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Fuel for Thought

Fernando De Mello Barreto

Paper prepared for presentation at the "Biofuels, Energy and Agriculture: Powering Towards or Away From Food Security?" conference conducted by the Crawford Fund for International Agricultural Research, Parliament House, Canberra, Australia, August 15, 2007

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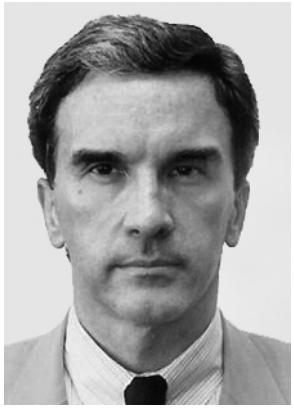

Fuel for Thought

HIS EXCELLENCY MR FERNANDO DE MELLO BARRETO

Embassy of Brazil, Canberra

Introduction

I welcome the opportunity to contribute to this conference in the place of Professor Weber Amaral[1] from Brazil who unexpectedly could not attend. Some of the information in my brief history of Brazil's ethanol program has been provided by Professor Amaral, but most of the information in this paper is from my own sources.

I will start by saying something about renewable sources of energy in general, and then I will go specifically to our vast experience, which you all know is the ethanol experience.

Renewable energy: significance and sources

Let me begin by showing you the place of renewable energy in the world, and comparing this with the position in Brazil (Fig. 1). Brazil is faring very well — perhaps better than any other country — in terms of the fraction of energy derived from renewable sources (45%, Fig. 2). Of course, not all our renewable energy is in the form of biofuel, but our ethanol experience has been particularly rewarding, and I would like to devote most of my talk today to this.

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He has had diplomatic postings in Madrid, Quito, New York, Ottawa, Geneva, and London. In Brasilia, his last job was as Chief of Staff of the Minister of Foreign Affairs. He has written *The National Treatment of Foreign Investments* (1994), *Brazilian Diplomatic History from 1912 to 1964* (2001) and *Brazilian Diplomatic History from 1964 to 1985* (2006).

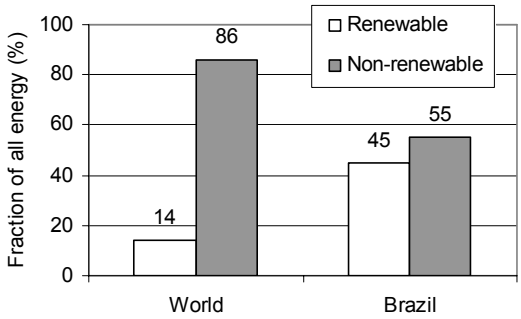

Figure 1. The place of renewable energy in the world and in Brazil

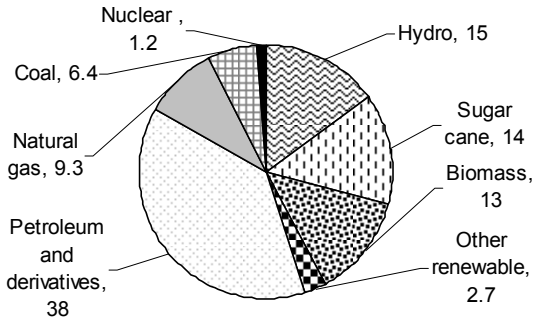

Figure 2. Sources of energy in Brazil — renewables, on the right, make up 45% of the total

A short history of the ethanol program

Brazil was hit very badly by the oil crises in 1973–1974 following the Yom Kippur War. We were not then self-sufficient in oil, although we are now. As a consequence of the great increase in the price of oil we started the ethanol program that has now been running for about 32 years, using sugarcane as the production base. In the beginning, of course, it did have incentives, mandates and subsides.

This is an edited version of the Ambassador's speech

[1]University of Sao Paulo, Piracicaba

From 1975 to 1979 the production of ethanol expanded five-fold, and the program was very popular when the second oil crisis came along. Industry was involved in the program from its inception.

In the early 1980s the government struck a deal with Brazilian manufacturers to make ethanol-only cars. There were problems in the beginning, but technology has now solved these. In the mid-1980s and 1990s, however, the price of oil dropped and so did the demand for ethanol.

The production of flex-fuel cars started in 2002–2003, and it was a great innovation. This really changed the situation in Brazil, and by 2005 over half the new cars were flex-fuel vehicles.

Incentives or subsides were progressively eliminated throughout the years, and now only one remains — a tax concession for ethanol (alcohol) cars (Fig. 3). Similar measures were taken to deregulate the fuel market (Fig. 4).

So while we started with a program heavily influenced by government, the ethanol program has really become a market-driven movement.

