Analysis of Incentive Policies for the Use of Biomass as Energy Source

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Abstract

In the search for solutions on the efficient use of natural resources, much has been discussed about the importance of effective public policies, as a way to minimize problems with the scarcity of natural resources, and how to achieve the desired sustainability through the implementation and exploitation of natural resources. renewable energy sources generated by the expansion of energy supply, one of which being natural resources is Biomass. In this context, biomass emerges as a great potential to solve, or at least mitigate the effects of using petroleum-based energy sources, contributing to the reduction of greenhouse gases (GHG), the implementation of public incentive policies. The use of renewable sources has become a more than current theme in the various rounds of debates on the improvement of climatic conditions in Brazil and in the world. The objective of the research was to identify the incentive policies adopted by the Brazilian government that made possible the advances and contributions generated by the use of Biomass as a renewable energy source within the national territory. The adopted method considered the aspects of a descriptive, exploratory study, with a qualitative approach based on a survey of the theoretical framework, which was used as material, books and original articles based on electronically available databases, to review the literature. available literature. The results of this study show that several benefits have been found through the use of renewable energy sources such as biomass, but this energy source is still not widespread in the country, where this is attributed to the scarcity of public incentive policy that in its great Most address the use of renewable energy as a whole, specifying the use of biomass without differentiation.

Keywords: Renewable energy; Biomass; Public Policy; Sustainability;

1. Introduction

Due to the current environmental situation and all the consequences that the planet is suffering due, especially, to the use of fossil fuels as the main source of energy, the search for alternatives to use cleaner fuels has been gaining space worldwide. According to Couto [1], one option to compensate for this mismatch in the use of non-renewable sources linked to the environmental issue is to encourage and encourage the use of biomass as a renewable energy source through public incentive policy.

To this end, the international community has been advancing the debate on the origin, forms and rational and sustainable use of energy sources, prompting society to reflect on the indiscriminate consumption of energy and on ways to save it. [2] [3].

Adding to the growing global concern about environmental issues, the approval of the Paris Agreement in 2015 at the 21st Conference of the Parties - COP 21, with the accession of 195 countries and the ratification of 155, pledging to limit the increase. The global average temperature at 1.5 ° C from pre-industrial levels associated with the transport sector may have accounted for 23% of combustion gas emissions [4].

In Brazil this figure reaches 43%, according to the balance released by the Ministry of Mines and Energy (MME) in 2016 [5], has motivated many scholars, scientists and politicians to discuss the capacity that Brazil has to produce biomass for be used in the manufacture of biofuels, their different types, and especially what are the public incentive policies implemented to foster the sector [5].

Increasing fuel production from renewable sources is the most viable alternative in the short and medium term and this requires countries to comply with sustainability requirements in a broad sense: environmental, economic, social, technological and strategic because of their soil and climate conditions, Brazil has great potential to produce biomass and the value added to this base of raw material represents an important comparative advantage for greater incentive of public policy, which may assist in the incentive for the use of biomass. as a renewable energy source for the production of electricity and biofuels [6]. Biofuels represent these possibilities and are perhaps the most promising because energy demand tends to increase as the world economy continues to grow [6].

Therefore, it is emphasized that the term biofuel refers to liquid or gaseous fuels, predominantly produced by biomass ”[7], the use of biofuels brings as an environmental advantage the possible reduction in greenhouse gas emissions [8], and partly replace the use of oil, which is why biofuels are included in the global energy matrix [9].

In this context, according to the referenced author most countries that are considered powers in this area, have in common a strong incentive made through their governments, in order to reduce the difficulties that consumers encounter to acquire a generation system. In Brazil, when it comes to legislation to encourage and use renewable sources by consumers, the country is still taking its first steps, with a relatively new regulation and that despite having many positive points, is not as aggressive as in other countries. countries.

