THE BRAZILIAN EXPERIENCE IN BUILDING A SUSTAINABLE AND COMPETITIVE BIOFUEL INDUSTRY*

PAULINA CALFUCOY

ABSTRACT

Growing concerns about climate change have prompted developed countries to adopt policies to improve the sustainability of their transport sector. Among these, the introduction of Biofuels seems to be a viable possibility in the short term to replace gasoline and diesel. However, some nongovernmental organizations and academics have questioned environmental and social sustainability of biofuels. It is stated that current biofuel production processes do not always meet the expected net lifetime GHG emission rate or cost-performance targets, and certain conventional biofuels have been criticized for causing deforestation and adding pressure on agricultural land that is needed for food production.

Among the countries in the global south, the Brazilian experience is an interesting case study that can contribute to our understanding of the processes of building domestic policies in developing countries to complement international sustainability standards for road transportation fuels. This article, will describe the Brazilian pathway to increased sustainability in the biofuel industry, which is characterized by a close cooperation between the state and the private sector in the domestic and international realm to conduct promotion policies.

* Paulina Calfucoy, Researcher in the Management and Envirnmental Economy Program PROGEA at UNTEC, Doctoral candidate in Development Studies at University of Wisconsin-Madison, calfucoy@wisc.edu June 2012.

1. Introduction 560
2. Biofuels and Sustainability Concerns 564
3. The United States and European Union's Sustainability Criteria 566
    3.1 The United State's Sustainability Criteria for Biofuel Production 567
    3.2. European Union Sustainability Standards 568
4. Brazilian Ethanol Promotion Policies: From Energy Security to Sustainable Production 571
5. Policies to Improve Sustainability of Brazilian Ethanol Industry 574
    5.1. Ethanol Policies to Increase Competitiveness and Environmental Sustainability 575
        5.1.1. Policies at the Global Level 576
        5.1.2. The Brazilian Response to the EPA Sustainability Criteria 578
        5.1.3. Brazilian Response to the European Union's Renewable Energy Directive 579
            5.1.3.1. Brazilian Responses to the Commission Public Consultations 580
        5.1.4. Bilateral Agreements and South-South Technical Cooperation to Promote a Sustainable Biofuel Production 582
    5.2. Ethanol Policies in the Domestic Realm 584
        5.2.1. Productivity Improvements 585
        5.2.2. Changes in the Domestic Environmental Regulations 587
            5.2.2.1. The Sugarcane Agro-ecological zoning 588
        5.2.3. Agro-environmental Protocol in the State of São Paulo 591
6. Conclusion 593

1. INTRODUCTION

Growing concerns about climate change and the need to implement measures to fulfill the commitments under the Kyoto Protocol[1] have prompted developed countries to adopt measures to reduce their greenhouse gas ("GHG") emission levels. To achieve this goal, most developed countries have implemented policies to improve the environmental sustainability of their transportation sectors.[2] Transport is a significant contributor to overall GHG emissions. The sector as a whole accounted for approximately 13% of overall GHG emissions and 24% of CO2 emissions from fossil fuel combustion in 2006.[3] It is expected that in the coming twenty years, in the absence of any corrective measures, global transport emissions will grow by 38%, creating a great challenge to achieving climate-change goals.[4]

Most policies to improve the environmental sustainability of transportation include measures to increase fuel efficiency and to substitute gasoline with renewable energies.[5] Among these renewable energies, biofuel is the most viable possibility in the short term to replace gasoline and diesel. Biofuel will require only minor adjustments in

---

1 "The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change. . . . [I]t sets binding targets for 37 industrialized countries and the European community for reducing greenhouse gas (GHG) emissions." For a more detailed description, see *Kyoto Protocol*, UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE, http://unfccc.int/kyoto_protocol/items/2830.php (last visited Sept. 21, 2012).

2 European Climate Change Program, *Second ECCP Progress Report: Can we Meet our Kyoto Targets?*, at i (Apr. 2003), *available at* http://ec.europa.eu/clima/policies/eccp/docs/second_eccp_report_en.pdf.

3 INTERNATIONAL TRANSPORT FORUM, REDUCING TRANSPORT GHG EMISSIONS: OPPORTUNITIES AND COSTS 6 (2010), *available at* http://www.internationaltransportforum.org/Pub/pdf/09GHGsum.pdf.

4 *Id.* at 7.