- ~~Alcohol price lower than gasoline price~~
- ~~Guaranteed remuneration to the producer~~
- **Tax reduction for hydrous alcohol cars** (the only incentive remaining now)
- ~~Loans for alcohol producers to increase their capacity~~
- ~~Gas stations were obligated to sell alcohol~~
- ~~Maintenance of regulatory alcohol stocks~~

Figure 3. Only one of the incentives that have been used since 1975 remains now

1990	End of maximum prices at gas stations
1991	End of maximum prices at fuel distributors
1992	
1993	
1994	
1995	End of monopoly
1996	End of consumer price controls on alcohol and gasoline
1997	Deregulation of anhydrous alcohol prices at the producer
1998	
1999 ⇩	Liberalisation of hydrated alcohol prices at the producer
2000	End of subsidies for hydrated alcohol
2001	Creation of 'CIDE' tax from 2002
2002	Complete deregulation of fuel prices
→	Prices in the whole chain of production and commercialisation are uncontrolled

Figure 4. Deregulation of the fuel market in Brazil

Fuels used in Brazilian vehicles

Diesel is the major fuel in Brazil — more than half — so there is a lot of interest in biodiesel now. Among the other components, petrol is only 25% because we have other fuels including natural gas (Fig. 5).

The scale and economics of ethanol production in Brazil

Brazil now has a massive biofuel program, predominantly based on our sugar industry — the world's largest. Figure 6 shows cane production and the fraction of the cane turned to ethanol. The latter rose to 75%, and although that fraction has now fallen the absolute quantity is always increasing (Fig. 7).

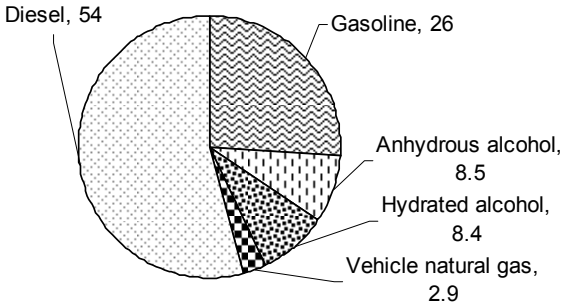

Figure 5. Fuels used in Brazilian vehicles, 2005. The vehicle fleet composition was 17 million gasoline, 2 million alcohol and 1.3 million flex-fuel vehicles.

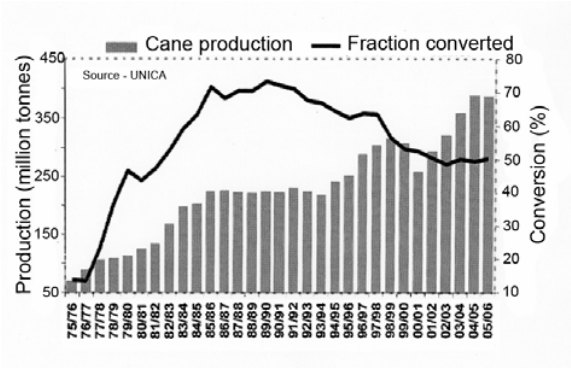

Figure 6. Sugar cane production and conversion to ethanol in Brazil. The trend is to convert a higher percentage of cane to ethanol: 58% of 575 million tonnes in 2010.

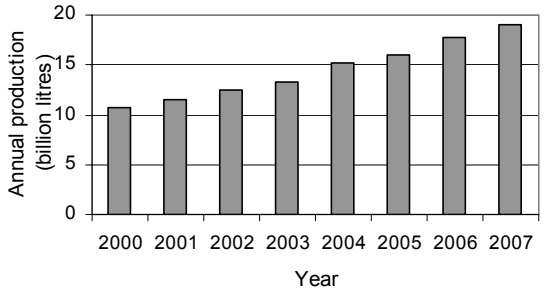

Figure 7. Ethanol production in Brazil

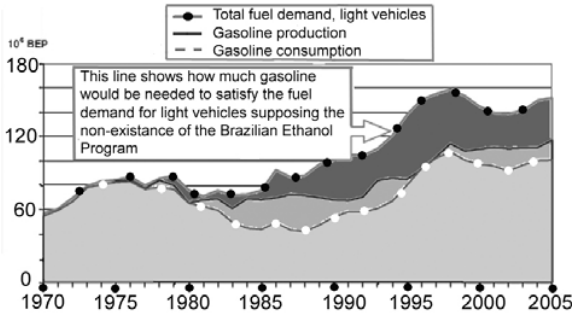

Figure 8. Sources of vehicle fuel over time, Brazil. In this period, the use of ethanol fuel in Brazil reduced the emissions CO^2 by 644 million tons.

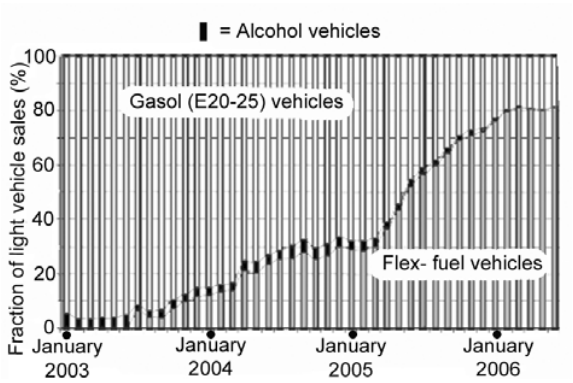

Figure 9. Only about 20% of new vehicles are now gasoline-dependent

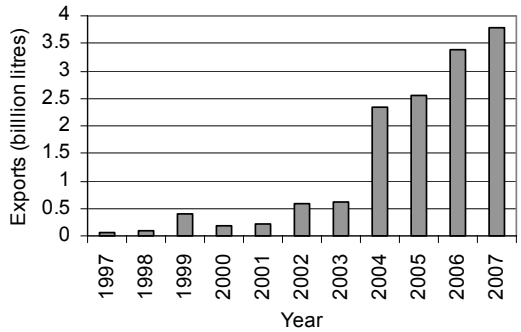

Figure 10. Brazilian exports of ethanol

Brazil is the largest producer of ethanol, with 71 billion litres in 2006. We have a low — possibly the lowest —cost of production, 29–32 cents a litre.