The use of biomass has the advantages of its utilization techniques. There are several types of possible sources of biomass for energy. All energy contained in biomass is classified as Bioenergy. Therefore, it is a low entropy energy from the most embryonic photosynthesis and chemosynthesis processes, dilated and accumulated along ecological chains [10]; [11]; [12]

In this sense, the authors point out that the use of biomass comes from ancient times as a source of energy

(firewood) of societies without, however, relying on sustainable production. For this reason, for a long time the term biomass was associated with the idea of deforestation. Only in the twentieth century began the use of modern biomass, with alcohol program in Brazil and the practice of reforestation for wood production.
Thus, it is observed that biomass is an important source of energy for these countries and that the way this fuel is used can be improved, with more efficient technologies promoting social and environmental improvements, such as reducing pollution levels, increasing the quality of energy. life, job creation and income [13].
Therefore, we emphasize that the energy use of biomass in its diverse forms has benefits, such as ensuring greater enjoyment of available resources, adding value and optimizing the agricultural production process and minimizing impacts resulting from waste generation and disposal in the environment [14] .
Given this context, the present study aimed to identify the incentive policies adopted by the Brazilian government that made possible the advances and contributions generated by the use of Biomass as a renewable energy source within the national territory.

2. Material and Method

The methodological approach adopted for this study follows the proposal of [15], which takes into account the approach to the problem, the objectives and the technical procedures adopted. The technical procedures adopted in research classified as qualitative and exploratory are broad and versatile.
It is characterized as qualitative because it allows understanding the context of the studied situation, enabling the capture and interpretation of phenomena and assigning meanings to them [16], exploratory for allowing greater familiarity with the problem raised and for being more flexible and informal, allowing the researcher to seek greater knowledge of the topic in perspective [15].
As for the research technique we used the bibliographic research that [16], is the survey of bibliographies already published in the form of books, magazines, separate publications and written press. Its purpose is to put the researcher in direct contact with everything that has been written about a particular subject.
Regarding the objectives, a bibliographical and theoretical review was conducted to deepen concepts such as renewable energies, biomass, public policy and sustainability allied to the results found during the research.

3. Results and Discussion

Taking into account the theoretical aspects referred to throughout the development of this study regarding public policies to encourage renewable energy sources, we now intend to validate the results obtained. Analyzing the literature that explores renewable energy [17], they concluded that the best performing countries in the production of electricity from renewable sources adopted government strategies that allowed them to leverage both investor attraction and technology evolution.
These governance mechanisms include energy policies, legislation, regulation, specific policy instruments such as financing, market creation, tax incentives, energy research facilities and data centers. They also include appropriate institutions such as energy agencies and, departments dedicated to implementing, managing and evaluating activities related to the development of this technology. These policies can be

adopted at federal, state and municipal levels [18].

Brazil has as its characteristic a high governmental expectation that intervenes in the yearning for self-sufficiency embedded in Normative Resolution No. 482/2012, therefore, public energy incentive policies should structure the system around renewable sources so that the future generator can evaluate and to observe the advantages greater than the environmental concern in the implantation of the private generating systems, considering that the public policies are developed based on the geographic reality and national market [18].

Based on this premise in the Brazilian energy matrix, biomass occupies the position of second largest source of energy, corresponding to 28% of the total and, in recent decades, Brazil has invested in the use of biomass fuels, biofuels. Since the creation of Proálcool, which due to the oil crisis has encouraged the production of sugarcane ethanol. To the PNPB that introduced biodiesel in the Brazilian energy matrix. Coming to RenovaBio that, in addition to providing predictability for the production and use of biofuels, promoting more energy security, aims to reduce GHG emissions in order to achieve the objectives signed and ratified in the Paris Agreement [19].

To this end, Brazil has a combination of factors favorable to the manufacture of biofuels - be it the availability of arable land to expand production - without the need for new areas resulting from deforestation and without competition with food production, either because it has a the highest productivity on the planet due to soil and climate conditions, as well as research centers with experience in the production and development of renewable fuels and an established consumer market with high growth potential [19].

The biodiesel policy in Brazil has gained momentum since 2000 and previous experience was decisive when developing the promotion plan. Thus, the Proalcool program played a key role in showing success from an energy point of view, but a failure from a social perspective. For these reasons, Brazilian biodiesel policy explicitly incorporated social objectives [20]; [21]

The government has created a social certificate, coupled with a tax break to induce companies to employ families in the production of biodiesel feedstocks. In addition, the government stipulated minimum quantities of raw materials that should be produced from the family farming and large property project [21]; [22]

This policy also opened a space for the movement of civil society organizations in the debate on energy policy, which until then was restricted to technical aspects. The explicit objective of the PNPB in legislation to promote small farmers does not appear to have been met [22]. One of the possible explanations for the greater presence of large industries and the preference for exports is that the economic incentives proposed by the legislation are not sufficient. Against the background of distorted fuel prices and relatively lower export refunds on biofuels, producing biodiesel for export is the most cost-effective option for producers [23].

