Francisco do Sul have modernized their facilities to compete for cargo with the Northern Arc ports. In this case, transportation costs will likely decline by $28/metric ton.

[2]Other competing countries include Paraguay and Canada.

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PREFERRED CITATION

Salin, Delmy L. February 2024. *UPDATE ON The Impact of Brazil's Infrastructure and Transportation Costs on U.S. Soybean Market Share: An Updated Analysis from 1992-2022 (Summary).* U.S. Department of Agriculture, Agricultural Marketing Service.
Web. <http://dx.doi.org/10.9752/TS410.02-2024>