5 Council Directive 2009/28/EC of the European Parliament and of the Council of 23 April on the Promotion of the Use of Energy from Renewable Sources and Amending and Subsequently Repealing Directives 2001/77/EC and 2003/30/EC, 2009 O.J. (L 140) 16 [hereinafter Council Directive 2009/28/EC].

current automotive technology and fuel-distribution systems,[6] it can be blended up to 25 percent with gasoline or diesel to partially reduce fossil fuel consumption,[7] and the production cost of some first-generation biofuels will become competitive in the global market.[8]

However, some nongovernmental organizations and academics have questioned environmental and social sustainability of biofuels.[9] Recent estimates indicate that current biofuel production processes do not always meet the expected net lifetime GHG emission rate or cost-performance targets, and certain conventional biofuels have been criticized for causing deforestation and adding pressure on agricultural land that is needed for food production.[10]

In response to these concerns, the United States and the European Union, which had already opted to support biofuel through the implementation of consumption targets, have included sustainability criteria to guarantee the environmental sustainability of their biofuel consumption, with the ultimate goal of meeting the environmental goals proposed in their climate change and energy policies.[11] In the European Union, the Renewable Energy Directive ("RED") has imposed unilateral limits, establishing penalties (such as limited access to the EU market) and standards (which involve meeting sustainability criteria set by international agreements with the European Union or by creating voluntary certification schemes).[12] The assumption that lies behind this Directive is that the establishment of these requirements will generate motivation to improve biofuel production systems by creating incentives

---

6 Emmanuel Ackom et al., *Backgrounder: Major Environmental Criteria of Biofuel Sustainability*, *in* REPORT T39-PR4 COMMERCIALIZING 1ST- AND 2ND- GENERATION LIQUID BIOFUELS AND BIOMASS 1 (June 24, 2010), *available at* http://www.task39.org/LinkClick.aspx?fileticket=wKf0TFLjXu0%3D&tabid=4426&language=en-US.

7 *See* CENTRO DE GESTÃO E ESTUDOS ESTRATÉGICOS, BIOETANOL COMBUSTÍVEL: UMA OPORTUNIDADE PARA O BRASIL 268 (Luís Augusto Barbosa Cortez et al. eds., 2009), *available at* http://www.cogen.com.br/paper/2010/Livro_Bioetanol_Cana_Acucar_2009.pdf [hereinafter CGEE].

8 *Id.* at 28.

9 Bernardo Mançano Fernandes et al., *Agrofuel policies in Brazil: paradigmatic and territorial disputes*, 37 J. PEASANT STUD. 793, 799, 800, 807 (2010).

10 Ackom et al., *supra* note 6, at 12.

11 Ester Galli, *Challenges to the Expansion of Ethanol Production in Brazil*, *in* THE FUNCTIONING OF ECOSYSTEMS 283, 283, 297 (Ali Mahamane ed., 2012).

12 Council Directive 2009/28/EC, *supra* note 5, at 17, 20–24.

to create better technology, while ensuring that biofuel production is not carried out in areas rich in biodiversity.[13]

When it comes to discussions about the sustainability of biofuels, most attention is given to the efforts of developed countries to set appropriate standards to influence production in the global south.[14] However, it is important to acknowledge the parallel path adopted by countries in the global south, which are expected to be important players in the global market to meet biofuel consumption targets in the United States and Europe.[15] While biofuels can be produced from many different crops, it is expected that a substantial portion of the 10 percent-target-use of biofuels for road transport fuel in the European Union may come from ethanol produced from sugarcane from Brazil, potentially making Brazil the most important economic partner of the United States and European Union in the biofuel market.[16]

Among the countries in the global south, Brazil's experience of improving sustainability in the ethanol industry provides an important case study.[17] Brazil is a world leader in the production of sugarcane-based ethanol.[18] Its industry began in 1970s, mostly for energy security reasons. Over time, ethanol has become the cleanest alternative for gasoline in the transport sector, making an important contribution to Brazil's environmental sustainability objectives.

Since the 2000s, Brazil's private and public sectors together have identified environmental sustainability as a central benefit of ethanol's advantages and as a factor that needs to be improved over time to maintain Brazil's competitiveness in the national and international market. Thus, Brazil has pursued a series of policies to improve the

---

[13] *Report from the Commission on Indirect Land-Use Change Related to Biofuels and Bioliquids*, at 2, COM (2010) 811 final (Dec. 22, 2010), *available at* http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0811:FIN:EN:PDF [hereinafter *EC Report*].

[14] Daniele Giovannucci & Stefano Ponte, *Standards as a New Form of Social Contract? Sustainability Initiatives in the Coffee Industry*, 30 FOOD POL'Y 284, 285–86 (2005).

