



A review of Brazilian biodiesel experiences



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ABSTRACT

This article investigates the history of proposals to use vegetable oils as fuel in Brazil beginning in the 1920s up to the current National Program for Biodiesel Production and Use – PNPB. The characteristics of vegetable oils markets and of the oil products market, as well as the incentive mechanisms formulated for biodiesel implementation, are analyzed. Although the research focuses on the Brazilian experience, initiatives of biodiesel insertion, or those already implemented in countries with significant oilseeds production are also studied. The results allow concluding that attempts to make biodiesel production viable confront several barriers. Comparative analysis revealed that vegetable oil world prices tend to be higher than the equivalent fossil oils. In Brazil, the initiative in the 1970s lacked political alliances to overcome the difficulties imposed by market conditions such as those that benefited the National Alcohol Program – Proalcool. In the resumption of the 2000s with PNPB, despite intense articulation and institutional incentives, arising from the limited scale of production of the feedstock from incentived family farming and from the nature of markets of vegetable oils, as food or fuel, and of fossil oils, especially regarding the respective regulating prices. The incentives provided by the PNPB seem insufficient for vegetable oils to prefer the energy market instead of benefiting from higher surplus in alternative food markets.

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Abbreviations: PNPB, National Program for Biodiesel Production and Use; Proalcool, National Alcohol Program; Proóleo, Production of Vegetable Oils for Energy Purposes; IAA, Sugar and Alcohol Institute; INT, National Institute of Technology; MIC, Ministry of Industry and Trade; ANFAVEA, National Association of Automakers; IPT, Institute for Technological Research; IPT, Institute for Technological Research; CIDE, Contribution for Intervention in the Economic Domain on Fuel; CEPLAC, Executive Committee of the Cocoa Farming Plan; MCT, Ministry of Science and Technology; GTI, Inter-Ministry Working Group; PIS/Pasep, Program of Social Integration/Program of Patrimony Formation of Public Servants; COFINS, Contribution to the Social Security Funding; MDA, Ministry of Agrarian Development; ANP, National Agency of Petroleum, Natural gas and Biofuels; Refap, Alberto Pasqualini Refinery; ICMS, Tax on Operations related to the Movement and Provision of Interstate and Inter-municipal Transport and Communication Services; P BIO, Petrobras Biofuels, Embrapa Brazilian Corporation of Agricultural Research; RFS, Renewable Fuel Standard

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1. Introduction

Biofuels have been gradually introduced into the fuels market due to high price or reduced supply of crude oil. During the 1990s the biofuels were inserted due to environmental concerns on climate change caused by increased greenhouse gas emissions mainly from fossil fuels. So in the United States the “Clean Air Act Amendments”, the Reformulated Gasoline Program “RFG Program” and the “Energy Policy Act” (EPACT) encouraged the use of alternative fuels. In the European Union the biofuels insertion was stimulated since the Common Agricultural Policy – CAP.

In the 2000s the blending mandates with biofuels proliferated as a global strategy to increase income and provide food security for farmers and rural workers in several Latin American countries (IFPRI, 2007): Argentina (Law 26.093/2006); Chile (Decree 11/2008); Ecuador (Decree 2332/2004); Peru (Law 28054/2003); Uruguay (Law 18.195/2007); Costa Rica (Decree 31087/2003); Guatemala (Decree 52/2003) and Colombia (Program of Biogasoline – Law 693/2001, Program of Biodiesel – Law 939/2004). Paraguay started the alcohol program in 1999 (Decree No. 2162/1999) and in 2005 the production of biofuels was considered of national interest (Law 2748/2005).

Biofuels have also acted as buffers in the agricultural commodities market. In Brazil, alcohol fuel production began in 1920 to regulate the production of sugar and reduce imports of gasoline. The sugarcane quotas intended for the production of anhydrous alcohol were variable according to the international sugar market circumstances. After National Alcohol Program – Proálcool, fuel alcohol began to be used in hydrated form and incentives were geared to enable the production not only in the sugar market, but also in the oil products market.

