



Cornhusker Economics

The Growth of Ethanol in Brazil: Sugarcane, Corn, and a Few Other Things

Last fall I traveled to Brazil and met with industry professionals, government officials, and academic researchers to learn about recent developments in Brazilian agriculture and what we can expect to see in the future. I have essentially been asking people their opinions about the main developments in Brazil in the last few years and their perspectives for the future. One of the main topics that has emerged consistently in these conversations is the increasing role of corn in the production of ethanol.

Let us go ahead and discuss the ethanol market in Brazil as we highlight the main ideas that have come up during my conversations. Just keep in mind that this is not a scientific study, but rather notes and information gathered from my conversations about agriculture in Brazil.

A little bit of history

Brazil developed its first ethanol fuel program in the 1970s, which was largely a response to the oil crisis in that period. Ethanol was used as a stand-alone fuel and also blended with gasoline. The blend varied over time, ranging from 10% in the early years to 27% more recently. After some progress in the 1980s, the program slowed down in the 1990s and then gained traction again in the 2000s. The development of flex-fuel vehicles (which run with either gasoline or ethanol) helped spark the program again.

Ethanol has been traditionally produced from sugarcane, which is crushed by sugarcane plants to produce both ethanol and sugar. Sugarcane production has been largely concentrated in the state of Sao Paulo, in the southeast of Brazil. Despite losing some ground to other states over the years, in the current crop year, Sao Paulo is still producing 52% of all sugarcane in Brazil. The next four top producers are Minas Gerais (12% of national production in the current crop year), Goias (11%), Mato Grosso do Sul (8%), and Parana (5%). These five neighboring states can be seen in the shaded area in Figure 1.

Figure 1: Map of Brazil showing the main states that produce sugarcane, ethanol, and corn (shaded area)