[15] MARCOS J. JANK ET AL., EU AND U.S. POLICIES ON BIOFUELS: POTENTIAL IMPACTS ON DEVELOPING COUNTRIES 15–20 (2007), *available at* https://ees.ucsb.edu/academics/documents/EU_US_biofuels_policies_Marshall_Fund.pdf.

[16] *See generally* David Laborde, *Assessing the Land Use Change Consequences of European Biofuel Policies*, INT'L FOOD POL'Y INST., at 9–15 (Oct. 2011), (EC) No. SI2.580403, *available at* http://trade.ec.europa.eu/doclib/docs/2011/october/tradoc_148289.pdf.

[17] Galli, *supra* note 11, at 284.

[18] *See* MINISTRY OF AGRIC., LIVESTOCK AND FOOD, BRASÍLIA, ANUÁRIO ESTATÍSTICO DA AGROENERGIA, at § 1.4 (2010), http://www.agricultura.gov.br/arq_editor/file/Desenvolvimento_Sustentavel/Agroenergia/anuario_agroenergia/# (Last visited Oct. 25, 2012).

performance of its biofuel industry,[19] following a path toward more sustainable production, even when most of its production is currently geared toward the domestic market.[20]

This article will describe the Brazilian pathway to increased sustainability in the biofuel industry.[21] This increase is characterized by a close cooperation between the state and the private sectors. This strategy has benefited both the international and the domestic realm. At the international level, Brazil has actively participated in defining the sustainability standards that differentiate its ethanol from other sources of biofuel and to organize a joint response between the public and private sector to overcome the potential technical barriers to trade. Additionally, the Brazilian government and private sector have worked to promote the sustainable production of biofuel in other parts of the global south to increase supply, which is an important component of its international cooperation policy with other developing countries. Within the domestic realm, Brazil has worked to implement research and development policies to support improvements in production and increase the sustainability of ethanol by implementing new regulations and domestic standards.

But Brazil's process has not been without controversy or difficulty. Domestic interests and priorities in the environmental and economic realms have affected Brazil's policy agenda. However, the country has adopted concrete measures to improve ethanol production, even when some challenges remain unresolved. The Brazilian experience is an interesting case study that can contribute to our understanding of the process of building domestic policies in developing countries that are a necessary complement to international sustainability standards to produce more sustainable alternative for road transportation fuels.

---

[19] Patricia Guardabassi, Os Desafios à Expansão Sustentável da Producão de Etanol de Cana-de-Acúcar, 40, 43, 54, 58 (2011) (unpublished graduate program thesis, University of São Paulo) (on file with author).

[20] *See* MINISTRY OF AGRIC., LIVESTOCK AND FOOD, *supra* note 18, at §2.1.

[21] The content of this paper is based on personal interviews of stakeholders of the Brazilian ethanol industry conducted in Brazil in 2011, and the analysis of secondary information.

2. BIOFUELS AND SUSTAINABILITY CONCERNS

Sustainability has become one of the defining concerns of the current industrial era, and it is a recognized criterion of public and political acceptance.[22] It is classically defined in three forms: economic, social, and environmental.[23] There is not a simple definition of sustainability, but the overall concept entails achieving a quality of life that can be maintained for generations.[24] Sustainable development is a combination of activities that can be expected to improve the human condition in a maintainable manner.[25]

Sustainable alternatives to fossil-based liquid transportation fuels were originally defined as sustainable if they were sourced from renewable feedstock, such as biomass;[26] however, the public and political support for the fuel industry has changed, and the industry's "social license to operate" and ability to maintain its political support (e.g., through funding and blending targets) hinges upon demonstrating positive environmental performance.[27]

In recent years, biofuels have been attacked for their potential disruption of the food supply, their impact on biodiversity, their possible reduction of water quality and water availability, and their lack of a direct benefit to those directly affected by biofuel production.[28] Additionally, doubts have been raised about the actual benefits of biofuels regarding the mitigation of GHG emissions, especially when indirect land-use change ("ILUC") is taken into account.[29]

Regarding their socioeconomic impact, it has been argued that biofuel crops could compete with food production, threatening food

---

[22] INT'L ENERGY AGENCY [IEA], SUSTAINABLE PRODUCTION OF SECOND -GENERATION BIOFUELS POTENTIAL AND PERSPECTIVES IN MAJOR ECONOMIES AND DEVELOPING COUNTRIES, at 7 (Feb. 2010), *available at* http://www.iea.org/publications/freepublications/publication/second_generation_biofuels.pdf.

[23] John Sheehan, *Biofuels and the Conundrum of Sustainability*, 20 CURRENT OPINION BIOTECHNOLOGY 318, 318–19 (2009).

