

ALCOHOL FUEL:

CONSOLIDATION OF THE DOMESTIC MARKET AND STRATEGY TO DEVELOP FOREIGN MARKET

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INTRODUCTION

The theme covered in our article is relatively new, because only now there are reasons to discuss global markets for alcohol strictly on economic terms, at some distance from ineffective state protectionism.

Most of our considerations will be based on the recent Brazilian experience in producing and using alcohol as a fuel, initiated in the mid-1970s. Additionally, we will be taking into account the knowledge developed in research institutions like the Copersucar Technology Center (today Centro de Tecnologia Canavieira), Planalsucar (today Ridesa – Inter-University Network for the Development of the Sugar-Alcohol industry), CTA – Aerospace Technology Center, IEA – Institute of Agricultural Economics, Unicamp, USP, Federal University of São Carlos, UFRJ, just to mention a few among many others.

Finally, we are also using our professional experience at Job Economia, particularly in regard to foreign markets as consultants to BID and Unido.

ECONOMIC BACKGROUND

All the movement towards using alcohol as a fuel is owed to relatively expensive petroleum, currently around US\$ 100.00 per barrel. This situation began in 2004, as shown on the graph below, referring to weekly light petroleum WTI prices in US\$/barrel. Rates refer to the first market closing in the New York Futures Exchange.

Upon considering that:

- Brazil, Russia, India, and China, should maintain an intense pace in their economic development and energy demand;
- OPEC is willing to provide oil at a price (US\$ 100/barrel) that makes costly new discoveries viable, as they do not foresee supplying alone all the additional demand for the product, we can expect a well balanced global offer and supply of petroleum and its derivatives, and therefore with relatively high prices. Everything leads to the fact that cheap petroleum – like it was in the 1980s and 1990s – will no longer exist.

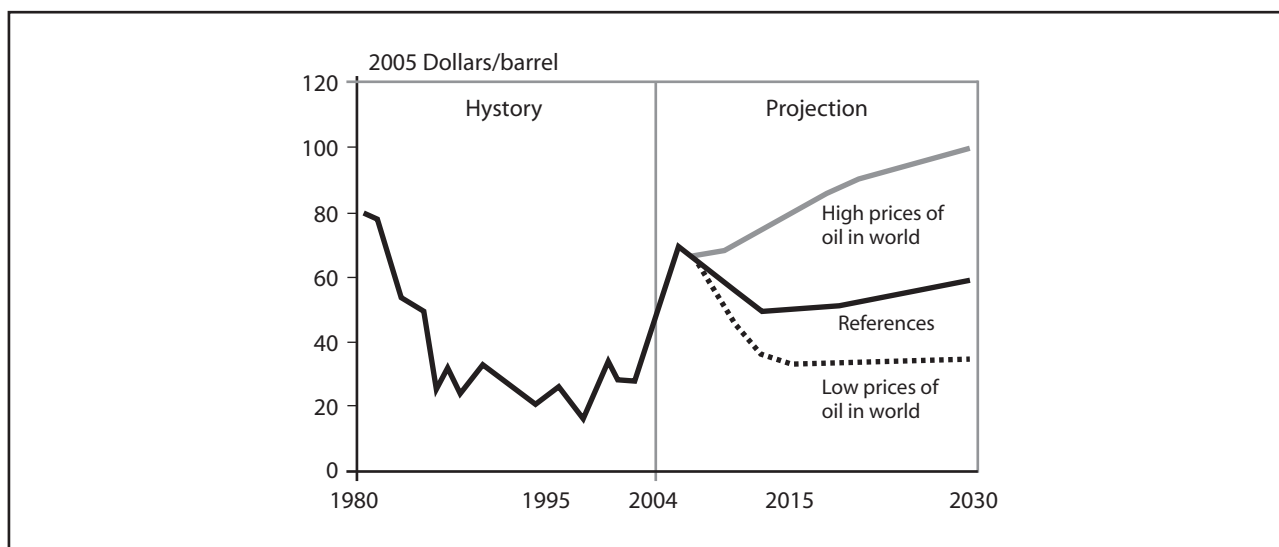
The U.S. Department of Energy – in its *Energy Information Administration, Annual Energy Outlook, 2007*, Washington, DC – which has been conservative in their price forecasts saw, in 2007, three possible scenarios for petroleum in the 2005-2030 period:

- declining prices relative to the situation in 2005 and reaching US\$ 40 per barrel over the next two decades;
- a reference scenario with prices also declining from the 2005 level and varying in the US\$ 50-60/barrel range over the next two decades;
- rising prices from 2005 on, reaching US\$ 100/barrel at the end of the period under analysis.