The engine of growth in the biodiesel market in Brazil was the domestic market, whose rate is determined by the government through the National Energy Policy Council (CNPEG). The creation of a guaranteed domestic market and the tax incentives provided by the new legislation allowed biodiesel producers, as well as large soy producers, to move to the domestic market through government-established auctions.

In this sense, it can be said that the instruments used in the policy were successful in securing supplies and

avoiding the risk of local market shortages. At the same time, Brazil appears to be reducing diesel imports, which would reinforce the achievement of the programmer's objectives [21]; [24]

However, the participation of family farming in the PNPB is marginal, and soy is the main input for biodiesel production. Indeed, recent experience shows that structural deficiencies in part of the country's family farming, which have difficulty in accessing resources, technology and capital, are a clear limiting factor for the progress of the program [22].

Petrobras Biocombustível's presence stands out as one of the two most important actors in the pursuit of PNPB's social and environmental objectives. The semi-state nature of this company allows it to find, in addition to purely private business objectives, social objectives that coincide with Brazilian energy policy in accordance with the federal government's priorities [23].

The PNPB was established to reduce dependence on oil and imports, pollutant emissions, and health care costs, as well as boosting jobs and reducing regional income disparities. This program was designed to add biodiesel to the Brazilian energy matrix. Federal law promulgated on January 3, 2005, established a mandate for the ANP to be responsible for regulating and controlling Brazilian biodiesel in the market [21] [25].

The Brazilian sugarcane energy sector has been struggling for years, evidenced by the lack of investment in new plants, leading to the closing of dozens of existing plants and the initiation of judicial recovery processes in others. The Brazilian ethanol industry also complains that the unpredictable fuel price policy has distorted markets, discouraged investment and forced dozens of factories into bankruptcy. Heavily indebted sugar and ethanol companies were forced to sell assets to rivals with stronger capital structures, such as Glencore Plc and Raízen Energia SA, with a 50-50 joint venture between Cosan SA Industria e Comercio and Royal Dutch Shell. Plc [5].

The lack of investment in new ethanol production facilities, coupled with the incentive to boost sugar production at the expense of ethanol production in 2016 in the face of strong global sugar prices. [26] contributed to an increase in Brazilian imports of ethanol into the US. While hydrous ethanol in Brazil competes with gasoline at the pump, anhydrous ethanol has a captive market as it is currently blended with gasoline at a blending rate of 27%.

However, although sales of "C gasoline" (gasoline blended with ethanol) have increased since February 2015, Brazilian production of anhydrous ethanol in recent years is not on a growth path [26]. In addition to Brazil's anhydrous ethanol production declining over the previous three seasons, the Sugar Cane Industry Union (UNICA) in April projected that anhydrous ethanol production in the Center-South region will total 10.84 billion liters in 2017. / 2018, which would represent only a modest 1.71% increase compared to 2016 regional / Production in 2017 (the sugarcane harvest begins in early April).

UNICA also projected that regional hydrous ethanol production would total 13.86 billion liters, down 7.57% from 2016/2017. In the first two months of the current season (April 1 to May 31), regional anhydrous ethanol production totaled 1.69 billion liters (21.46% below the same period in 2016) and regional hydrous ethanol production totaled 2.61 billion liters (29.41% year on year) [26].

With the approval of Law No. 13.576 / 17, which established the National Biofuels Policy, UNICA President Elizabeth Farina was in favor of Renovabio's implementation due to the importance the program will bring to the predictability of the biofuels and renewable energy markets. .

Datagro's consultancy with Brazil's National Energy Policy Council cites that investments may increase while RenovaBio gives a better idea of the industry's potential by 2030. Instead of focusing on improving hydrous ethanol price relative to price as a motivation for flex-fuel vehicle drivers, RenovaBio could encourage fuel distributors to increase sales of hydrous ethanol to the detriment of gasoline sales. In addition, it should encourage investments in new sugar / ethanol plants and consequently the increase in Brazilian production of anhydrous ethanol - currently mixed with gasoline at a blending rate of 27% [5].

The RenovaBio program provides predictability for the sector, which is the main demand requested by industry, aiming to promote decarbonization of the transport sector - it differs from PNPB in that it is not based on tax differentiation, besides being an important driver in the gain of several segments of the industry. society, the economy, the environment [27].

