Business Management Dynamics
Vol.2, No.3, Sep 2012, pp.11-21

Characterization of demand for hydrous ethanol fuel in Brazil

Nilton Cesar Lima[1], Sonia Valle Walter Borges De Oliveira[2], Márcio Mattos Borges De Oliveira[3] and Jamerson Viegas Queiroz[4]

Abstract

The purpose of this study is to characterize the demand of hydrous ethanol fuel in the Brazilian market. This research seeks to present the developments, challenges and new market scenarios of hydrous ethanol. The theoretical part of the object design research, hydrated ethanol demand, seeking the understanding of the market of ethanol in its emergence in the country via Proálcool, as well as its rise and fall, the challenges and new scenarios from the flex fuel vehicle. The contextualization of ethanol fuel on the domestic market under as characterized the offer, its technologies and its main thrusters in the diffusion of the fuels market is not object of investigation. The work has as investigative methodology of exploratory and descriptive, explanatory, whose method is qualitative, in which research provides reflections and understanding from the understanding of hydrated ethanol fuel demand in the Brazilian market. the evidence considered in the study demonstrated through a qualitative analysis, which allowed demand conditions varied market mutation, since its emergence times up to the present time, that began with the economic pressures arising from the volatility of prices of oil barrels until the time the flex fuel technology redraws a new scenario in the market of hydrous ethanol.

Key words: Ethanol, Fuel, Energy, Demand, Brazil.

Available online
www.bmdynamics.com
ISSN: 2047-7031

INTRODUCTION

In recent years, there has been several news about ethanol fuel. Critics, newspapers and international agencies have been exposing and testifying the importance of an alternative fuel and economically and environmentally viable. The amount of entities that changed its structure and strategies due to the insertion of an alternative fuel and ethanol reveals that the energy industry has promising propositions about the fuel sector.

In this sense, this article is part of the following problem: *which context characterized demand for hydrated ethanol in the country?* To do this, set as general purpose characterize the demand of hydrated ethanol in the fuel market of the country. Specifically, it is expected that:

(i) Present the emergence and evolution of ethanol in Brazilian market;
(ii) Exposing the directions, implications, challenges of ethanol;
(iii) To characterize the new market scenario and hydrated ethanol demand.

This study show-if relevant, because identifying the hydrated ethanol demand, despite their level of complexity to the productive, commercial and distributive conditions, makes it possible to understand how much is an important segment in the energy sector that search for alternative solutions. Thus, to understand their current context and characterization are of utmost importance for a country's development and to the strategic decision-making process. In view of the emerging economy stage of Brazil, the trend when it seeks the development is the fortification and dynamization of the market, and this supports the magnitudes of the supply and demand for ethanol, now here seized only by demand. It is known that increasing the ethanol market was initially the volatility in the price of oil barrels, which motivated the Brazilian Government to invest in alternative fuel: ethanol, which before was called alcohol fuel. The investigative focus for this study is the hydrated ethanol, currently representative in the country's energy matrix, so it becomes necessary to highlight briefly its evolution in the domestic market whose focus will be on demand.

So this study that will be presented below is arranged from this introductory section, with the presentation of the methodology used in section 2; a contextualization of the ethanol market in section 3;

[1] *Federal University of Alagoas, Faculty of Economics, Management and Accountin. E-mail: cesarlim@yahoo.com*
[2] *University of São Paulo, Faculty of Economics, Management and Accountin. E-mail: soniavw@terra.com.br*
[3] *University of São Paulo, Faculty of Economics, Management and Accountin. E-mail: mmattos@usp.br*
[4] *Federal University of Rio Grande do Norte, Center for Technology. E-.mail: viegasqueiroz@gmail.com*

in section 4, it is an approach about the phases of ethanol, demonstrating its rise and fall in the market of fuels; in section 5, does a brief context about the new market composition; in section 6 we have a study on the flex fuel vehicles and other technologies that faced with the demand for ethanol; and a last section exposing the conclusions.

RESEARCH METHODOLOGY

The methodology for this study was performed with purpose analytical, exploratory empirical approach for pricing research focus was adopted under the characterization of hydrated ethanol demand in the Brazilian market. The methodology underpinning the achievement of the goal presented whose theoretical outline about referred to demand that enable understanding of advances or setbacks for the fuel market in the country.

The method proposed by this work is of qualitative research. According to Miles and Huberman[5] (1994 *apud* GHAURI; GRONHAUG, 1995), qualitative research is appropriate in studies of complex issues, such as human or organizational behavior, allowing the researcher to obtain much more detailed information. Similarly, Godoy (1995) points out that the qualitative method provides a wide variety of working methods, analysis and presentation of results and various considerations regarding the subject. Thus, the method chosen for this research is qualitative, with a unstructured, exploratory methodology, which offers reflections and understanding of the context of the problem. The qualitative is used for cases where you want to explore a problem and your data may be considered conclusive, but not generalizable to the target population. With respect to the type of search, it is considered that the investigative content of this survey is exploratory and descriptive type, which, according to Gil (2007), aims to deepen the knowledge about a particular issue to make it more, seeking to describe the characteristics of a phenomenon or predetermined population.

