Global Concerns and Renewable Energy Policies: The Use of Regional Vegetal Resources to Create Growth Zones in Developing Countries

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In a legal framework that must respect the ecologic balance, the economic viability, social inclusion and culture preservation, this study focuses on the efficiency of the Brazilian National Program of Biodiesel. The context shown below is the program´s capability of developing isolated regions of the country characterized by lack of conventional energy policies, rich culture aspects, poverty and the possibility of producing energy by its natural resources and species. The results demonstrate a large legal framework already constructed and quantifiable evolution in regional fuel production, although the confusing legal system and the still poor economic incentives diminish the efficiency of the program.

1. Introduction

The substitution of the current world's energy model, based in fossil fuel, is a global issue. Law, as a social life organizer, has an instrumental function in these policies` materializing, which must observe the regional factors to develop local green energy production and its population. As an example the biodiesel fuel can be extracted from various natural vegetal sources, found in various poor regions of Brazil. The agricultural background is ready to be used, which decreases the gap between the energy technology status of developed and developing countries.

By this scenario, using the legal structure of the Brazilian program of biodiesel use and production, the possibility and viability of local renewable resources to develop its host regions will be analyzed. Charts of the national biodiesel production and its geographical distribution can assure a critical analysis of the juridical categories used as the possible instruments that can be executed to improve the process.

2. Instruments of analysis

2.1. A perspective of sustainable development

The concept of a *sustainable development* cannot be seen as a balance between economic activity and natural resources available, because it does not consider the social and cultural balance of the involved populations in the resource management. In this order, a real concept of *sustainable development* must follow these contents: a) ecological balance; b) social inclusion and cultural maintenance; c) economic viability.[1]

Ecological balance means a real view of the resources needed and wasted as well as the environment's physical, biological and chemical capacity of sustaining the demands of the production system. It cannot be confused with the technologic capacity of avoiding the excess of pollution or any future prognostic of this scenario. The adapting movement of the production system towards a cleaner production involves not only the technology available, but also costs of installation, entrepreneurial/consumer behavior and regional geopolitics.

The social inclusion and cultural protection reveals the need of comprehension of the different social structures living in the society and the conscience to study and protect them. The capitalistic model of the last century, based on the monoculture crops and maximum

productivity, exterminated entire local social structures in the developing countries, reducing its populations to poverty and cultural misidentification in urban centers.[2] In this context, the main objective is to absorb these communities to the production system, provide them economic survival and sustain their cultural background.

The economical viability of the development model resides in its efficiency to allocate natural, social and cultural resources in the most harmonic way possible with adequate satisfaction of human needs. Must be noted that the economy survival depends on the economic agents' behavior, production adaptation (e.g. alternative fuel use), redirection of the economical activity priorities and consuming patterns. All these factors must converge to internalize the negative externalities caused by the economical activities and make the economic system possible.

In this scenario, the research made proposes an economic study of the legal system directed to the biodiesel production and its capacity to develop even the most isolated regions of the country.[3] That implicates verifying the efficiency of these norms to promote a better planned energy allocation, environmental sustainability and social/cultural protection of the population. Efficiency is determined by *Schäfer* as maximizing the allocation of natural resources and ensuring quality of life.[4] The studied environmental regulation, thus, will be efficient while guaranteeing the best allocation possible of the natural resources.[5]

The arguments above show the necessity for the legal system to adopt certain guidelines:[6] a) the use of the market as the State's auxiliary in the natural resources management; b) possibility of transfer of natural resources to those who most need them, done with the proper compensation; c) unity of the information system of resource management to ensure the best logistics; d) guarantee of life quality for the population. These items do not aim to substitute the state regulation, but to avoid its structural super dimensioning, maintenance cost increase and lack of efficiency...

3. The Brazilian policy on biodiesel use

3.1. Guidelines for a public energy policy

The Brazilian Law No. 11.097/2005 represented the normative framework for regulation of *biodiesel* in Brazil. It changed the art. 1º of Brazilian Law No. 9.478/1997, determining biofuels development as one of the energy policies guidelines.[7] Another important factor is the intensity of fossil diesel replacement rule. It determines the volume of at least 5% of *biodiesel* in the composition of the total common diesel sold to consumers in the national territory by the year of 2013 (Art. 2º, § 1).

