Analysis and Comparison of Corn Production in Brazil and the United States – July 2023 Report

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Summary

While Brazil is positioned to surpass the U.S. in corn exports this year, the data do not indicate the trend leading to this development will necessarily continue. There are many factors at play when considering which country will take the lead in exports in the future, including domestic demand, relative exchange rates, infrastructure, climate conditions, and global sustainability goals. The U.S. has relative advantages in the global corn market that can be harnessed to support our $90 billion corn industry.

Since 2010, Brazil has more than doubled corn production and increased corn export quantity by over 500%. This translates to a rise from 8.6% of world corn exports in 2010/11 to USDA's current projection at 30.2% of the world market for the 2022/23 marketing year that will end on August 31. Incentive for future growth will depend not only on global demand but also on factors such as logistics, infrastructure, expected profit margins, and relative price in the world market. The USDA forecast for lower Brazilian corn production for 2023/24 could signal factors of limitation stabilizing future corn expansion.

Brazil is on pace to surpass the U.S. in corn export quantity for 2022/23, a year with drought reducing U.S. corn production by 10% from the initial projection. Likewise, the severe U.S. production loss due to drought in 2012/13 also offered Brazil the lead in corn exports. Brazil's share of world corn exports relative to the U.S. has fluctuated up and down over the last decade. Exports of corn as grain are the primary focus, but exports of corn in value-added products including ethanol, dried distillers grains, and livestock and meat products, are essential pieces of the U.S. corn market with opportunity for growth.

While the U.S. and Brazil have both increased productivity over time, global sustainability is an important consideration. According to USDA's international agricultural productivity data, farmers in the U.S. increased fertilizer use by 4.1% from 2015 to 2020, while farmers in Brazil increased fertilizer use by 32.8% in the same period. In 2020, farmers in Brazil used 112% more fertilizer per hectare than U.S. farmers to provide the extra fertility needed to grow multiple crops in a year. Brazil achieves similar yields as the U.S. on soybeans, a crop with relatively low fertility needs, while corn yields are less than half U.S. yields despite high fertilizer use.

Cropland area has also expanded in Brazil, jumping from 26.0 million hectares in 2000 to 63.5M in 2021. An estimated 80% of new cropland from 2000 to 2014 was repurposed pastures and 20% was conversion of natural vegetation[1]. Cropland can continue to expand into existing pasture, but deforestation has slowed and continued efforts to maintain valuable rainforest are critical to global sustainability[2]. In the United States, farmers continue to increase productivity of corn over time with a finite land area.

While some aspects of demand for U.S. corn are dependent on macroeconomic factors like exchange rate, effective and supportive policy could improve demand for U.S. corn now. The Market Access Program (MAP) and Foreign Market Development (FMD) programs in the farm bill, which comes up for reauthorization this year, have been integral in developing new global export markets. As world corn production grows, more corn is available for low-carbon emissions biofuel use. Policy that supports greater use of homegrown biofuels like corn-based ethanol would benefit consumers and corn farmers.

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Data Note: *Figures from the June USDA World Agriculture Supply and Demand Estimates (WASDE) Report will be updated as needed after the release of the July WASDE on July 12 at 11am ET.*

1. Weather & Production

The United States' 2022/23 marketing year production was 13.7 billion bushels, 10% less than the initial projection and 9% lower than the previous year due to a drought that impacted some corn growing regions. Brazil is still harvesting the remaining 2022/23 production that USDA forecasts at a record 5.1 billion bushels of corn. Brazil's record crop in a marketing year with a drought-reduced crop in the U.S. is providing a relative advantage to the South American country on exports. Brazil also expanded trade relationships, including China as a new partner in late 2022. As of the June World Agriculture Supply and Demand Estimates (WASDE) report, USDA projections for 2023/24 show Brazil's production again at 5.1 billion bushels while the forecast for the United States is back to a trendline 15.3-billion-bushel level.

However, with drought blanketing the U.S. and covering an estimated 67%[3] of U.S. corn, the likelihood of lower yields increases, but the recent 2.1 million[4] acre increase in estimated corn planted acres for the 2023/24 crop is at least partially offsetting what otherwise may be a production shortfall. USDA is projecting a small drop in Brazil's corn production for the upcoming 2023/24 crop, further demonstrating the possibility for either nation to lead on exports going forward. Any real-time changes in acres and weather impacts on Brazil's 2023/24 corn production are less clear currently.

2. Acres & Yields

According to USDA, Brazil is projected to harvest 56.1 million corn acres in the 2022/23 marketing year, the fifth year in a run of major increases in corn harvested acres. With the current projection, Brazil's corn harvested acres have increased by an average of 3.0M acres or 6.5% growth annually over the last five years. For comparison, this average annual addition is close to the total corn harvested acres in the state of Missouri over the same five marketing years.

About 30% of the total land area in Brazil is used for crops and pasture, with only a quarter of the segment (7.8% of total land area) in cropland. Aside from 3.5% of land for other purposes, the remaining two-thirds of the land in Brazil is in protected and preservation areas[5].

Although a large area is protected, there is potential for cropland area to double by expanding into existing pastureland that is fit for crops. Soybeans remain the primary crop of interest in Brazil, but expansion of cropland area would also likely increase acres of corn as a second crop. For 2022/23, more than three-fourths of total production is expected from the second crop farmers in Brazil are currently harvesting.