BRIEF CONTEXTUALIZATION OF THE ETHANOL MARKET

It starts with the Brazilian Government by instituting the *Programa Nacional do Álcool-Proálcool*, in view of the volatility of oil prices in the international market. At the time, President Ernesto Geisel prioritized investments directed to production of sugarcane, ethanol (alcohol) and ethanol-powered cars, including actions that oblige all petrol stations in the country to sell ethanol. This culminated in the creation of the first ethanol powered vehicle, and by reason of all fuel stations have to possess an ethanol supply pump, allowed that if as the main structure formed to its subsequent consolidation.

The *Proálcool* began with its creation on November 14, 1975, by Decree Law No. 76,593 of Federal Government, and extended until 1979. The goal was to centralize efforts in production of anhydrous ethyl alcohol Fuel (ECAA), from the sugar cane to be used in the mixture with gasoline in Otto-cycle engines, at the rate of 20%. This is due to the first international oil crisis, in 1973, when nearly quadrupled the price of a barrel of oil, US $ 2.70 to $ 11.50, a fact which has resulted in great damage to the Brazilian trade balance. On the occasion of the first shock, more than 80% of the domestic consumption of oil was imported. The author also points out that the country had spent US $ 469 million with importing oil in 1972 and expense spent for $ 2,840 million in 1974, representing 32.2% of the value of imports from the country, who, in 1973, for the same volume of oil, was 9.7%, which led to a national energy crisis. (SCANDIFFIO, 2005, p. 27-28).

Yet for Scandiffio (2005, p. 30), the emergence of the *Proálcool* not due exclusively to the first oil crisis of 1973; There was on the other side of the crisis in the national sugar exports at the end of 1974. That is, financial difficulties due to oil imports and the instability of international market price for sugar, based on the Government's determination to seek energy autonomy, boosted the release of oversaw *Proálcool*. This program represents a milestone in the evolution of ethanol in Brazilian market, which characterized the plaintiff market, and was divided into three stages: the first starts in 1975 and ending in 1979 as a result of the rise in prices of barrels of oil; the second step, from 1980 to 1990, registers the height of *Proálcool*; the third step extends from 1991 to 2003, and presents the stagnation of the program in the

[5] *MILES, M. B.; HUBERMAN, A. M. Qualitative Data Analysis: An Expanded Sourcebook. London: Sage, 1994.*

1990s, together with another attempt to reactivate the *Proálcool* in 1996, but not succeeding and ending with the deregulation of the sugar ethanol sector.

In the first step of the program, the expansion of ethanol production, according to Santos (1993), went through two major problems: the price paid to producers and the issue of fuel storage. This fact marked the expansion of alcohol at the time, and in the present research notes that this concern had as interventionist support socket solution by the Government (represented by the State – *Petrobras*), subsidizing the ethanol freight, which no longer occurs more in the industry. And with respect to the stockpiling of ethanol, there is another problem related to the *Proálcool*: neither the mill owners, nor the Institute of Sugar and alcohol-IAA, nor the National Petroleum Council (NPC) took the responsibility of storing, distributing and commercializing, until the time it was assigned to the distributors responsibility to acquire the ethanol directly from power plants, as the quotas fixed by the National Petroleum Council and transport it to the mixing centers, refineries. Namely, in that instant, the secondary base of ethanol fuel market.

The second step of the program focuses on the period from 1980 to 1990, established by Decree Law No. 83,700 Federal Government in July 5, 1979, with the production of ethyl alcohol fuel hydrated (AEHC) currently named as ethanol fuel hydrated ethylic (EEHC), to be used in the newly-released "the ethanol car"; It was Otto cycle engine cars that have been modified to receive 100% hydrated ethanol. The challenge in the second step was to win, according to the author, the adherence to the program for the auto industry, and this challenge was overcome in part by war between Iran versus Iraq, which in September 1980, cut 50 percent of Brazil's oil daily imports, which boosted the sale of cars moved by ethanol or ethanol. (MELO and FONSECA, 1981, p. 58).

THE RISE AND FALL OF ETHANOL IN BRAZILIAN MARKET

In continuity with the challenges of the second stage of the program, it has to be the first ethanol-powered vehicles were produced at a fast pace, but had problems to start its operation at low temperatures. This new type of vehicle only on hydrous ethanol demanded the development of a new engine, with a higher compression rate than the gasoline-powered engine, and also required the development of new corrosion-resistant materials, applied to pieces of various vehicles. It is emphasized that, at the beginning of the *Proálcool* ethanol produced from sugar cane was presented as a viable alternative compared to the use of gasoline, even in times when the gasoline engines had to be converted into ethanol-powered engines because the manufacturers had not yet begun to produce ethanol-powered vehicles on a large scale. According to Santos (1993, p. 34), trade in ethanol-powered vehicles, which was 0.4% in 1979, was for 25% of the total sales in 1980, and this trajectory was increasing until 1986.