An exception to this transition mechanism can be found in Art. 2º, § 2 of Law 11.097/2005. It established that the National Energy Policy Council could decide for the decrease of this period of transition and establish new criteria.[8] Such information is important, when you observe the recent edition of Resolution No. 06/2009 of CNPE, which raised the minimum percentage of *biodiesel* blend with the fossil diesel to 5% in January/2010 and accomplished the objectives previewed for 2013.

3.2. Standards for social inclusion

The system presents the concern of developing the poorest regions of the country by offering specifically designated incentives. Law No. 11.097/2005, for example, states that the minimum amount of mixture of biodiesel with the diesel common will have to be processed, preferably, from raw materials produced by

family farmers, including those resulting from collecting activity (art. 2º, § 4).

Public authorities can determine different rates of economical incentives, depending on the raw material used in the production of biodiesel, its geographical origin and the producer involved (art. 5 of Law No. 11.116/2005). Beside this mechanism, there is an economic incentive for producers of biodiesel offered by the so-called *Social Fuel Seal* (Art. 7, MDA Resolution No. 01/2005). This seal reveals some special financial conditions for the biodiesel producers. The resolution 1135/2004 of the Brazilian National Bank of Development (BNDES) provides funding of up to 90% of the total cost of the projects directed to the production of biodiesel. If the producer of biodiesel does not have the seal, this percentage drops to 80% of the total project cost of the production project.

3.3. Specific tax incentives

Federal law provides tax incentives to both biodiesel and raw material producers. There is no Industrialized Product Tax (IPI) to the product biodiesel.[9] In addition, the national tax system allows the reduction (and even the exemption) of social contributions (Art. 4º of Decree No. 5.297/2004). In the latter case, it should be noted that the format of incentives varies depending on raw materials and producing region, which shows the mechanism seen in art. 5º of Brazilian Law No. 11.116/2005.

4. Regional factors to promote growth zones by renewable energy policies

4.1. Geographical areas of analysis

The Northern and Northeastern Brazil[10] contains the major part of the communities with no connection to an electric supplier, and no solution was efficient in dealing with it. The conventional Brazilian energy model based on connections to central electric stations in the major urban locations does not apply to some areas in these regions. These communities are largely spread on the territory, even days of non-road travel for any city. Besides, these places use diesel generators, whose cost is very high, due to the large distance of fuel transport.

These communities have their own social structure and way of life, which makes these regions very rich anthropologically. Their relation with the surrounding environment brings attention: their traditions accumulated hundreds of years of knowledge towards species cultivation. However, the lack of financial resources to acquire the minimum living standards despairs these communities. The youngest people become uninterested in the continuity of their traditions and leave the communities to the poorest zones of the huge urban centers due to the lack of qualification for the labor market.

By the facts shown above, it is possible to denote the following characteristics: a) isolation from the major Brazilian centers; b) presence of traditional communities linked to the region; c) large quantity of biodiversity and directed knowledge; d) precarious condition of life; e) cultural degeneration.

4.2. The use of regional vegetal species to produce energy in remote regions

Brazilian law defines *biodiesel* as a fuel made from renewable biomass destined to internal combustion engine use, which can substitute partially or entirely fossil originated fuel.[11] The most important: it can be extracted by a numerous range of economically viable vegetal species,[12] which were related in the primary inter-ministerial study made by the Brazilian government:[13]

Efficiency in oil of vegetal resources

SPECIE	EFFICIENCY IN OIL
Cotton	30 a 40%
Peanuts	40 a 50%
Rice	15 a 23%
Babaçu	58 a 67%
Coconut	50 a 65%
Rape seed	39 a 45%
Sesame	48 a 55%
Sunflower	45 a 55%
Linseed	35 a 45%
Mamona	45 a 55%
Corn	30 a 36%
Coconut Palm	35 a 45%
Palmiste	55 a 65%
Soybean	18 a 21%

Although there are some vegetal species more efficient to produce *biodiesel*, soybean appeared as the major raw material supply. Materials like mamona and babaçu, for example, have neither scale production nor detailed database to face possible production problems. As soybean is the largest crop commercially available,[14] it became the main source of biodiesel production.