Because of the dominance of corn as a second crop, Brazil does not achieve the same corn yields as in the United States. The USDA forecast for Brazil's 2022/23 corn yield equates to 92.6 bushels per acre, resulting in a five-year average of 85.4 bushels per acre, just short of half of the 173.1 bushel per acre U.S. average for the same period. The difference is not due to the use of non-GM seed. Brazil reported genetically modified seed was used on 95%[6] of corn planted in the 2022/23 crop year, virtually the same as in the U.S. The difference is largely due to most of the corn being a second crop. Without additional investments in fertilizer, irrigation, or transition to the first crop, major growth in yields is not likely. Under the current demand and price structure, the incentive for additional investment is not strong enough, but increasing demand for corn could spur changes.

3. Ethanol Investment & Capacity

One source that could limit future exports from Brazil is the country's own demand for ethanol production. From 2014 to 2022, corn ethanol production in Brazil grew from 11.6 million gallons to 1.2 million gallons[7]. The Brazilian National Corn Ethanol Union projects corn ethanol production to rise to 2.6 billion gallons by 2030[8]. Given the more than 30% annual increases in corn ethanol production since 2014 and the facility expansion in the pipeline, the less than 10% annual increases needed to hit that 2030 target are attainable.

Over 400 million bushels of corn are currently used in Brazil's corn ethanol production, representing over 8% of total corn production and about 20% of the quantity that Brazil currently exports. The expected corn ethanol production in 2030 would use more than 900 million bushels. Some ethanol plants in Brazil can use both corn and the traditional sugarcane feedstocks. The feedstock decision is based on the region and what crop is readily available and costs.

4. Infrastructure & Transportation

Currently about 60% of grain is transported by trucks in Brazil. While that is nearly equal to the share of grain transported by truck in the U.S., the road systems are much different. Brazil is 86.6% of the size of the entire United States but has just 25% of the roadway miles found in the United States, of which only 12.4% are paved roads.[9] In comparison, nearly 70% of roadway miles are paved in the U.S.

Brazil has several projects underway to increase the efficiency of its transportation system, with focus on rail and waterway development. With these projects Brazil aims to reduce general cargo transport by highways to 30% and increase the role of railways in moving grain to ports from 21% to 35%, and the role of waterways from 14% to 29%[10]. While most grain exports had to exit Brazil through southern ports, the expansion of northern ports over the past decade has given the northern half of the nation a shorter and less costly pathway to reach a port.

Another infrastructure challenge for Brazil is the growing grain storage capacity deficit. The 35% increase in grain storage capacity from 2010 to 2022 hasn't kept pace with the 82% increase in grain production in that time[11]. In the current year, the difference in total grain production and storage capacity could exceed 4 billion bushels. Because there are multiple harvests in many growing regions, there is a possibility to reuse storage, but forces clear-out of the previous crop in what may not be optimal timing for the farmers.

5. Prices & Profitability

The current corn price in Brazil is quite a bit lower than in the United States. Throughout May and June, Brazil's freight-on-board-export price has fluctuated near $30 per ton, or about $0.75 per bushel, less expensive than the corresponding price at the U.S. gulf. The exchange rate for the Brazilian real and record second crop harvest currently underway are contributing factors to the price difference. While the lower corn price is generally attractive for foreign buyers comparing prices between the two nations, this translates to lower prices at the farmgate where current prices offer marginal profitability. Farmers have little incentive to sell at these prices, but in some cases lack of storage capacity is perpetuating sales. The Brazilian real has appreciated relative to the dollar from a year ago. As the real appreciates relative to the dollar the relative cost of production is reduced, but the corn being sold into the world market is also comparatively lower.

Looking Ahead

Brazilian farmers' appetite for corn production will depend on the relative costs and price, investments in infrastructure, and demand sources. Expanding ethanol production in Brazil could use more corn and temper the rapid growth in exports. But rising demand could also fuel production expansions that would provide corn to meet growth in both domestic use and export categories. Although getting to an optimal situation has a long-term time frame, continued infrastructure improvements are underway and are already lowering transportation costs.

In the short term, weather impacts on production and changes in relative currency value could be drivers that cause major swings in world market dynamics despite a longer-term outlook. If the value of the Brazilian real continues to appreciate relative to the U.S. dollar, it could curb the pace of growth and expansion.

Endnotes

1 https://www.pnas.org/doi/10.1073/pnas.1810301115

2 https://www.nbcnews.com/news/latino/deforestation-amazon-dropped-34-reversing-trend-bolsonaro-rcna92988

3 https://drought.unl.edu/archive/AgInDrought/AgInDrought_20230704.pdf

4 https://downloads.usda.library.cornell.edu/usda-esmis/files/j098zb09z/hh63v8465/zg64w269x/acrg0623.pdf

5 Embrapa 2019

6 https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Agricultural%20Biotechnology%20Annual_Brasilia_Brazil_BR2022-0064

7 FAS

8 World-Grain.com

9 As of 2021 the United States Department of Transportation reports 4,187,440 roadway miles, of which nearly 70% are paved: https://www.fhwa.dot.gov/policyinformation/statistics/2021/hm220.cfm, https://www.bts.gov/content/public-road-and-street-mileage-united-states-type-surfacea. As of 2023, the Brazilian road system includes 1,069,200 miles of roads, of which 12.4% are paved: https://en.wikipedia.org/wiki/Brazilian_Highway_System

10 farmdocdaily January 19, 2022

11 farmdocdaily November 23, 2022