Over the last 30 years the ethanol program has saved 1.4 billion barrels of oil and correspondingly reduced emissions (Fig. 8).

Future production trends

Ethanol production is expected to grow at 10–13% annually to reach 22 billion litres annually. The rapidly changing capacity of the vehicle fleet to use such fuel is illustrated in Figure 9.

In the middle of the figure the data for vehicles that run on pure ethanol are shown: sales of these vehicles have practically disappeared since 2003 with the development and rapid uptake of the flex-fuel technology. At the same time sales of normal gasoline cars also have been greatly reduced.

This is a real revolution in cars because consumers themselves are able to decide at the petrol station whether at that moment they wish to buy ethanol, gasoline or a mix of both.

International trade in ethanol

Although exports of ethanol from Brazil are increasing (Fig. 10), about 85% of the ethanol we produce is for domestic consumption. Most exports probably go to the United States. President Bush, in the course of a recent visit to Brazil, expressed interest in our ethanol program and concluded agreements on cooperative research. The low price of oil over the last 30 years has discouraged international interest in our ethanol program, but that has now suddenly changed.

Industry expansion

The industry is growing in Brazil: we had about 336 industrial plants at the beginning of this year. Forecasts in 2002 predicted vigorous growth involving private investment of some $14.6 billion, resulting in one new plant each month for the next five years.

We estimate that a million and half direct jobs have been created with the ethanol industry, plus four and half million indirect jobs.

The United States and Brazil are the two largest producers of ethanol. The US uses corn; we use sugar as it is much cheaper for us. The price of corn in the US (and Mexico) has increased significantly because of the demand for grain to produce ethanol.

The areas of sugar cane production are spread all over the world (Fig. 11).

The sugar cane plantations in Brazil amazingly just take 2% of the Brazilian agricultural land. Although people criticise the Brazilian program, some experts say we could multiply our production at least eightfold without touching the Amazon forests. Our sugar cane is not grown in the Amazon region.

In Brazil, the cane-growing areas are in the northeast and the south, sites analogous to coastal Queensland. Many countries in the Caribbean, Asia and Africa could become sugar-cane ethanol producers.

World ethanol production has been increasing (Fig. 12), and Brazil is keen to see ethanol become an international commodity, like oil, without trade barriers. If a country like Japan that produces cars could rely on suppliers of ethanol other than far-away Brazil, it would be encouraged to manufacture and to use more ethanol-fuelled cars.

We would also like to promote research on technology and to stimulate investment. Brazil has been keen on such developments in the international arena for ethanol, and is working closely with the USA.

One of the members of the audience has reminded me of an interesting little anecdote. In 1788, when the first fleet came from England, all the fleets stopped first in Rio de Janeiro (because of the global pattern of winds), from where they would go to Cape Town and then to Australia. Since the very beginning we have exported from Brazil to Australia — among other products — rum made of sugar. Now, in modern times, perhaps we can again cooperate with Australia on something else to do with sugar!

Thank you very much.

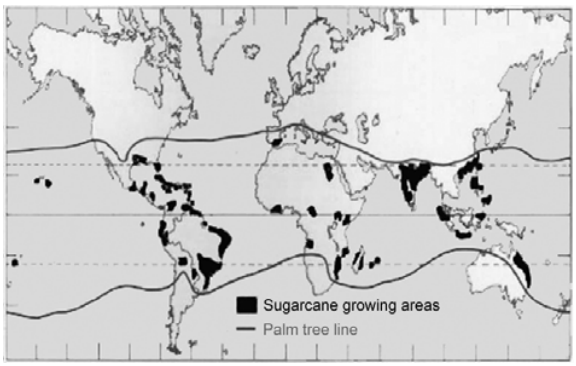

Figure 11. Sugar cane growing areas around the world

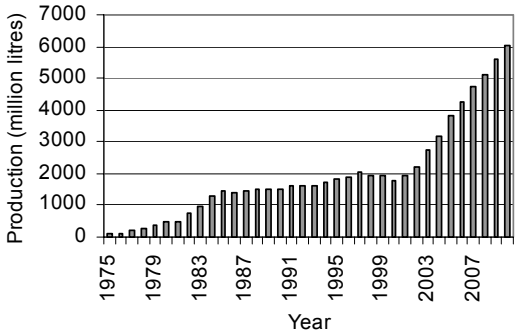

Figure 12. World production of ethanol fuel (F.O. Licht)