The incentives were pursuing. According to Moraes (2000, p. 42), it fell to the Government stimulate the demand of hydrated ethanol powered cars, as automakers awaiting endorsement of consumers to start their series manufacturing. Settled, initially, the price of ethanol to a ratio of 65% of the gasoline, longer term financing for the purchase of cars on ethanol, and opening of supplies for ethanol cars throughout the weekend, which was not the case for gasoline.

According to Scandiffio (2005, p. 39), the program that included the use of fuel AEHC presented its peak around 1989, when it reached 37.8% of the Brazilian fleet of cars and light commercial vehicles. To the author, that year of 1989, the hydrated ethanol consumption was 10.8 billion liters.

According to Anfavea (2010b), the production of ethanol cars, which had its beginning with 4,614 units in 1979, jumped to 254,001 in 1980. And in 1985 reached 697,731 units, coming to represent 66.4% of the total production of national vehicles, but in the year 2002 fell around 56 thousand, about 10% of the total production. In parallel to this analysis, Teixeira (2005) points out that sales of ethanol-powered cars began to occur in 1981, and in 1985 and 1986, production reached 90% of all new vehicles sold in the country, given the credibility of the consumer for the ethanol-powered engine technology and the low price of fuel paid on resale.

However, Santos (1993, p. 57) highlights that the year 1985 represented a milestone in that started the decline of the expansion phase of the *Proálcool*. To the author, the decline of the program was actually caused by a deficiency in planning, which led to a misfit between supply of renewable fuel and production of ethanol-powered cars, which, in turn, on demand. i.e. hydrated ethanol demand grew

regularly, but the production (supply) stopped growing from 1985. This was due to the fact that fuel prices begin to fall because of the fall in the price of a barrel of oil, since the price of ethanol could not be higher than 65% of the price of gasoline. In this way, the decrease in the price of oil – from 1986 – reflected directly in the price of gasoline, which served as a reference to the price of hydrated ethanol, reducing the competitiveness of renewable fuel, and the demand for ethanol-powered vehicles, adding to the fact that it is a technology that still had difficulty in cold starting, which made the vehicle more efficient compared to gasoline. *Petrobras* also contributed to the decline of the program, because, although the State control via distribution of fuel ethanol had served the interests of *Petrobras*, from 1986, this control has excessively high costs, since the fleet of ethanol in the country had increased, that is, the subsidies given to freight, therefore, the costs were borne by *Petrobras* – responsible for distributing ethanol fuel at the time.

Among other factors that contributed to the fall of ethanol production and demand in the Brazilian market, Castro et al (1994, p. 33) point out that the freezing of prices of sale to the consumer for five months in 1985, as a result of anti-inflationary measures, was different from the purchase price to the producer. This was determined independently by the Institute of Sugar and alcohol (IAA), according to production costs. To the author, the effect of all of these factors was that, after 1986, the participation of this type of vehicle in the domestic market gradually reduced in relation to the production of ethanol. Such a fact worsened at the moment that prices in the international market of sugar have become attractive and drove the plants to increase sugar production for export, thus weakening the domestic production of ethanol. This marked a scenario whose demand for ethanol fuel, stimulated by the increase in the fleet of cars running on this fuel type, not accompanied the ethanol supply which constitute.

According to Anfavea (2010a), the resulting lack of product in ethanol-producing plants destroyed the positive image generated by alternative fuel, causing a sharp drop in demand. As a result, the production of ethanol-powered vehicles suffered a 13% reduction in the country. The subsidies were also reduced and the hydrated ethanol lost competitiveness before the gasoline. Consequently, Teixeira (2005, p. 14), reveals that sales of ethanol-powered vehicles have fallen to 4% in 1994 and 0.56% of the total cars sold in 1996. These factors contributed to the decline of *Proálcool*, which, coupled with technical problems characteristic of innovative processes, performance ethanol engines made as inferior to gasoline, resulting in the decrease of its demand, caused by problems like: weaker engines than traditional engines, lower efficiency, difficulties with cold starters, corrosion problems etc. Your aggravating still was due to the value that the vehicle lost on the secondary market (used vehicles). I.e. ethanol vehicles had gradually lost its value on the secondary market, cost less compared to gasoline powered vehicle, and, given this situation, they virtually disappeared from assembly lines.

Scandiffio (2005, p. 45) points out that the effect of the fall in demand for ethanol results from the fact that the context of this market was in its phase of decline, this because about 28 freestanding distilleries, financed by the *Proálcool*, would have terminated their activities in 1989/90. In line with the crisis, the author points out that, in 1989, there were strikes and boycotts of the sugarcane workers and independent suppliers of sugar cane, including threat of the producers themselves to stop the production of ethanol, as well as allegations of illegal marketing of ethanol. As a consequence, the third step of the *Proálcool*, comprising the Decade of 1990 by the year 2003. Understood as the stagnation phase of the program. The author also notes that the landmark during this period starts soon in the first years of Government of Fernando Collor de Mello, to adhere to the neoliberal postulates consolidated in the Washington consensus – whose 10 guidelines converge to two basic objectives: drastic reduction of the role of the State in the economy, and openness to imports of goods and services and the entry of risk capital in the country. These changes resulted in a greater internationalization of production and Finance of the Brazilian economy, which were also supported by the Federal Constitution of 1988. Is when the deregulation in the sugar ethanol sector, i.e. it was within a context of economic liberalization to which the country has acceded. Fits contextualize the findings outlined by Santos and Burity (2002, p. 29), say that opening the market promoted by President Fernando Collor de Mello, through liberalization of imports of vehicles, forced the industry to seek higher quality and productivity levels. This subsequently led to the automobile sector companies systemizes to employ flex fuel technology.