The study considered the US\$ exchange rate of 2005. Keeping in mind that the average dollar



FIGURE 1 Variation of oil prices (ligh and oil) – from 2002 to 2008 in US dollars/barrel.



Source: Energy Information Administration (USA). *Annual Energy Outlook 2007*. DOE/EIA-0383(2007) (Washington, DC, February 2007. Website <www.eia.doe.gov/oiaf/aeo>.

FIGURE 2 Variation of oil prices (hystory and projections) from 1980 to 2030, in US dollars/barrel.

in 2005 (as compared to August 2008) devaluated 20% relative to the euro, and 33% relative to the real, it makes sense that the high prices scenario has prevailed.

Petroleum in the US\$ 70-80/barrel range is enough to render the Brazilian anhydrous alcohol mixed to gasoline viable in the long run, considering an exchange rate within the US\$ 1 = R\$ 1.70-1.80 range and a refining premium around US\$ 12/barrel. Furthermore, we should not forget that alcohol mitigates the negative consequences of the greenhouse effect, and that sugarcane alcohol, by means of co-generation of electric energy, accrues rights to carbon credits.

Therefore, fundamentally, Brazilian anhydrous alcohol, to be mixed to gasoline in a proportion of up to 20%-25%, represents a good investment and export opportunity, considering that petroleum has a high likelihood of its price reaching or surpassing US\$ 70/barrel in the long run.

We are only considering anhydrous alcohol mixed to gasoline in this analysis, as the use of 100% hydrated alcohol in flex-fuel Otto cycle

motors is less efficient on both performance and economical criteria. As we will see later, the global supply of alcohol might not suffice to cover a worldwide demand of 20% to be mixed to gasoline.

It is worth reminding those for whom fuel alcohol is not their everyday subject, that anhydrous alcohol mixed (up to 20-25%) with gasoline does not cause significant losses in engine performance (km/l or MPG). On the other hand, the use of 100% hydrated alcohol in flex-power motors causes a 40-45% increase in fuel consumption, as compared to gasoline.

OUTLOOK FOR THE DOMESTIC MARKET

The table below predicts a supply and demand scenario for 2015, developed using a model created by Job Economia. The baseline year is 2004, when the Proalcool fuel movement became strong.

Premises that support the alcohol supply and demand forecast are the following:

TABLE 1 Supply and demand scenarios for cane, ethanol, and sugar in Brazil.

Brazil		2015 Million	2004 Million	Annual growth 2004-2015
Supply				
Sugarcane total area	ha	13.7	5.7	8.3%
Sugarcane	ton	980	386	8.8%
Sugar	ton	38.3	26.6	3.4%
Total ethanol	m ³	59.8	15.3	13.2%
Total TRS	ton	143.7	55.2	9.1%
Demand				
Domestic demand	ton	12.0	9.5	2.2%
Sugar exports	ton	26.0	16.9	4.0%
Domestic demand of ethanol				
Fuel ethanol	m ³	50.0	12.7	13.3%
Others uses	m ³	1.7	1.0	5.0%
Ethanol exports	m ³	8.5	2.6	11.5%
Total TRS	ton	144.0	55.8	9.0%

1. GNP growing 4% per year.
2. Sales of automobiles and light commercial vehicles growing 5% per year.
3. Mix of anhydrous alcohol to gasoline of 25%.
4. Sales of flex-fuel vehicles should rise from 80% in 2006 to 90% from 2008 onwards, i.e.: 1.43 million in 2006 to 3.2 million in 2015.
5. Consumer price of hydrated alcohol \leq 70% of the price of gasoline.
6. Vehicles Fleet: 31 million in 2015, compared to 20 million in 2006. Growth of 5% per year.
7. Average yearly scrapping of 6.6% of the fleet, against sales that represent 11.1% of the average fleet in the 2006-2015 period.
8. Global Otto cycle (gasoline, alcohol, and natural gas) consumption grows 8.3%. Fuel consumption increases from 1,700 liters year per vehicle to something close to 2,250 liters/year per vehicle, as a result of hydrated alcohol replacing gasoline, income and credit growth, and reduction of the average age of the fleet.
9. Alcohol demand for export admits that in 2020 the world will be using 10% of alcohol mixed in gasoline, and that the Brazilian share would be 12%-13% of this consumption, close to the forecast for sugar.
10. The model further considers that chemical industries will be having *business as usual* in their demand for alcohol. The model does not consider a more aggressive demand of chemical industries, as we have seen lately.