A simple geographical analysis indicates the impossibility of this model of biodiesel production. The forest presence eliminates any possibility to hold a commercial soybean crop, and they do not need it. Most of them are covered by native useful species that can produce biodiesel not only for its demands, but commercially. There are several programs that promote pilot power stations and fuel plants in over 30 communities across the Amazon region.[15]

The advantages of the use of this energy model for the regions mentioned are huge. The receipt generation by fuel production stimulates the local population to not destroy the surrounding biological resources. Socially, the community integrates with the production system without degenerating itself, as it can be economically sustainable and can acquire basic human needs and services. In this context, the cultural background is protected and guaranteed by the continuing strength of the renewed ties of its inhabitants.

5. Viability analysis

By the perspective of sustainable development shown in the item 2.1, the energy program must improve in some sectors to achieve its maximum efficiency. Here are some examples:

5.1. Confusing legal framework

The minimum cost of transaction requires a clear range of property right rules, and a direct system of governmental competences to solve the environmental licensing conflicts. The governmental competences, as well, must be clear and functional, what decreases bureaucratic time and production delays.

Although the Brazilian legal system presents several incentives to the fuel productions in the zones defined above, it presents some practical and structural problems. In the practical area, most of the land does not have a defined property title or an adequately defined land use system. There are two types of problems: a) nobody knows exactly whose land is being used, due to the lack of precise mapping and land registering; b) the land is eligible as an extractive *reserve,*[16] but there is no specific regulation to protect the area and its use for product collection.[17]

The structural problems are observed in the administrative spheres of competence given by the Brazilian Constitution.[18] The constant struggle to define which bureaucratic environmental sector would police the private agent's projects dramatically slows down the environmental

licensing and monitoring processes. This scenario, then, creates an inconvenient distance between the private agent's financial resources and the energy projects, because there is a lack of confidence about the definition of the real costs of operation of the whole energy project.

5.2. The lack of a united information system

One of the keys to an economically efficient juridical order is a clear system of environmental information. The local institutions must provide all the produced information to a central database of environmental information, which would decrease the transaction costs of evaluating where the available resources for the population use are. Not only centralized information is needed, but an easy process to access the governmental database is also important to direct the private agents towards the best investment.[19] These two factors show the importance of the environmental information system: availability and possibility of exploitation.

Although the SISNAMA[20] provides some database about the environmental assets and its possibilities of private exploitation,[21] which represents a great evolution, there is still much work to be done. The systemic conflicts between the environmental institutions affect the information system and its viability. There are just a few and still timid initiatives to unite their information and action systems, which increases the transaction costs, especially in bigger projects.[22] For example, these problems avoid the CDM- projects (Clean Development Mechanism) as well. The absence of a unified and reliable system of available resources reduces the possibilities of creating new projects and reduces the amount of carbon credits launched into the market.

5.3. Low effect of the given incentives

As shown in the third part, the specific Biodiesel Program Law indicates a series of tax and financial incentives for the private agent to produce in the Northern and Northeastern regions. There is even a mechanism of increasing/decreasing these incentives depending on the region where the plant is located and the type of vegetal source used. It is possible, then, to control and manage the benefits and incentives for the private agents to realize energy projects in the most distant regions of Brazil, consolidating new manners of biodiesel production and its diversification, given the soybean dominance.

Actually, the biodiesel production charts do not demonstrate much advance, as it indicates the continuing predominance of soybean and the lack of increase of alternate vegetal sources in the energetic matrix. [23] In the specific regions treated in this work, the increase of cost caused by natural geographical difficulties of transportation almost extinguishes the private interest in investing in these regions.[24] The amount of incentives given by the juridical instruments is not sufficient to overthrow the logistic difficulties of producing in distant areas.