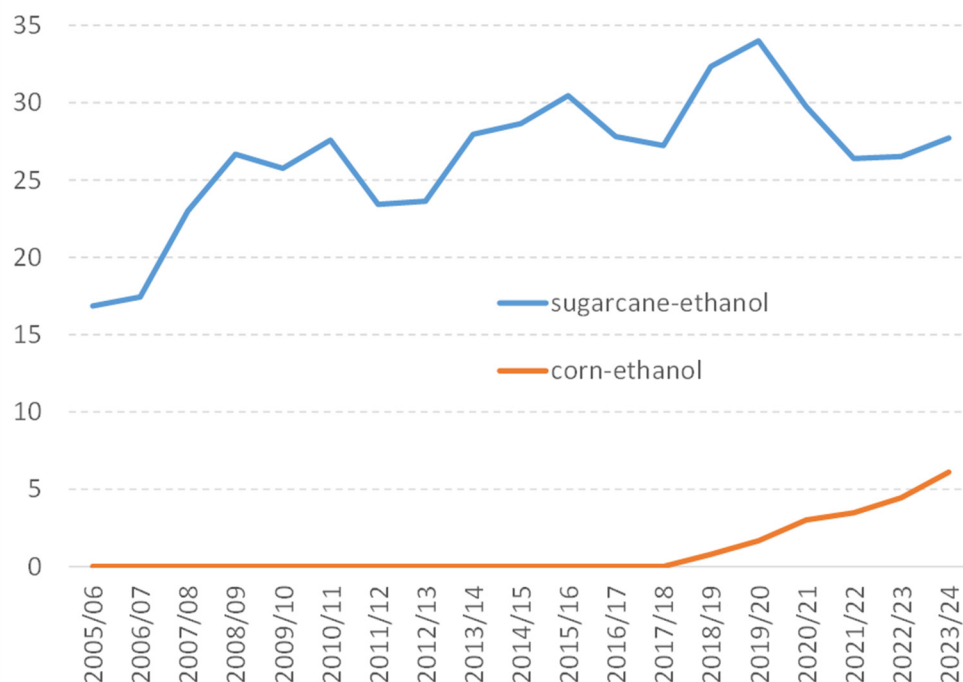


Created with mapchart.net

Sugarcane still rules, but corn is catching up fast

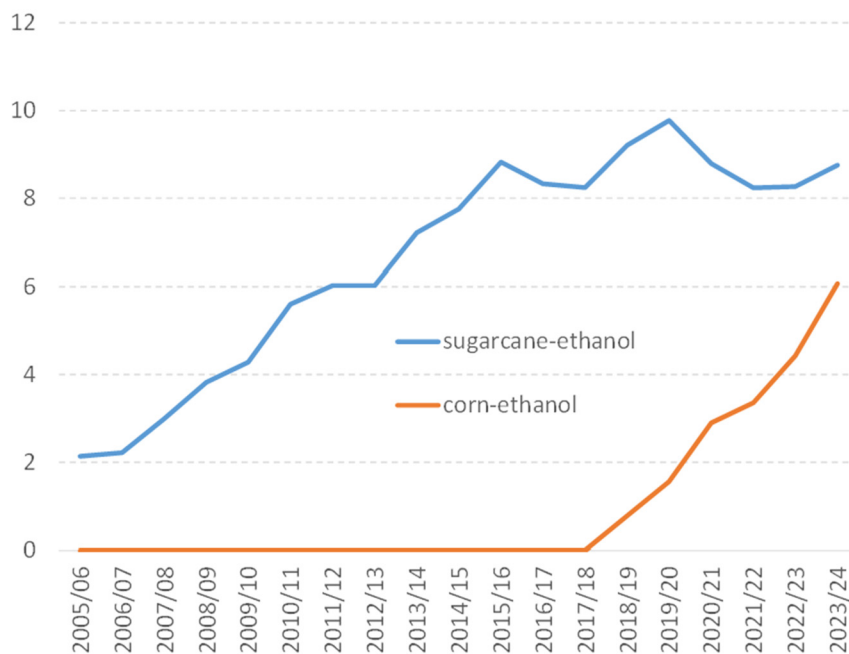
Until 2017/18, almost all ethanol produced in Brazil came from sugarcane. In 2018/19, corn-ethanol accounted for 2% of the total ethanol production in Brazil. Since then, the participation of corn increased consistently every year. In 2023/24, it is estimated that corn will account for 18% of all ethanol produced in Brazil. In only six years, the participation of corn-ethanol in the total production of ethanol in Brazil rose from close to 0% to 18%, while the participation of sugarcane-ethanol decreased from close to 100% to 82% (Figure 2).

Figure 2: Ethanol production in Brazil by input – 2005/06 to 2023/24 (billion liters)



The growth of corn-ethanol has been taking place mostly in the center-west of Brazil (Mato Grosso, Mato Grosso do Sul, and Goias), where its growth has been particularly strong. In 2018/19, only 7% of ethanol produced in the center-west came from corn. In 2023/24, it is estimated that 41% of ethanol in the region will come from corn (Figure 3). One of the main reasons is that there is a large availability of corn in the area. Approximately 58% of all corn produced in Brazil comes from the three states in the center-west region: Mato Grosso, Mato Grosso do Sul, and Goias (which are the west side of the shaded area in Figure 1). On the other hand, the southeast states of Sao Paulo, Minas Gerais, and Parana have a larger availability of sugarcane relative to corn. These three states produce about 70% of all sugarcane in the country, but account for only 23% of corn production in Brazil. Hence, most of the ethanol produced in the southeast area still comes from sugarcane.

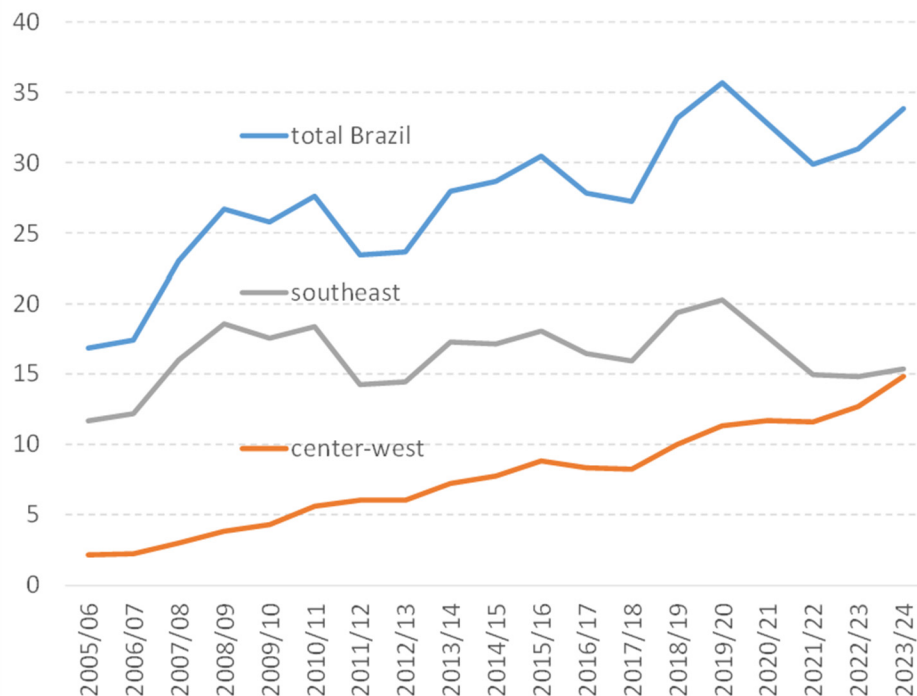
Figure 3: Ethanol production in the center-west of Brazil by input – 2005/06 to 2023/24 (billion liters)