Some conclusions:

1. In 2015 Brazil will be milling something close to 1 billion tons of sugarcane per year, with a sugarcane cultivation area around 14 million hectares.
2. Sugar production will increase some 3%-4% per year in the 2004-2015 period, while alcohol production should grow some 13%-14% per year, getting close to 60 billion liters in 2015.
3. Sugar exports which were – over the past decade and the first half of the current one – the dynamic component of the

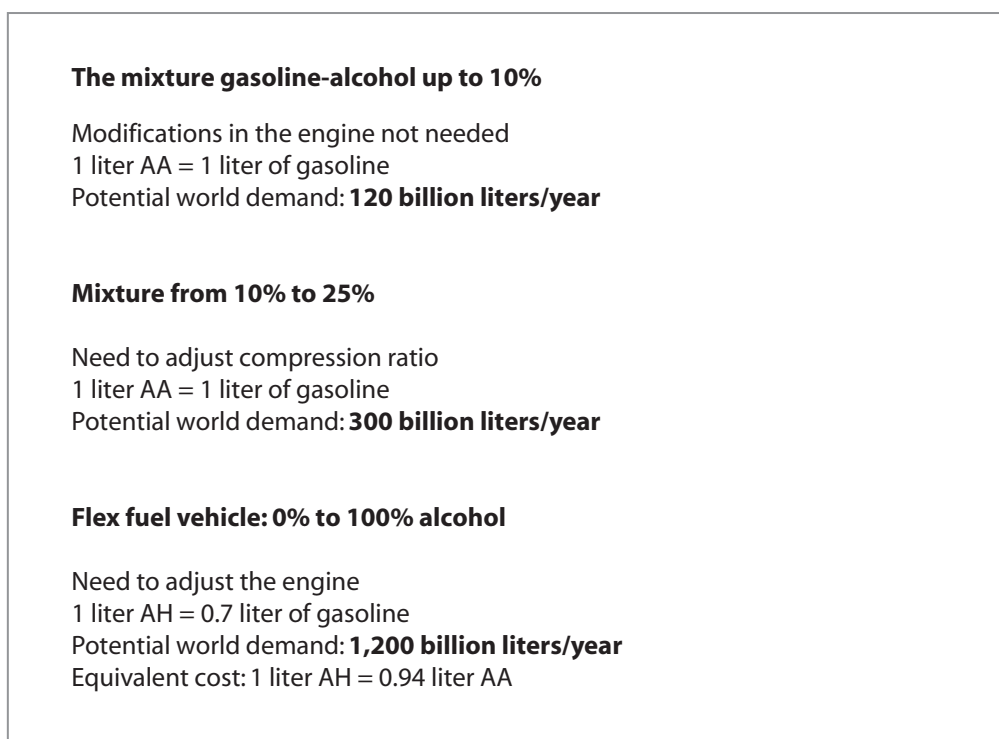


FIGURE 3 Demanda potencial mundial de álcool para motores segundo diferentes porcentagens de mistura.

industry, having grown around 17% per year, will have a rather refrained growth, close to 4% per year.

4. Possible alcohol exports are predicted to be between 8 and 9 billion liters. If more volume is required, the domestic market will only be partially served with alcohol at relatively high prices for the Brazilian consumer.

OUTLOOK FOR THE FOREIGN MARKET

Considering the current world consumption of gasoline, the potential demand for anhydrous alcohol as fuel in the world may be estimated as shown in the Figure 3.

The world supply of fuel alcohol may be seen on the Figure 4.

The growth of ethanol demand in the world has been expressive since 2004. World production more than doubled in the last four years. On the other hand, Brazil and the US still hold some 90% of this production. This means that the fuel alcohol issue for other countries is still more an issue for debating and taking stand than real action.