Figure 1 summarizes the public policies implemented over the last decades in Brazil for the production and use of biofuels by the country.

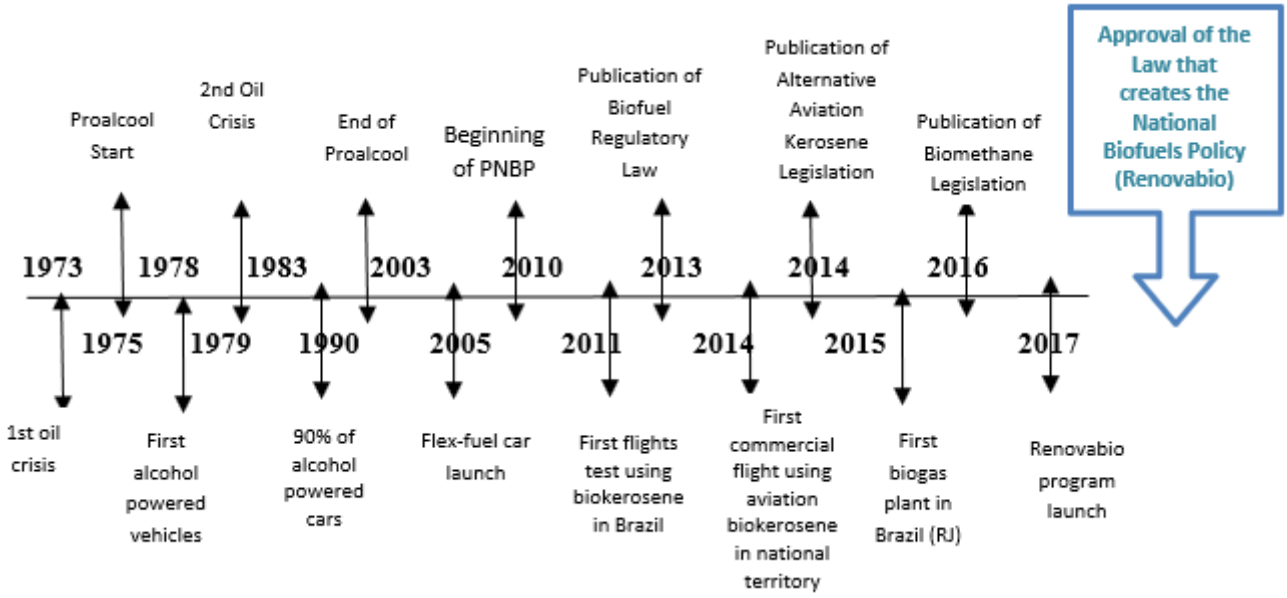

Figure 1 - Biofuels timeline in Brazil
Source: [27]

In addition to national programs to encourage the use of renewable sources, other, more current public policies also target the diversity of the Brazilian energy matrix, as is the case of bill 3.529 / 2012, which aims to diversify Brazil's energy matrix. , based on the national policy of generating electricity from biomass. With the sanction of this law, it is inevitable the generation of electricity from biomass and the greater participation of renewable sources in the Brazilian energy matrix [28].

Biofuel production results in a reduction in foreign exchange, as well as job creation and a rural oilseed market; In the case of biodiesel, it also reduces environmental pollution due to the lower amount of sulfur present in its composition and the reuse of oils already used [29].

However, this production is also impacted by government subsidies and other political factors. It is necessary to implement energy policies that stimulate their growth and efficient use [30].

Policies to promote research, development and deployment of renewable sources fall into three categories [4] [31]: tax incentives: corresponding to the application of public resources that will not be reimbursed,

including tax mechanisms such as tax reductions, exemptions , deductions and tax credits, as well as the granting of subsidies; state financing mechanisms, use of public funds with expectation of financial return, including the granting of financing, guarantees and equity interest in projects; and regulatory policies: setting rules by regulated agents.

As can be seen, despite investments in public policies to encourage renewable energy sources, such as biofuels, among others, in the current context of political and economic crisis, it is not possible to predict the actions of the Brazilian government, without deadlines and implementation statements. expected incentives for investment in renewable energy. However, it is possible to evaluate the irrefutable influence and dependence of public policies to increase the relevance of the use of renewable energy sources, such as biomass [6].