The third phase of the *Proálcool* demarcates the end of the program. One of the first measures was to extinction, in 1990, of the Institute of alcohol and sugar-IAA, which had been created in 1933, by means of Decree Law No. 22,789, under the regime of President Vargas, had a strong presence in the control over the production, prices, destination of sugar, in addition to defend that ethanol should be made autonomous distilleries located in regions not beet because it feared (IAA) that a deviation in the raw material harm sugar manufacturing, thus losing space in the international market (VARGAS, 1979, p. 77).
According to Moraes (2000, p. 59), IAA assignments were transferred to the Regional Development Secretariat of the Presidency of the Republic, until, in 1991, was created the National Advisory Committee of sugar and alcohol, with the participation of the following sectors: Ministry of economy, agriculture and infrastructure, science and technology departments and Strategic Affairs of the Presidency of the Republic representatives of private industry, ethanol and sugar cane vendors and sugar sector workers. That is, the sugar ethanol sector chancellor his deregulation through this Consultative Commission, which ended the public monopoly on marketing of fuel ethanol, whose domain was both the supply side (fixing quotas and prices), as demand, controlling the export, the internal market, stocks etc., sugar and ethanol, which were made for about sixty years through IAA.

NEW MARKET COMPOSITION OF ETHANOL

Given the deregulation, the ethanol market has gone to seek overseas demand. In this regard, Moraes (2000, p. 61) highlights the emergence, in January 1999, in the Center-South region of Brazil Alcohol S/A, whose main function was to commercialize ethanol production on the domestic market and also perform the export of fuel ethanol, once the industry generated around 1.2 billion gallons of surpluses.
Moraes (2000, p. 62-64), in the midst of all this scenery comprised in the third step, the sugar ethanol sector, after deregulation, brought a concern regarding the control of ethanol prices in the domestic market, especially from the 1998-99 crop, since the Federal Government had failed to fix prices of anhydrous and hydrated ethanol, sugar and, due to deregulation.
Arises, therefore, a new model of the relationship between the producers of sugar cane, sugar mills in the sugar ethanol sector, refineries and distributors, in which prevailed at the time the rules of the free market that has lasted until today. This new marketing model admits that the price for sugar cane (planters) paid to producers to be fixed from two variables: the amount of Total Recoverable Sugar (ATR) and the prices of derivatives (anhydrous and hydrated ethanol) in P.V.U condition (Post Vehicle Plant) in the State of São Paulo, for the internal and external markets. I.e., buy and sell ATR ATR modified, in the form of sugar and ethanol; in the case of P.V.U., a company hires a carrier distributor of ethanol to remove the product at the plant that you sold. This model is managed by the Council of the sugar cane Producers, Sugar and Alcohol do Estado de São Paulo (Consecana), established since 1997, and formed by members of the Union of the sugarcane agro industry in the State of São Paulo, UNICA (representing the business sector), and the Organization of cane Planters sugar do Estado de São Paulo (Orplana), representing producers. Thus, trade liberalization, in 1990, deregulating the sugar ethanol sector, generated several changes in the public and private sphere, among which are exports of sugar and ethanol, which were privatized, the end of sugar production quotas and the release price of ethanol. And, according to Moraes (2000, p. 64-69), the compensatory measure for the plants in this third step, in order to suppress reductions in demand for ethanol, was with the scroll of your debts in favorable conditions, plus some tax advantages for the automobile industry in selling cars on ethanol, as the IPI differentiated.
It is emphasized that, with the process of deregulation, commercialization not obeyed more crop plans, but the availability of scheduled among producers, ethanol already did not count more with the mechanisms of complementation of prices. Under this aspect, the monthly availability of ethanol have been provided by power stations, and the National Union of Fuel distribution companies and Lube – *Sindicom*, who was responsible for exposing the volume of demand that was divided between the availability of each producer to meet trading. To the author, the availability to meet requests of distributors was calculated considering the speed of production of each unit in the course of the crop.
Currently, the hydrated ethanol for fuel purposes is acquired by the distributors and directed to retail stations located in all regions of the country (totaling about 37 000 jobs in the year 2010). The *Sindicom*, in the year 2010, was attended by 202 distributors, out of a total of 508 currently existing in the national

market, being also responsible for 60% of the ethanol supply among the 37 thousand fuel stations in the country.