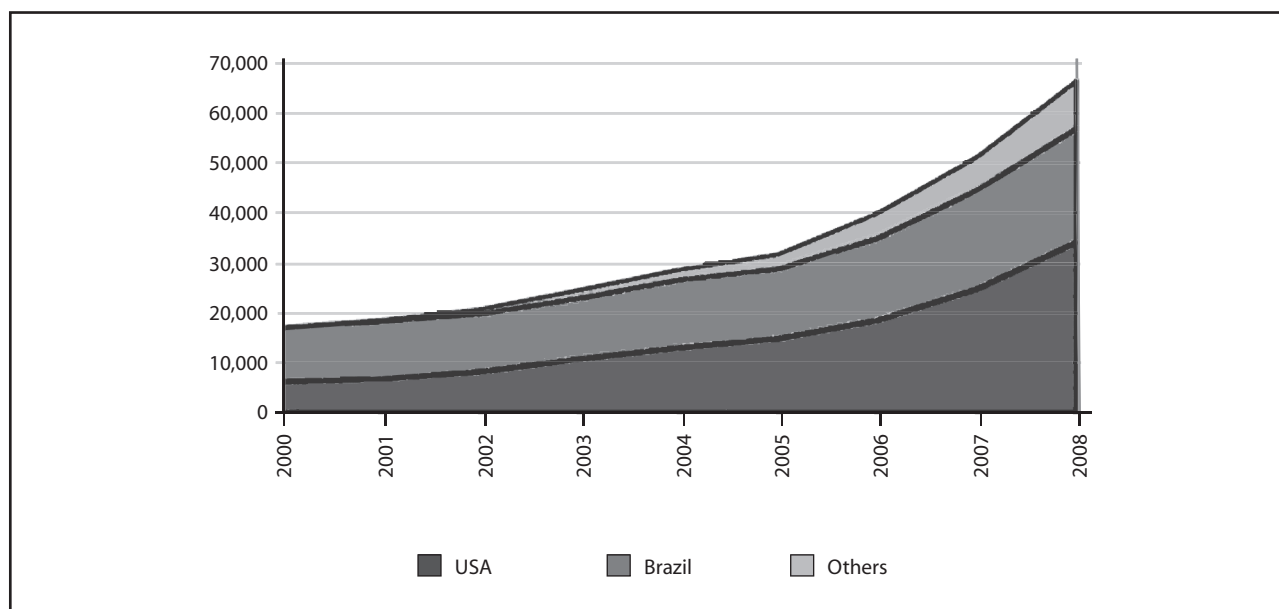
It is important to consider from the selling side that biofuels represent a good investment

opportunity, mostly in the case of alcohol from molasses and sugarcane. Furthermore, it should be considered that perspectives for biofuels are very good, however limited by time and space. The use of food cultures for energy is limited by their high opportunity cost. The land available for significant increases in harvests for biofuels is limited to some regions in the world, like Brazil and Africa. Finally, it should be remembered that new technologies, in the long run, will take care of new energy sources, as well as their more efficient usage.

The International Energy Agency, in 2007, suggested a world energy supply scenario that can be summarized as shown on the table below.

Production levels predicted for Brazil and the US are conservative. In this latter case we are considering the new energy law, passed in December 2007. Making the expected corrections, we arrived at a world production of 140 billion liters per year or 2.4 million barrels per day.

As shown on the previous table, biofuels (ethanol and biodiesel) production will increase significantly until 2012: 19% per year. However their share in the market will be small. They will represent 2.5% of the petroleum market, and the alcohol-gasoline mixture may represent around 10% worldwide.



Source: International Sugar Organization – Market Trends, May 2008.

FIGURE 4 World production of bioethanol, ML.

TABLE 2 Scenarios for world oil and biofuels supply.

	2006		2012	
	Billion liters/year	Million barrels/year	Billion liters/year	Million barrels/year
World oil	4,932	85	5,571	96
Biofuels, including biodiesel	50	0.86	102	1.75
USA	19	0.33	31	0.53
Brazil	17	0.29	31	0.53
EU	8.7	0.15	22	0.38
Others	5.3	0.09	18	0.31

This is a comfortable situation that causes little concern for OPEC. The gasoline market will have to undergo an adjustment, since its consumption will drop as alcohol is used more and more. However, by means of relative prices, it will be possible to fine-tune the supply and the demand of petroleum derivatives.

