



# The Sweet Side of the Ethanol Industry in Brazil

November 2018

London | New York | Singapore | Hong Kong

Research | Agriculture | Metals | Energy | Financial Futures & Options

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## The Ethanol Market in Brazil

Ethanol, or ethyl alcohol, is a biofuel that can be obtained from the processing and fermentation of sugarcane, as well as other agricultural products such as corn, beet and potatoes. The Brazilian government have consistently sought to support and expand ethanol production to reduce dependency on imported petroleum (and associated oil price shocks) and cut greenhouse gas emissions. Notably, Brazil is currently the 2nd largest producer of ethanol in the world after the USA.

At a fuel pump in Brazil, a consumer can fill up with two types of fuel: 1) A mix of gasoline and anhydrous ethanol (currently 1 litre of gasoline is mixed with 27% of anhydrous ethanol) or 2) pure hydrous ethanol. Around 70% of the light vehicle fleet are flex-fuel vehicles in Brazil, with the ability to run on pure ethanol or any mix of gasoline and ethanol. The evolution of the Brazilian automobile and light vehicle fleet (Otto Cycle) is displayed below.

### Estimated Brazilian Automobile and Light Vehicle Fleet

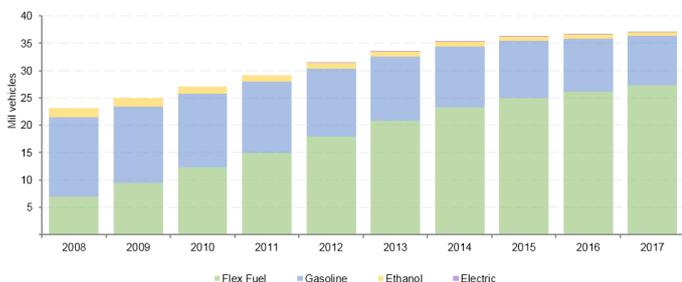


Figure 1. Source: UNICA

Over the years Brazil has supported its ethanol industry in a variety of ways including incentivising sales to the domestic car fleet, substantial mandatory ethanol blending in gasoline, fuel price setting through Petrobras, supporting the development of flex-fuel vehicles and banning the purchase of diesel-powered cars. However, now the only support ethanol obtains in practice is a slight tax advantage compared to gasoline and the mandatory blending of anhydrous ethanol.

### Why is Ethanol Important to the Sugar Market?

The majority of mills (95%) in Centre-South (CS) Brazil

are designed to make both sugar and ethanol from sugarcane. In theory, a mill could make 100% of one product and none of the other, but in practice the tonnage of cane is so big that they run both units during the peak periods of the harvest (June-Sept). However, mills have the option to make more or less of each product; typically favouring the product which is most remunerative at the time. In practice, the mix (for the crop as a whole) can go as low as 36% sugar / 64% ethanol, or as high as 50% sugar / 50% ethanol. Notably, the sugar mix in 2019/20 could go below 36% as several mills have invested in extra ethanol capacity.

### The Sugarcane Refining Process



Figure 2. Source: Sugar Australia

That means, on the basis of a 550 mmt cane tonnage, CS Brazil can make 10 million tons more or less sugar in a given season. As a result, the ethanol parity (i.e. the price at which sugar and ethanol both give the same return to a mill) tends to become either a floor or a ceiling to the world sugar price. It is a floor when sugar prices are higher than the ethanol parity (because we know that if the sugar price goes down below ethanol, we could lose up to 10 mmt of supply) and a ceiling when sugar is below ethanol. For 2018/19, we predict a small deficit in the Global Sugar S&D, with a larger deficit forecast in 2019/20. Therefore, the world may need some, but not all, of the 10 mmt sugar available through the ethanol swing in Brazil. The ethanol parity is therefore a magnet for sugar prices at the moment and is likely to remain so throughout the coming harvest.