Identified the contextualization of fuel ethanol in Brazilian market, it is now characterize his greatness in the current sugar-energy tracking. According to Nair et al (2009, p. 15-21), "the agro-industrial system, which includes encouraging the ethanol productive chain, has a more than $ 80 billion per year." Based on this figure, the authors argue that the energy has a feature to supply products in a sustainable manner, with cleaner energy and used by vehicles which move to ethanol. And it is estimated that of the total fuel consumed in Brazil by lightweight passenger cars in 2015, 80% will already be ethanol. Still, among the data pointed to by the authors, is the gross domestic product-GDP in the sugar ethanol sector, which was $ 28,153 .10 million, equivalent to 1.5% of the national GDP. More data can be seen in table 1, which shows the potential productive with taxes, and no estimated on sales taxes (ICMS, IPI, PIS and COFINS). You can see that ethanol is the main product in the energy chain, accounting for approximately 60% of the total.

Insert table 1 here

Nair *et al* (2009, p. 03-05) showed that, in the year 2008, the commercialization of ethanol generated a turnover in US $ 12,417 .36 million (including sales to external and internal market); in fuel distributors was $ 8,624 .05 million and in the sale was $ 10,346 .70 million. According to the authors, the turnover in those respective segments has been higher than the marketing of sugar, which generated a financial move in $ 9,765 .08 million (external and internal market). However, even if it is favorable to ethanol producers for sale, it is necessary to evaluate the profitability and scenarios relevant to the moment, as for example: poor harvests of sugar production abroad and foreign exchange volatility. And according to the authors, in that it is the responsibility of the contracts for the sale of bioelectricity, generated from sugarcane bagasse negotiated in 2008, the sector generated an annual turnover of $ 389,63 million, and this has been a byproduct that adds value to the producer in profitable levels, assuming also be higher if the manufacturer chose to reuse the bagasse for ethanol production (6lignocelluloses ethanol). In addition, point out that, in addition to the ethanol fuel be representative in volume of domestic sales in the year 2008, were consumed 14.08 billion liters of ethanol hydrated. The main reason for this growth was the introduction of cars with flex fuel engines, which in 2008 accounted for 90% of production of light commercial vehicles in Brazil.

FLEX FUEL VEHICLE AND NEW TECHNOLOGICAL CHALLENGES IN DEMAND FOR ETHANOL

According to Anfavea (2010b), flex fuel technology gained acceptance by the consumer from 2003, whose sales in 2009 accounted for 92% of all marketed in light vehicles fleet. These data make it possible to detect the consolidation in the domestic market of flex fuel vehicles that spurred the demand for ethanol. The Association reveals that the automotive industry has already registered the mark of 10 million of flex cars produced in the country since 2003, when the technology has arrived. With this, the ethanol-powered vehicles, gasoline or a mixture of both fuels obtained in 2009 40% of participation in all existing national fleet of light vehicles of the Otto cycle (moved to gasoline, ethanol and flex vehicles). Among this scenario, it is also important to highlight, according to Nair et al (2009), that the internal market has a turnover of anhydrous ethanol in the order of US $ 2,972 .89 million with the sale of 6.48 billion liters in 2008. Consumption in Brazil is intended to blend with gasoline, currently at a ratio of 25%. For a country that sold in 2009 26 billion liters of hydrated ethanol, according to ANP (2010), this addition by anhydrous ethanol is significant for the fuel sector, which is faced with a market comprising a number of vehicles powered by ethanol and flex around 15 million.

The demand for fuel, such as pointed out by EPE (2009, p. 06), presented his projection for hydrated ethanol, for the period 2008 to 2017, in order of 53.2 billion liters only on the national market. This estimate is conditioned by the success in sales of vehicles flex, having reached 2.6 million units in 2009. According to studies of EPE (2009, p. 07-08), for the year 2017 projects a number of 37.1 million fleet of light vehicles. It is estimated that the production in the automotive industry is 95% flex vehicles, since their ancestry reveals that, from 2003, the participation of this category on domestic sales has increased exponentially, going from 3% in 2003, to 22% in 2004, 53% in 2005, 82% in 2006 and 91.3% in 2007. Permitted the consolidation trend in this category in the automotive market, whereas only imported cars

and top of the line are dedicated to gasoline vehicles, something around 5% of sales, 95% remain, therefore, flex fuel mode. That is, there will be no sale of the ethanol-powered cars only in the projection of this scenario for the year 2017. Under this aspect, the profile of the fleet by fuel from the years 2008 to 2017 demonstrates the dominance by flex vehicles, as can be seen in table 2:

Insert table 2 here

Once estimated fleet to 37.1 million light vehicles, it is understood that 73.6% of this amount will be flex vehicles traveling all over the country, offering to the final consumer at the time of decision-making autonomy by which supply fuel supply. It is estimated that 75.51% of the energy consumed by light vehicles were met by ethanol flex fuel hydrated in the year 2007, this percentage was obtained on the basis of historical data of gasoline consumption C, informed by the ANP, and the production of ethanol (MAPAA, 2010, p. 18).