The management of the economic incentives must observe two factors in this scenario. The first of them is related to the accountability of the difficulties shown above. They must be quantified and equalized into financial incentives that allow the private agents to invest and prosper. The second one is the limit of these incentives. If the economic costs exceed the benefits brought by their adoption, they are not viable.[25] The statistical control is a key factor to a correct analysis: the initiatives/projects must quantify and qualify not only the economic benefits, but also the ecological, social and cultural indexes, as explained in the item 2.1.

6. Conclusions

Some regions in Brazil do not adapt to the hegemonic energy public policy. The distance to the huge city centers, the costs of the energy links and its land configuration forbid the implement of the agricultural model seen in major land properties. The energy policies originated in native vegetal sources of biodiesel represent an alternative way of development of these communities: a) it sustains the local forest; b) provides resources for the communities; c) reduces poverty and the need of moving from the locality; d) sustains the linkage and the empiric knowledge about the species; and e) reduces the technological gap by means of the natural knowledge already dispersed in the communities.

Brazil already has an entire legal framework to stimulate these efforts. The legal framework determines economic and social stimuli to provide development in areas covered by the biodiesel producing species. There are some initiatives to unify all the environmental database, such as the existing conservation units and resources available in the country, as juridical and economic incentives to direct the investment traffic to the poorest areas of the country. The system, however, is not perfect yet. The conflicts presented in the legal framework and the environmental authorities competence conflicts still increases the social cost of investing. Besides that, the economic incentives are still insufficient to provide a massive flow of investments and even surpass the huge costs of producing energy in isolated Brazilian regions.

7. References

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[1] LEFF points that the environmental rationality is not based on productivity or efficiency, as seen in the economic theories but on ecological balance and social/cultural inclusion and maintenance. These factors must be joined to the economic system to modify its priorities and objectives. LEFF, Enrique. *Epistemologia ambiental.* Translated to Portuguese by Sandra Valenzuela; reviewed by Paulo Freire Vieira. 4ª ed. rev. São Paulo: Cortez, 2007. p. 135-136.

[2] MORIN, Edgar. *Terre-Patrie / Edgar Morin and Anne-Brigitte Kern. Translated from French by* Paulo Azevedo Neves da Silva. Éditions du Seuil, 1995. p. 61.

[3] The economic analysis of the law represents the norm study by a economic perspective, which the most perceptible effect is the conception of the Law as a determinant of behavior and instrument for public policies materializing. COOTER, Robert; ULEN, Thomas. *Law and Economics.* 3ª ed. EUA: Longman, 2000, p. 7.

[4] COOTER; ULEN. Op. Cit., p. 8.

[5] COOTER (n. 6) p. 9.

[6] Although the guidelines are directed to correct negative externalities caused by environmental damages, it can be useful for the energy production system, as we still have a whole market of forestry areas that needs protection and private agents who need to invest in these areas to collect its productive species. MICELI, Thomas J. *The economic approach to law*. EUA: Stanford University Press, 2004. p. 11.

[7] Art. 1º, XII, Lei nº 8.478/1997.

[8] The criteria are: a) availability of supply of raw materials and industrial capacity to produce *biodiesel* b) the participation of family farming in the supply of raw material, c) reducing the regional inequalities d) the performance of engines with the use of fuel, industrial policies and technological innovation.

[9] The last table of taxed products by this contribution (annex of the Brazilian Decree No. 6.006/2006) excludes biodiesel from taxation.

[10] The Northern region includes the states of Acre (AC), Rondônia (RO), Amazonas (AM), Roraima (RR), Pará (PA), Amapá (AP) e Tocantins (TO). The Northeastern region includes the states of Bahia (BA), Alagoas (AL), Sergipe (SE), Pernambuco (PE), Paraíba (PB), Rio Grande do Norte (RN), Ceará (CE), Piauí (PI) and Maranhão (MA).

[11] Art. 6º, XXV, Brazilian National Law n.º 9.478/1997.

[12] Actually, *biodiesel* is extracted from vegetal oil and even animal oil. Nonetheless, the latter initiative is really rare and isolated.