Ethanol production has been growing, thanks to corn and the center-west

The overall growth of ethanol production in Brazil in the recent past has been due primarily to the expansion of corn-ethanol. Between 2005/06 and 2023/24, total ethanol production in Brazil doubled (100% growth). Ethanol production in the center-west region grew 594% during this period while in the southeast states it grew only 31%. In the current crop year, the center-west region is producing about as much ethanol as the traditional production area in the southeast (Figure 4). Again, this strong growth has been driven by the expansion of corn-ethanol production.

Figure 4: Ethanol production in Brazil by region – 2005/05 to 2023/24 (billion liters)



Is there a particular reason why corn-ethanol expanded so much?

The last few years offered good opportunities for the expansion of corn-ethanol in the center-west of Brazil. As we mentioned before, corn production has increased in that area and provided more inputs to produce ethanol in the region. The overall growth of the economy (largely due to agriculture) also created more demand for fuel in the area. Since most of the infrastructure for fuel production and distribution in Brazil has been traditionally located in the southeast, there was room and opportunity for the center-west to start producing more fuel locally.

Also, as we can see in Figure 4, the production of ethanol from sugarcane in the southeast decreased in the last few years. The main reason was that sugar has been relatively more profitable for sugarcane plants during that period, hence they chose to focus more on sugar rather than ethanol. This behavior is typical since sugarcane plants chose the split between sugar production and ethanol production based on the profitability of each product. What it means for this discussion is that sugarcane plants were not as interested in ethanol and this created more room for the expansion of corn-ethanol.

What happens next?

Now that we have a better perspective on why corn-ethanol expanded rapidly in recent years, let's think whether this expansion will continue. Some market analysts and industry professionals that I talked to believe that within the next few years, the proportion of corn-ethanol can increase from the current 18% to around 30% of the total ethanol production in Brazil. They argue that the emphasis on biofuels and the large availability of corn in Brazil will keep pushing the

production of ethanol and especially the use of corn as input. In addition, they also claim that the newer ethanol plants based on corn are more modern, more automated, and more professionally managed compared to the older sugarcane plants, which can help make the production of corn-ethanol more profitable (and hence more attractive). As a side note, the newer plants come in different settings. Some can produce ethanol only from corn, while others can produce ethanol either from corn or sugarcane (the “flex plants”).

Is there anything that could slow down the growth of corn-ethanol? Yes, absolutely. One of the reasons why corn-ethanol expanded recently was the large availability of input at relatively lower prices. Corn will likely remain largely available in the center-west, but the production of corn-ethanol will not be as attractive when corn prices go up. Besides, sugarcane plants have been paying more attention to sugar because of higher sugar prices in the world market. Once sugar becomes less profitable at some point in the future, those plants will start paying more attention to ethanol again and then there will be more competition for corn-ethanol plants.

Final thoughts

Therefore, although we can expect more ethanol produced from corn in the coming years, it is unclear whether it will keep expanding at the same pace as in recent years or how much it will contribute to total ethanol production.

One point to keep an eye on is the typical dynamics of markets. If supply and demand conditions and price movements make corn-ethanol more profitable, ethanol plants in Brazil will keep increasing their production. If it makes more economic sense to produce corn-ethanol (as it happened recently), they will use more corn to produce ethanol.

Supply and demand conditions for ethanol, corn, sugar, and other related commodities in the coming years will determine the profitability of producing all these commodities, and producers will naturally focus their attention on the most profitable ones. But whatever the price signals from the market are, keep in mind that there is plenty of room for Brazilian plants to expand their production of ethanol. As we saw in the last few years, when opportunities arise, they are ready to take them.

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