Comparing the total demand of ethanol (fuel, export and other uses) estimated by EPE (2009, p. 40), with production of MAPA projections and UNICA between a period of 2007 to 2017, it is possible to note that projections of supply respectively are between 55 and 54 billion liters, short of estimated demand by EPE, which is in its entirety in order of 64 billion gallons for the year 2017long-term, signaling the need for an expansion of industrial capacity, and certainly his pet peeve is in prices, given that the demand is greater than supply. Already in the short term, the studies of EPE (2009, p. 40) show that there are differences between demand and supply in the reporting period, as shown in the Graph 1 below.

Insert figure 1 here

Despite the difference of total ethanol demand being less than 2% of total production in the year 2009, this can be addressed by changes in targeting the use of sugar cane for the production of sugar, as the specific demand of each market.

According to the EPE (2009, p. 40-41), ethanol has also served as raw material for the petrochemical industry in Brazil for the production of ethylene and, thus, of petrochemical products (such as thermoplastic resins). However, it is a raw material that can determine whether the use will be from the nafta or so from the chemical route, in the acquisition of ethanol, once that directly competes with oil prices.

According to Bosco (2008, p. 21), the provision of nafta will grow, but not in a satisfactory way to meet the demand for the production of thermoplastic resins. However, with the subsequent increase in the price of oil and the search for new environmentally sustainable raw materials, comes the motivation of some petrochemical companies for the use of ethanol as a raw material.

On the basis of studies established by EPE (2009), it is estimated that the demand for ethanol for the production of polymers in chemical industry in Brazil will be around 500 million liters in 2010, and there are projections according to EPE (2009, p. 22) of 1.95 billion liters in the period between 2011 and 2017. This type of market is known as non-oil energy, which recently has the ethanol as a replacement raw material of nafta. Non-energy products are used for purposes other than the propellant fuel. It is worth mentioning, as studies of the MAPA (2005), which the prospects for growth in domestic demand for ethanol raise on behalf of the expansion of flex vehicles, apparently there will be no problems in relation to the distribution of the fuel. This is due to the fact that the largest consumer market in the fuel is located in the Center-South region of the country, where are situated the vast majority of ethanol-producing units and new projects in deployment. It is to emphasize the possibility of another alternative use for ethanol production farnesene, know that this technology allows you to get the diesel from sugar cane. Assuming that the internal consumption of diesel was 44.3 billion liters in 2009, and what in the world is around 1.25 trillion liters per year, according to ANP (2010), it is estimated that there is a scenario even more promising provided for the raw sugar cane.

Faced with the prospect of increased productivity and reduced costs of production through technological and productive gains, the scale of EPE (2009) studies point out that the price of ethanol to the consumer should stay in the heights performed today. However, it is important to note that a variability around the current level of price can occur in function of the annual seasonality of the product, given the disparity between supply and demand for the year 2009 is 2%. This allows you to understand that, in periods of harvest: greater supply and lower prices; already during the off-season: lower supply and higher prices.

In studies on the projection of demand for ethanol fuel in the country, associated with the growing increase of Brazilian flex fuel fleet, it is estimated that in this market, the ethanol fuel will require about 55 billion liters until 2020, unless imbalance in the price of ethanol versus gasoline prices; There is also the potential demand for this fuel ethanol in the external market of 39 billion liters, on behalf of legislation that requires the addition of ethanol to gasoline (some countries, following the example of the United States may have access to import, if new production routes do not materialize). (MARQUES, 2010, p. 04).
In relation to the demand for ethanol as a raw material for the chemical in the manufacture of ethylene among others, Marques (2010, p. 73) claims that "there is a potential market reach a demand of about 7 billion gallons, in addition to the need for sugar, which will demand 40 million 8ones for the period projected." According to the author, when considering that Brazil an account for about 2.8% in the ranking of the world's production of ethylene, it becomes clear how much is significant potential demand for raw sugar cane.