In Brazil, the idea of what is now known as biodiesel was introduced after World War I when a survey was conducted on the supply of vegetable oils and proposals were made for their use as fuel. In the 1940s during World War II, there were attempts to produce biodiesel through tests with pure and blended oils with alcohol. In the late 1970s amid the second oil shock, Production of Vegetable Oils for Energy Purposes -Proóleo was created, but it was never fully implemented and failed as opposed to other parallel initiatives, such as successful Proalcohol.

In 2004, a new proposal for the production of biofuel was introduced through the National Program for Biodiesel Production and Use – PNPB. Despite the incentives proposed in the program, biodiesel production has not been consistent. The main guiding principle of the program was social inclusion and regional development through policy incentives for the production of biodiesel from oilseeds derived from family farming. However, soybean and cattle tallow, which are Brazilian agribusiness byproducts, are the main feedstock used in the production of biofuels.

Some authors analyzed the development of PNPB and the availability of raw materials. Cremones et al. [97] detailed the current status of the program with emphasis on raw materials used and the prospects of use such as bikerosene and aviation biofuel. Bergmann et al. [98] analyzed the feedstock for biodiesel production including the soybeans but mainly the alternatives feedstock. It also provided a short review on the deployment of biodiesel in Brazil. The relationship among agricultural commodities, petroleum and biofuels sparked an interest in 2008 because of an increase of

commodity prices and some authors studied these links, with different interpretations, among others, [24–26]. The last study of Biodieselbr journal reviewed the successes and failures of PNPB after 10 years of its implementation [102].

The objective of this study was to identify, first, the viability of the deployment of biodiesel according to the behavior of world markets of vegetable oils and petroleum. Second is to show the barriers to the production of biodiesel in Brazil by analyzing the various initiatives from the 1920s up to the current PNPB. Characteristics of vegetable oils markets, oil products markets and incentive programs for biodiesel production were reviewed. Concepts such as regulating price, market price, surplus and rent were borrowed from the theory of rent on natural resources, to provide an understanding on the behavior of the relationship of these markets.

The document is divided into three sections. Section 1 shows an analysis of the viability of biofuels in relation to the oil and agricultural commodities markets. It presents the deployment of ethanol in the markets of oil products and sugar in Brazil and the situation of biodiesel in countries with significant production of vegetable oils. In Section 2, the trials and studies for the deployment of biodiesel in Brazil between the 1920s and the 2000s are reviewed. Section 3 assesses the PNPB incentive mechanisms formulated for family farming benefit and for biodiesel gaining access to a share in the Brazilian fuel market. As the feedstock accounts for approximately 80% of the biodiesel production costs, a review of feedstock available is carried out in each period.

1.1. Biofuels viability: insertion in the petroleum and agricultural commodities markets

The viability of a fuel can be observed through the ability to self-reproduce within its reference market, i.e. its production is sustainable under the prevailing conditions. Biodiesel reproduction is linked to the behavior of vegetable oil and diesel markets. Historically, the price of vegetable oils has been higher than the price of petroleum and diesel, even considering both, the international and domestic diesel retail prices (Graph 1). While the price of vegetable oil remains higher than that of diesel, the producer of vegetable oil will, off course, be better off by selling the product in the food market instead the energy market. Moreover, the deployment of biodiesel in the oil products market will be a result of pricing policy and incentives mechanisms which contribute to the reduction of biodiesel production costs and formation of lower prices than the diesel prices, its closest competitor, which has lower production costs and higher heating value. Under normal market conditions, without subsidies and without incentives, biodiesel is viable only if the market price corrected by the heating value is equal or lower than the diesel market price and higher than the vegetable oils market price. Thus the producer of vegetable oils can obtain surplus¹ or land rent² by selling products in the energy market or in the agricultural commodities market.

¹ The surplus is defined as the difference between the individual production cost of a natural resource monopolized and isolated capital and the general price of production of capital invested in any productive sphere, in this case, vegetable oils. The surplus is greater or lesser in function of productivity, more or less, of natural base of the monopolized resource.

² When the resources are subject to land ownership the surplus become rent.

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