[13] BRASIL. Regional Integration Ministry. *Plano Amazônia Sustentável*. http://www.integracao.gov.br/pdf/desenvolvimentoregional/pas.zip, Access in 03/01/2009.

[14] Recent numbers point at Brazil as the second producer in the World with 58,4 millions of tons, according to the Brazilian national authorities. BRASIL. EMBRAPA. *Soybean in numbers*. http://www.cnpso.embrapa.br/index.php?cod_pai=16&op_page=294. Access in 03/01/2009. Represents 83% of the raw material used to produce biodiesel, according to the latest monthly review of the Brazilian Petroleum Agency. BRASIL. ANP. Monthly biodiesel production report (May 2010). Available at http://www.anp.gov.br/?dw=25747. Access in 06/04/2010.

[15] The Biomass Reference Center of Biomass from the University of São Paulo provides detailed information about the running programs and its production. BRASIL. SÃO PAULO. University of São Paulo. Atlas of the Brazilian bioenergy. Available at http://cenbio.iee.usp.br/download/atlas_cenbio.pdf. Access in 01/09/2010.

[16] Brazilian Law No. 9.985/00 determines a legal framework for environmentally protected areas: the *conservation units*. It classifies these areas by their ecologic

importance and limits economical intervention in several ways (third chapter). For example, some areas cannot be exploited economically; others adopt the monitored forestry products collection system. The last ones are characteristic of the Extractive Reserves (art. 18), whose objectives are exactly the protection of the collective communities that live in the ecologic preserved area and its cultural background. To guarantee the accomplishment of those objectives, the reserve must have a deliberating council, formed by representants of public institutions and from the local communities, and an exploitation plan, which determines how the land can be used.

[17] This problem may appear in two perspectives. The first one is the lack of a legal act to create the extractive reserve and its borders, leaving the area´s population in an insecure context. The second one is related to the lack of efficiency of the reserve´s council to determine an exploitation plan for the forestry product collection, due to its absence or politic interests of its participants.

[18] The Brazilian State has three instances of administrative competence: the Federal Union, The Estates and the Municipalities. Each of them has environmental competences given by the national Constitution (art. 24, art. 30, I), and complements each other. The borders of these competences have caused a large quantity of jurisdictional conflicts, which increases the transaction costs for all new projects.

[19] Internet database services available for public consulting, as a fast bureaucratic response for the public questions are measures to ensure an adequate information access.

[20] Abbreviation for *Sistema Nacional do Meio Ambiente*. Created by the Brazilian Law No. 6.938/81, represents the nation system of environmental information and protection.

[21] The Brazilian Environmental Ministry has a database of all allowed *conservation units* in the country, even the ones held by the States and the Municipalities. BRASIL. MMA. CNUC (National conservation units registry). Available at http://www.mma.gov.br/sitio/index.php?ido=sistemaInformacao.index. Access in 06/02/2010.

[22] In huge and harmful projects, the appearance of two or more environmental institutions claiming their competence over the environmental licensing and monitoring are common. Due to the confusing legal framework, there are numberless jurisdictional conflicts on this matter. On the other hand, smaller projects sometimes have no institutional claim of competence.

[23] A comparison of graphics of the last five years shows almost no increase of other vegetal sources in the biodiesel production matrix. BRASIL. ANP. Monthly biodiesel production report. Available at http://tinyurl.com/22rkyu2. Access in 06/04/2010.

[24] Some initiatives are still being held in the region, such as the PETROBRAS investments in palm oil production in far regions of Pará (PA). AGÊNCIA ESTADO. *Petrobras investe em produção de biodiesel no Pará.* Available at http://portalexame.abril.com.br/negocios/noticias/petrobras-investe-producao-biodiesel-556171.html. Access in 06/14/10.

[25] BREYER determines that the regulation or public policy must observe its cost of implementation and the benefits brought to the population. In other words, how much the population is willing to pay for the ecologic benefits?. BREYER. *Regulation and its reform*. EUA: Harvard Press University, 1982, p. 23.