Success for the growing development of renewable energy will depend solely on global production and marketing policies in domestic and international markets, as well as a strong state presence in the implementation of fiscal measures and incentives, and especially subsidies to compensate for the difference in values in compared to other fossil fuels, as the costs of producing renewable energy are still quite high [2]. Another extremely important issue will be setting global targets for the use of biofuels that could be blended with conventional fuel.

Currently around the world, there are about 10 countries that compel oil companies to add a percentage of biofuels to regular fuel, for example, EU countries and Brazil. Given the above scenario, the importance of renewable energies in national and international debates is undeniable, especially when the urgent need to reduce greenhouse gas emissions is inserted as a way of minimizing the impacts of climate change. dependence on fossil fuels [32].

Consistent with the facts presented, it can be said that in recent years, global investments in renewable energy have grown significantly. In 2009 alone, approximately US $ 112 billion was invested, almost 95 billion more than in 2001.

For the first time in history, investment in renewable energy has outpaced fossil fuel-based technologies. China, leader of the ranking in 2009, invested about US $ 32.6 billion, with wind energy representing more than 70% of the destination for this resource. Because of its strong economic growth over the last three decades (1980-2010), China has experienced a considerable rise in energy demand, increasing its reliance on non-renewable sources such as coal and oil.

The US, the largest producer of ethanol in the world, ranked second, with over $ 18 billion spent primarily on wind energy and biofuels.

Brazil, despite standing out in the global energy scenario due to harnessing its hydroelectric potential and the production of sugarcane fuels, representing approximately 45% of its total energy supply from renewable resources, still finds a large challenge in light of the country's low investment in research, development and deployment of new renewable energy sources [33]. Table 1 presents the main countries that use renewable energy.

Table 1 - Major countries in the world and their global potential in the use of renewable energy.

Países	Potencial de uso de energias renováveis relacionadas ao potencial global (%)
China	20
EUA	13
Brasil	7
Índia	6
Indonésia	3
Rússia	2

Source: [34]

From this point of view, the importance of public policies to boost the development of the renewable energy sector related to the global potential of countries is of fundamental importance, including attracting investments and encouraging entrepreneurs in this area. With public incentive policies, it is possible to enhance the development of the production chain, relieving and supporting the generation of scientific and technological knowledge, the training of professionals in the area, the integration between academic and research institutions, creating a positive dynamic among the research institutions. State and private initiative for advances in the sector.

Public policies can help create economies of scale and lower deployment costs and further expand the use of these energies. The experiences of European countries show that when the scale of production increased, the cost decreased and the population's access to these technologies became feasible [32]. In this scenario, Brazil has a privileged situation for the production of a renewable energy source using large-scale biomass, as there are extensive arable areas and favorable climatic conditions throughout the year.

For electric power generation, [35] mentions that biomass is transformed into an intermediate material, used in a driving machine, that will drive the electric power generator (through the mechanical energy produced). Given the facts, cogeneration (whereby it is possible to obtain thermal and electrical energy) is used in most sugarcane plants. Thermal energy is used as a heat source for industrial processes or in the commerce or service sector, while mechanical energy is used as work or transformed into electricity by means of generators.

Thus, the use of biofuels from biomass on a global scale, with the support of public incentive policies, may contribute to international efforts to reduce greenhouse gas emissions, as it represents a renewable alternative to the use of fossil fuels.

4. Conclusion

Throughout the study under analysis several limitations and difficulties were found, which may condition the results. Thus, although there is a lot of information about public policies, the non-adoption of most of these policies by the countries mentioned in the base had implications for the results of this study. Further research and research are needed for possible adjustments to public policies to encourage renewable energy sources, so that self-sustainability exists.

Brazil has a great potential for biomass production due to its large territorial extension, with the availability of arable land, soil conditions and climate conducive to the planting of different crops, without competition between energy agriculture and food production. This scenario allows Brazil to become prominent in the development of new technologies, in the manufacture and use of biofuels. To this end, public and private sector investment is needed to foster the policy segment of encouraging the use of biomass as an energy source.

The Brazilian government, after its commitment to reduce greenhouse gas emissions, established after the commitments made at COP21, added to the need for safety and predictability for the biofuels market, with consequent increase in the sector's competitiveness, established the Policy. National Biofuels.

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