OUTLOOK FOR BRAZILIAN ALCOHOL EXPORTS

We are considering that the worldwide production and consumption potential of fuel alcohol on a first stage to be something in the vicinities of 120-140 billion liters per year, i.e., 10% of the world's consumption of gasoline.

If Brazil maintains – like with sugar – a share of 40% of world exports, and considering exports as 30% of the world consumption, like in the case of sugar, which is a protected market, it is reasonable to conservatively expect Brazilian alcohol exports in the magnitude of 15 billion liters per year. We are currently exporting close to 5 billion liters per year.

How long would this take to happen?

From mid-range on, as on the short range there is some worldwide resistance to use fuel alcohol.

Such resistances are found mostly in the petroleum industry, as well as among the sugar producers, natural candidates to produce alcohol, initially from sugarcane molasses. In this case, producers intend to expand the existing protection in the sugar market to the new fuel alcohol market. This intent is politically difficult nowadays, as the markets are competitive and globalized,

often regionally clustered, which prevents new commercial safeguards.

Next we will cover in detail the aspects that condition the development of the international alcohol market.

Commercial barriers

The countries now considering the adoption of fuel ethanol, such as the US and the EC, understood this move as an instrument to reduce dependency on imported petroleum and improve the environment, as well as an instrument to protect employment and income in the field, i.e. the initial idea was protectionist from an international trade standpoint.

This condition inhibits alcohol as a global commodity on the short term. On mid and long terms, it is possible that the degree of protection to domestic production of ethanol will be naturally reduced, as an outcome from a growing demand for fuel alcohol and restrictions on the supply side, particularly the competition with foods.

Alcohol in other countries and the interests of the petroleum industry

It has been observed in other Latin American countries and even in some developed countries that are considering using biofuels that economic interests connected to petroleum still raise barriers to using ethanol to replace derivatives from that product.

This condition also inhibits alcohol as a global commodity on the short term. As alcohol demon-

strates its viability as an option – from technical, economic and strategic stances – to replace part of the gasoline, improving its quality and the environment, the petroleum industry will adopt this commercial option. Observe the cases of Venezuela and Nigeria, which are petroleum producers and exporters and that consider using Brazilian anhydrous alcohol mixed to gasoline.

Technology transfer would not be an obstacle to the entrance of other countries in alcohol production, considering it is available, either from governments interested in the use of fuel alcohol – like Brazil and the US – or from equipment suppliers.

Brazil's alcohol supplying capacity

Investment projects in the production of alcohol in Brazil point to a production level around 60 billion liters in 2015 and that about 20%-25% might be for export. This situation of exportable surplus as a fraction of the total production is not much different from the current one: we are producing some 24-25 billion liters and exporting 5 billion of them.

Our alcohol supply-demand scenario admits that the domestic market will continue being the larger destination of the production, based on a steady demand from flex-fuel vehicles, i.e., if in the next seven years, foreign demand exceeds our exportable surplus of 8-9 billion liters, there will be a need to increase the pace of investments in comparison to what we are witnessing now, or to partially supply the domestic market with higher prices for the Brazilian consumer.

Improvements in alcohol exportation logistics are taking place and should support growing volumes of international trading of this product.

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Product specification

As long as there is a specification standard for fuel alcohol that may be accepted in the international trade, this will certainly foster and increase the dynamics of its acceptance as a global commodity.

The beneficial effect of this standard specification should be more effective in the mid term, when it is expected that the world will be more open and less protectionist to the international trade of fuel alcohol.

Business agreements and future markets

The availability of a solid reference for an alcohol export agreement is essential for the dynamics of its foreign trade. Furthermore, if we want the product to become a global commodity, an exchange negotiating alcohol in future markets is needed to avoid risks associated to market prices.

The beginning of the change in the world's energy matrix is benefiting Brazil, with sugarcane alcohol. Our country can also exploit this opportunity by developing conditions for our BM&F to become an international benchmark as future alcohol trade exchange.

The alcohol agreement at BM&F is a mature agreement, resulting from negotiations that began some 10 years ago. What they miss is an initial and temporary injection of liquidity, which depends on the market players themselves, if they want to turn Brazil into a world reference for fuel alcohol. After all, our country has the longest tenure in this matter, as we have been using fuel alcohol for 30 years already.

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