### What Determines the Ethanol Parity?

The price of ethanol in Brazil is loosely correlated to the domestic price of gasoline and therefore the world price of crude oil. The correlation of ethanol to gasoline prices

is determined by several factors including seasonality. As the harvest gets under way and new production of ethanol comes on stream, supply of ethanol surpasses demand. Ethanol can only be stored in special tanks, so when these have filled up mills have no option but to sell. This phenomenon is, of course, stronger when the mix heavily favours ethanol such as in 2018/19.

One of the main factors influencing ethanol demand, and therefore the price of ethanol and the ethanol parity, is the ratio of the gasoline price to the ethanol price at the pump.

Consumers with a flex-fuel vehicle should fill up with the cheapest fuel on the day (taking into account the relative energy value of each fuel). The rule of thumb is that if the pump price of ethanol is 70% or less than the pump price of gasoline, there is an economic incentive to fill up with ethanol. This is based on the fact that 70 cl of gasoline will take a car the same distance as 1 litre of ethanol. So you would expect fuel stations to advertise the ratio and motorists to fill up with ethanol when the price is 69% of the gasoline price, and with gasoline when that price is at 71%.

However, the reality of consumer demand is not that straightforward. For example, some motorists only use gasoline as they fear ethanol has a damaging effect on their engine. On the other hand, some choose to only use fuel ethanol because of the environmental benefits. However, the majority of consumers fill their vehicles with whatever seems cheapest using a quick mental calculation (usually using prices at a round number). The result is that motorists in practice only make a significant switch to ethanol when the price is significantly low, i.e. 60-65% or lower. When this happens demand for ethanol picks up significantly.

The difference between the ex-mill price of ethanol and the pump price is dependent on a number of additional costs reflecting transport and taxation etc. However, it is important to note that the price paid by distributors to mills is not derived from the ethanol price at the pump in a consistent manner. In other words, distributors often operate a kind of cartel to keep the price at the pump high and pay a lower than normal price to the mills.

For example, at the beginning of April 2018 (see red dashed line in Figure 3), the ex-mill price of hydrous ethanol started plunging with the onset of the sugarcane harvest, however the pump price of ethanol remained fairly stable. This delay in the pass-through of pricing

often occurs at the beginning of the harvest as fuel distributors work their way through the stocks acquire at pre-harvest prices. Notably, this price-lag has also emerged in the past few weeks (see green dashed line), meaning that mills are seeing their own prices fall with no corresponding pressure on consumer prices which would in turn generate greater offtake.

### The Ex-mill Ethanol Price vs Pump Price in Sao Paulo

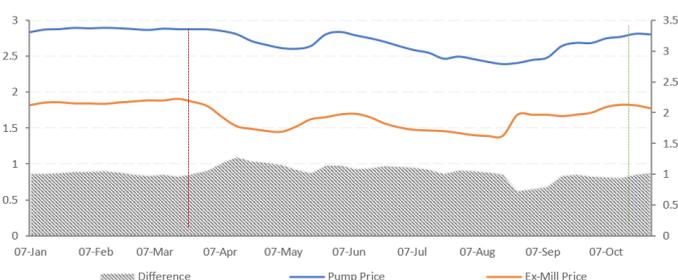


Figure 3. Source: ANP; CEPE; Marex Spectron Research

### How do Mills Change the Sugar-Ethanol Mix?

The typical evolution of the sugar mix in CS Brazil is represented by the red dashed line in Figure 4. At the start of the season when the amount of cane being crushed is small, mills can run only one unit, sugar or ethanol. They tend to favour ethanol because immature cane is more suited to making ethanol, resulting in a high/low ethanol/sugar mix at the beginning of the harvest. The same applies at the end of the crop, and during periods of excessive rain.

However once the crop gets going the mills make both products because the steam which runs both processes can only function when both units are operating. We used to think that this implied a minimum sugar mix of about 40% for a crop as a whole, but have now learned that mills are more flexible than we thought.