[24] Rocio A. Diaz-Chavez, *Assessing Biofuels: Aiming for Sustainable Development or Complying with the Market?*, 39 ENERGY POL'Y 5763, 5764 (2011).

[25] *Id.*

[26] Ackom et al., *supra* note 6, at ii.

[27] *Id.*

[28] Arnaldo Walter et al., *Sustainability Assessment of Bio-Ethanol Production in Brazil Considering Land Use Change, GHG Emissions, and Socio-Economic Aspects*, 39 ENERGY POL'Y 5703, 5703 (2011).

[29] Joseph Fargione et al., *Land Clearing and the Biofuel Carbon Debt*, 319 SCIENCE 1235, 1237 (2008).

supply security and adding pressure onto agricultural land that is needed for food.[30] The expansion of biofuel production also raises concerns about the potential negative impact on rural populations, both because of its effect on settlements and domestic migration and because of its impact on land concentration due to the scale of the production process and the characteristics of the technology involved.[31]

In terms of its environmental impact, biofuel's contribution to the reduction in GHG emissions has faced scrutiny because of the negative effects of the extensive land required for biofuel production and the potential impact on deforestation.[32] Furthermore, there are concerns about biofuel's energy balance when considering the net impact of their lifecycle production process.[33] When fertilization, transport, and emissions from deforestation, burning, peat-drainage, cultivation and soil-carbon losses are taken into account, the energy balance tends to be more negative than neutral.[34]

According to a recent study by the Organization for Economic Cooperation and Development ("OECD"), only a few technologies in biofuel production have a reasonable greenhouse gas emissions balance—even without taking into account the carbon emissions effected through land-use change.[35] Among current technologies, only sugarcane-based ethanol in Brazil, ethanol produced as a by-product of cellulose production in Sweden and Switzerland, biodiesel from animal fats and used cooking oil can substantially reduce GHG emissions as compared with gasoline and mineral diesel.[36] The other conventional biofuel

---

[30] C. Ford Runge & Benjamin Senauer, *How Biofuels Could Starve the Poor*, 86 FOREIGN AFF. 41, 42–43 (2007).

[31] MINISTRY OF DEV., INDUS. AND FOREIGN TRADE, *Etanol Questoes para Sustentabilidade*, http://www.inmetro.gov.br/painelsetorial/palestras/etanol_DelcioRodrigues.pdf (March, 2007); João Alziro Herz da Jornada, *Programa Brasileiro de Certificação em Biocombustíveis: I Panel Setorial*, MINISTRY OF DEV., INDUS. AND FOREIGN TRADE (July 23, 2007), *available at* http://www.inmetro.gov.br/painelsetorial/palestras/PBCBio_PainelSetorial_JJornada.pdf.

[32] Edward Smeets et al., *The Sustainability of Brazilian Ethanol - An Assessment of the Possibilities of Certified Production*, 32 BIOMASS & BIOENERGY 781, 786–87 (2008).

[33] Sarah C. Davis et al., *Life-Cycle Analysis and the Ecology of Biofuels*, 14 TRENDS PLANT SCI. 140, 143–44 (2009).

[34] *See id.*

[35] Richard Doornbosch & Ronald Steenblik, Organisation for Economic Co-Operation and Development [OECD], *Biofuels: Is the Cure Worse than the Disease?*, at 4–5, Round Table on Sustainable Development, SG/SD/RT(2007)3 (Sept. 11–12, 2007), *available at* http://media.ft.com/cms/fb8b5078-5fdb-11dc-b0fe-0000779fd2ac.pdf.

[36] *Id.* at 4.

technologies typically deliver GHG reductions of less than 40 percent compared with their fossil-fuel alternatives.[37]

One of the most important concerns about biofuel's environmental sustainability is the indirect land-use change effect.[38] This effect is defined as the impact of producing biofuel feedstock on land directly converted from another type of agricultural land.[39] It is postulated that the carbon emissions from such land-use change have to be included in the overall calculation of greenhouse gas emissions of the specific biofuels.[40] Moreover, if biofuels are instead cultivated on existing agricultural land, it may then displace other crop production. Ultimately, this may lead to the conversion of rich biodiverse land into agricultural land.[41] Through this route, extra biofuel demand will lead indirectly to land-use change.[42]

Measuring ILUC effects is a complex matter with no clear consensus on the modeling and quality of the data available to support conclusive results.[43] ILUC measurements concern future impacts, which are inherently uncertain, as future developments will not necessarily follow the trends of the past.[44] Moreover, the estimated land-use change can never be validated, as ILUC is impossible to directly observe or measure.[45] However, there is a growing consensus about the necessity of including policies to address ILUC impact when evaluating biofuel's environmental sustainability.[46]

3. THE UNITED STATES AND EUROPEAN UNION'S SUSTAINABILITY CRITERIA

All these concerns about the sustainability of biofuels have demanded action from policymakers and biofuel producers to adopt policies to substitute gasoline production with an alternative that might

---

[37] *Id.* at 5.