CONCLUSIONS

With respect to considerations brought in this work, note that the automobile sector, after the third step of the *Proálcool*, responded with a drop in sales of cars moved by ethanol. However, it was from 2003 which emerged a new scenario to ethanol market with the introduction of a new technology to Otto cycle engines, the flexible engine, which, from a single feeder, accepts both gasoline and ethanol fuel hydrated, making a new ethanol fuel demand scenario. It is recognized that the development in other fields, for example, hybrids or hydrogen vehicles, will directly affect the demand for ethanol-powered vehicle. However, this shows that ethanol has played an important role, given the structural circumstances formed from the *Proálcool* until today established technologies in automotive industries (flex fuel), especially regarding its distribution channel, to allow each post had a fuel supply pump, ethanol and, of course, also considering its environmental aspect, since it is enshrined as clean energy.
Another aspect that emerges from this research relates to the increased consumption of hydrated ethanol to gasoline with anhydrous ethanol (C), this is due to the increase of flex fuel cars. In this context, consideration should be given to the efforts that the plants/distilleries, including the cane suppliers, machinery, equipment and supplies, had to accomplish to adapt to a new market environment, whose use of sugarcane as feedstock for the production of ethanol, anhydrous or hydrated went on to demonstrate its resumption in growth of demand in the domestic market. However, the existing infrastructure in the country in terms of producers, ethanol collectors' centers, warehouses, databases, distribution, retail jobs and means of transport must be coordinated with the fuel ethanol supply capacity, between the various actors in the chain, depending on future demand survey. On the other hand, there is the prospect of increased productivity of ethanol, and this will depend on the expectations of the sugar ethanol sector, such as those related to the international price of sugar and ethanol prices in the internal market, international ethanol market Outlook, alternative uses, in addition to the flex fuel in the Brazilian market. Due to this, the studies do not accurately predict the increase in productivity of hydrous ethanol demand front signaled for the future, because of seasonal effects, price of sugar and of alternative uses that sugar cane has provided currently, considering that the own ethanol fuel itself already has two types of uses, the anhydrous and hydrated ethanol. For this reason, to meet internal and external markets, the ability to cause a temporary shortage situation and, consequently, an increase in the price of ethanol due to a possible increase in demand. The success of flex and the alternative uses (ethene to make plastics; and farnesene used to produce diesel), promote a scenario of high demand for raw sugar cane, offering to industry challenges of productivity and agricultural expansion as alternatives to overcome competitive by hydrous ethanol.
Note therefore that the ethanol fuel market has been consolidated from incentives promoted by *Proálcool*, and only from the flex technology plus the technology in alternative uses (for example, ethene and farnesene), which was redesigned a promising demand for sugar cane. Both technologies have designed now a promising horizon, but, so far, is the green fleet of light vehicles in the country (flex) that awakens as the main competitive splitter in use of the main raw material, sugar cane, at the time of forming hydrated ethanol market prices. In addition, it was observed that the automotive industries, with flex fuel technology, provided the elevation of the demand for ethanol fuel hydrated since this present relative

advantage the prices paid for gasoline c. This flexibility in the choice of fuel and the existence of uncertainty with respect to the price of gasoline and ethanol add value to car, because the consumer can choose the cheapest fuel every time that fuel the vehicle. However, until the vehicle fleet will provide this autonomy to regulate the market by forces of power of decision to the final consumer, the price swings tend to occur among the regions of the country. Hydrated ethanol market currently has its total production marketed around 26 billion liters, this volume reveals that from its emergence with the *Proálcool* the main legacy for this sector is its ability to modify other parallel major economies such as the automobile industry, chemical industry, power plants and distilleries and including producers, however all this cluster is not coordinated in their range in order to grant the full attendance projections that one has on demand, this being a prospect for new scientific research.

REFERENCES

ANFAVEA - Associação Nacional dos Fabricantes de Veículos Automotores. 2010a. Disponível em: <http://www.anfavea.com.br>. Acesso em: 12/06/2010.

ANFAVEA - Associação Nacional dos Fabricantes de Veículos Automotores. Anuário da indústria automobilística brasileira 2010b. Disponível em: <http://www.anfavea.com.br>. Acesso em: 24/05/2010.

ANP - Agência Nacional de Petróleo. 2010. Disponível em: <htpp://www.anp.gov.br>. Acesso em: 10/06/2010.

BOSCO, F. Tecnologia verde e amarela. Petro & Química, São Paulo, n. 307, 2008. Disponível em: <http://www.editoravalete.com.br/site_petroquimica/edicoes/ed_304/304.html>. Acesso em: 12/06/2010.

CASTRO, A. C.; KOSTER, C. H.; FRANIECK, E. K. Flexible Ethanol Otto Engine Management System. In III Congresso e Exposição Internacionais de Tecnologia da Mobilidade, SAE Brasil, São Paulo, 1994.

EPE - EMPRESA DE PESQUISA ENERGÉTICA. Balanço Energético Nacional 2009. Ano base 2008: Resultados Preliminares. Rio de Janeiro, 2009. Disponível em: <https://ben.epe.gov.br/downloads/Resultados_Pre_BEN_2009.pdf>. Acesso em: 12/08/2009.

FARINA, E. et al. Mercado e concorrência do etanol. Etanol e Bioeletricidade A cana-de-açúcar no futuro da matriz energética. Coordenação e organização Eduardo L. Leão de Souza e Isaias de Carvalho Macedo. UNICA – União da Indústria de Cana-de-açúcar. São Paulo-SP, 2010.

GHAURI, P. N.; GRONHAUG, K. Research methods in business studies: practical guide. New York: Prentice Hall, 1995.

GIL, A. C. Como elaborar projetos de pesquisa. 4. ed. São Paulo: Atlas, 2007.

GODOY, A. S. Introdução à pesquisa qualitativa e suas possibilidades. Revista de Administração de Empresas – RAE. São Paulo, v. 35, n. 2, p. 57-63, mar.-abr. 1995.

MAPA – Ministério da Agricultura, Pecuária e Abastecimento. Plano Nacional de Agroenergia 2006-2011. Brasília-DF, 2005.

MAPA - Ministério da Agricultura, Pecuária e Abastecimento. 2010. Disponível em: <http://www.agricultura.gov.br/>. Acesso em: 04/08/2010.

MARQUES, J. J. O "plástico verde" e o mercado brasileiro de etanol. São Paulo, 2010. Dissertação (Mestrado em Administração) – Programa de Pós-Graduação em Administração, Faculdade de Economia, Administração e Contabilidade da Universidade de São Paulo.