In the peak period, cane is crushed as fast as possible i.e. as fast as it can be processed into sugar and ethanol. You cannot 'slow down' the process, so this means that both the sugar and the ethanol units are working at full speed 24 hours a day. So how can the mix be varied? Cane is crushed up to 5 times. The juice from the first crush is richer (contains more sucrose) than later crushes.

So that rich juice can be directed to make the product which the mill wants to favour.

### The Bi-Weekly Sugar Mix in Brazil

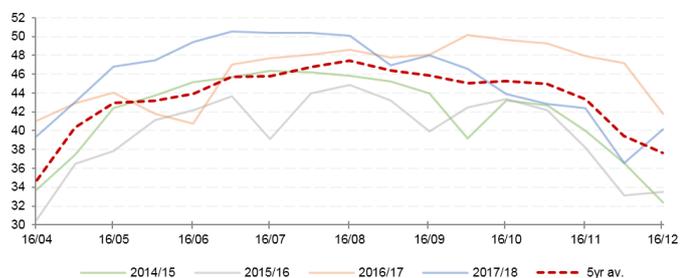


Figure 4. Source: INICA; Marex Spectron Research

### 2018/19 Harvest Season; Accumulated Production until 1 November 2018

	2017/18	2018/2019	Var. (%)
Sugarcane	531,447	508,339	-4.35%
Sugar	33,219	24,350	-26.70%
Anhydrous Ethanol	9,741	8,402	-13.75%
Hydrous Ethanol	12,920	18,858	+45.96%
Total Ethanol	22,661	27,260	+20.29%
TRS	73,209	71,235	-2.70%
ATR	137.75	140.13	1.73%
Sugar Mix	47.62%	35.87%	-24.67%

Table 1. Source: UNICA

### What Has Happened in 2018 So Far?

The ethanol parity (see Figure 5) started to increase from week 28 in 2017; eventually overtaking sugar prices and peaking at ~17c/lb in week 4 2018. Despite a sharp drop in ethanol prices at the beginning of the harvest, the production of ethanol has remained more remunerative to sugar for the majority of 2018.

### The Ethanol Parity vs Sugar no. 11 in 2017 and 2018

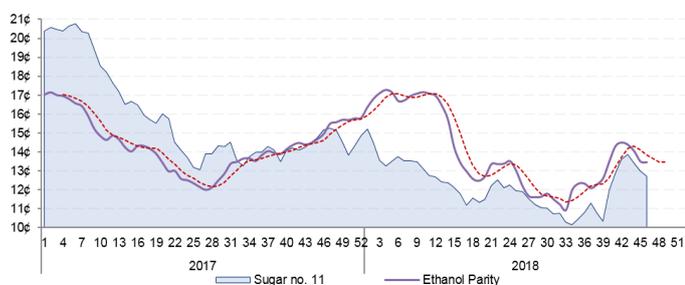


Figure 5. Source: CEPEA; Bloomberg; Marex Spectron Research

As demonstrated by Table 1, the switch to ethanol this year has been exceptional. It is clear millers have followed the ethanol parity (see Figure 5) and have demonstrated a strong preference for ethanol production, with the accumulated sugar mix as low as 35.87% for the 2018/19 season so far (-24.67% Y-o-Y). Notably, the total accumulated hydrous ethanol production equates to 24.35 mmt, up 46.96% from last year.

On the other hand, we have also a strong increase in demand this year. Figure 6 shows the price of gasoline and hydrous ethanol at the pump in Sao Paulo in 2018. As we can see, gasoline prices have been slowly increasing since the beginning of the year, remaining above 4R\$/litre. Conversely, ethanol prices were on a downtrend from week 16 to week 27, slowing rising thereafter. As a result, the pump price ratio (green bars in Figure 6) fell from 71% at the beginning of April to an impressive 57% in August. The pump ratio has since rebounded slightly to ~62%.