MARJOTTA-MAISTRO, M. C. Ajustes nos Mercados de Álcool e Gasolina no Processo de Desregulamentação. Piracicaba, 2002. Tese (Doutorado em Economia Aplicada) – Escola Superior de Agricultura Luiz de Queiroz da Universidade de São Paulo.

MELO, F. H. de; FONSECA, E. G. da. Proálcool, Energia e Transportes - Pioneira, FIPE, São Paulo, 1981.

MORAES, M. A. F. D. de. A Desregulamentação do Setor Sucroenergético do Brasil. Americana-SP: Caminho Editorial, 2000.

NEVES, M. F.; TROMBIN, V. G.; CONSOLI, M. A. Mapeamento e quantificação do setor sucroenergético. 2009. MARKESTRAT - Centro de Pesquisa e Projetos em Marketing e Estratégia . Disponível em: <http://www.favaneves.org/>. Acesso em: 02/06/2010.

SANTOS, A. M. M. M.; BURITY, P. BNDES: 50 anos – Histórias Setoriais: O Complexo Automotivo. 2002. Disponível em: <htpp://www.bndes.gov.br>. Acesso em: 14/06/2010.
SANTOS, M. H. de C. Política e Políticas de uma energia alternativa: o caso do Proálcool. Rio de Janeiro: Notrya, 1993.
SCANDIFFIO, M. I. G. Análise prospectiva do álcool combustível no Brasil – cenários de 2004 a 2024. Campinas, 2005. Tese (Doutorado em Planejamento de Sistemas Energéticos) - Faculdade de Engenharia Mecânica da Universidade Estadual de Campinas.
SZMRECSÁNYI, T. O Planejamento da Agroindústria Canavieira do Brasil (1930-1975). Universidade Estadual de Campinas. São Paulo: Hucitec, 1979.
TEIXEIRA, E. C. O desenvolvimento da tecnologia flex fuel no Brasil. Instituto DNA Brasil. 2005.

Table 1 – Estimative of the gross domestic product in the sugar ethanol sector on the basis of final products (2008).

Product		**Internal Market** USD (millions)		**External Market** USD (millions)	**Total (MI + ME)** USD (millions)	
		With taxes	Without taxes	Free from taxes	With taxes	Without taxes
Ethanol	Hidrated	11.114,50[a]	9.105,10	23,78	11.138,28	9.128,88
	Anidre	2.972,89b	2.250,88	2.366,33	5.339,22	4.617,21
	Non-energetic	438,78c	351,57	n.d.	438,78	351,57
Sugar		5.297,14d	4.455,83	5.482,96	10.780,10	9.938,79
Bioeletricity		389,63e	242,87	n.d.	389,63	242,87
Yeast and Additive		21,41	19,43	42,20	63,61	61,63
Carbon Credits		n.d.	n.d.	3,48	3,48	3,48
Total		**20.234,35**	**16.425,68**	**7.918,75**	**28.153,10**	**24.344,43**

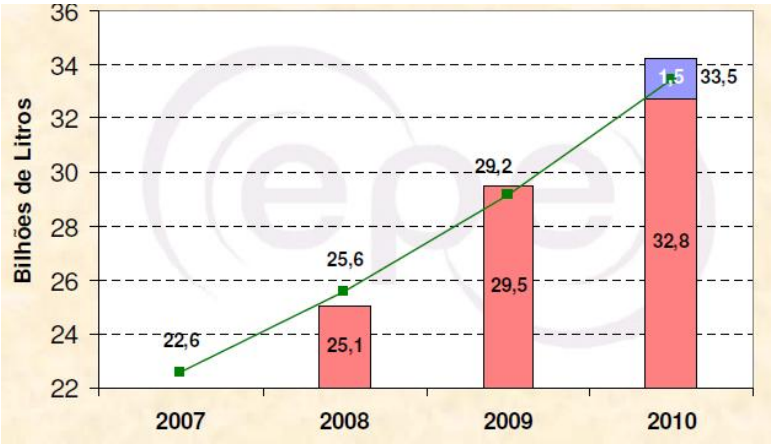
a-the sale of the stations considering the formal and informal markets.
b-sale of power plants to the distribution considering the formal and informal markets.
c-sum of sales of sugar plants for industry and retail sales.
d-sum of sales of sugar plants for industry and retail sales-sale of power plants and in the auctions of energy.
Font: Neves *et al* (2009, p. 02).

Table 2 – Fleet's Profile (light vehicles) by kind of fuel (2008 x 2017).

Discrimination	**2008**	**2017**
Gasoline	63,4%	24,8%
Ethanol	7,0%	1,6%
Flex fuel	29,6%	73,6%

Font: EPE (2009, p. 08).

Figure 1 – Total demand projections and ethanol production industrial capacity.



Projection EPE of ethanol production by the plants in Study.
Projection EPE of ethanol production by the plants (operating +implantation)
EPE total ethanol demand

Font: EPE (2009, p. 40).