### The price of Gasoline and Hydrous Ethanol at the Pump in Sao Paulo

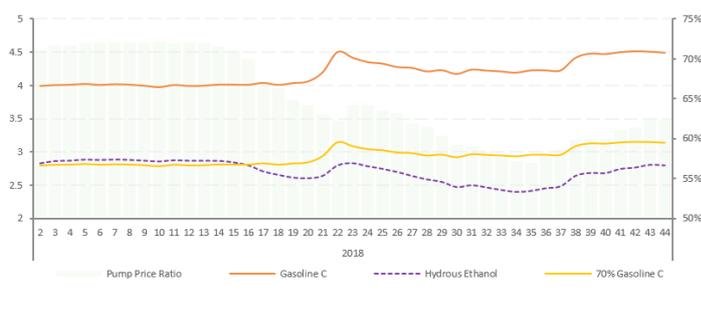


Figure 6. Source: ANP; Marex Spectron Research

This decline in the pump price ratio has resulted in a surge in ethanol demand, as illustrated by the green line in Figure 7, with record values observed in 2018 since June. For instance, 13.3 bln litres of ethanol was consumed in CS Brazil between January and September 2018, compared to 6.9 bln litres for the same period

last year (+93% y-o-y; almost double!). Sales of hydrous ethanol have indeed been outstanding in 2018 so far, but we argue that they have needed to be given record stocks of ethanol accumulating in Brazil. So although production is coming to an end, ethanol demand needs to remain firm going forward.

### The Consumption of Hydrous Ethanol in CS Brazil

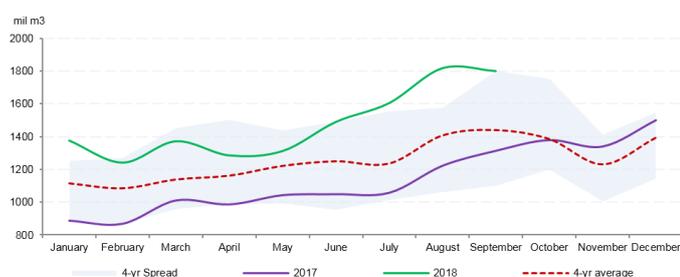


Figure 7. Source: ANP; Marex Spectron Research

### What is the Future of Ethanol in Brazil?

The immediate question is: *'what will the effective ethanol parity be at the start of the 2019/20 harvest?'*

That will depend on crude/RBOB prices at that time, expressed in BRL. If we extrapolate from current conditions, the ethanol parity looks to be ~14 c/lb. If fuel prices continue to decline as many suspect, this would probably set a ceiling on sugar prices (depending on currency movements). However, the ethanol parity will only affect sugar production once the crop has got under way. Until then, with current crop coming to an end, the ethanol parity has no effect.

Obviously, this expected parity will have an important bearing on sugar prices. No one will feel safe to be long of sugar at ~14 c/lb if the ethanol parity is 13c/lb. But it is by no means clear that, if this expected parity continues to decline, operators will actually want to sell sugar down. To be short of sugar at 11 c/lb, because the expected parity is say 10.5 clb, would be to run a double risk: sugar prices could go up for other fundamental reasons (e.g. a weather problem) and at the same time the expected ethanol parity could rebound.

In summary, we feel that the importance of the ethanol parity before the start of the next crop can be over-estimated. It may act as a cap on rising prices but not as a driver to push prices down.

## White Paper Authors

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Robin Shaw is a leading sugar analyst at Marex Spectron, who has worked in these markets, in various locations around the world, for over 40 years. He was the former of Head of Trading at Sucden in Paris until 1992, when he left to co-found CR Sugar. From 1999 through to 2016, Robin was a consultant to Cevital, and he has been with Marex Spectron since 2003. His Weekly Sugar Report is one of the most highly regarded in the industry and Robin is a regular speaker at international conferences.

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