[38] *EC Report*, *supra* note 13, at 2–3.

[39] Press Release, Ruth Delzeit et al., Review of IFPRI Study: Assessing the Land Use Change Consequences of European Biofuel Policies and its Uncertainties 2 (June 2012), *available at* http://www.ebb-eu.org/EBBpressreleases/Review_iLUC_IfW_final.pdf.

[40] Walter et al., *supra* note 28, at 5709–10.

[41] Delzeit et al., *supra* note 39, at 2.

[42] *EC Report*, *supra* note 13, at 3.

[43] *Id.* at 6–9.

[44] *Id.* at 6.

[45] *Id.*

[46] *Id.* at 12–14.

make a real contribution to GHG emission savings. Considering that both the United States and European Union support the development of a domestic biofuel industry and both have adopted biofuel-consumption targets, the path taken by these entities has focused on defining standards that affect biofuel production domestically and in the global south.[47] This article will focus mainly on Brazil's strategies and policies, but I will first describe the changing international context by analyzing the way new policies and standards in the world's largest markets have shaped the biofuel market.

3.1 THE UNITED STATE'S SUSTAINABILITY CRITERIA FOR BIOFUEL PRODUCTION

The Renewable Fuel Standard ("RFS") Program was launched in 2005 and established the first renewable-fuel volume mandate in the United States.[48] In its first version, the RFS program required 7.5 billion gallons of renewable fuel to be blended into gasoline by 2012.[49]

Under the Energy Independence and Security Act of 2007 ("EISA"), the volume of renewable fuel required to be blended into transportation fuel increased from 9 billion gallons in 2008 to 36 billion gallons by 2022.[50] Additionally, the program established new categories of renewable fuel and set separate volume requirements for each one depending on their GHG emission reduction.[51] EISA required the United State's Environmental Protection Agency ("EPA") to apply lifecycle GHG performance threshold standards to ensure that each category of renewable fuel emit fewer greenhouse gases than the petroleum fuel it replaced.[52]

---

[47] *See, e.g.*, Energy Policy Act of 2005, Pub. L. No. 109–58, *available at* http://www.epa.gov/oust/fedlaws/publ_109–058.pdf.

[48] Nicolae Scarlat & Jean–Francois Dallemand, *Recent Developments of Biofuels/Bioenergy Sustainability Certification: A Global Overview*, 39 ENERGY POL'Y 1630, 1636 (2011).

[49] *Renewable Fuel Standard (RFS)*, UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, http://www.epa.gov/otaq/fuels/renewablefuels/index.htm. For more information on the RFS2, see ENVTL. PROTECTION AGENCY, EPA-420-R-10-003, RENEWABLE FUEL STANDARD PROGRAM (RFS2) SUMMARY AND ANALYSIS OF COMMENTS (2010).

[50] Energy Independency Security Act, H.R. 6, 110th Cong. § 202 (as passed by House, January 4, 2007), *available at* http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=110_cong_bills&docid=f:h6enr.txt.pdf.

[51] *Id.*

[52] *Id.* at § 201.

Based on this methodology, the Act identified three types of biofuels: cellulosic ethanol, biomass diesel, and "other advanced."[53] The use of renewable fuels in the United States will be required in order to reduce GHG emissions by at least 20 percent by 2022, with 58 percent of all renewable energy coming from cellulosic ethanol and other advanced biofuels.[54] Like Europe, the United States will grandfather the GHG emission standards for existing installations until 2022.[55]

3.2. EUROPEAN UNION SUSTAINABILITY STANDARDS

The European Union adopted the Fuel Quality Directive ("FQD") in 2007 and the Renewable Energy Directive ("RED") in 2009 as part of its energy and climate change policies.[56] The FQD requires a 6 percent GHG reduction in transportation fuels by 2020.[57] The European Union reiterated its support for mandatory biofuel targets, calling for 10 percent use in 2020, subject to production sustainability and the commercial availability of second-generation biofuels.[58]

The European Union Directive requires that the share of energy from renewable sources must be 20 percent by 2020, with at least 10 percent use in transportation fuel.[59] While the 10 percent obligation is equal among all member states, the overall 20 percent obligation represents only an EU average, with markedly different targets for individual member states.[60] Both RED and FQD also have sustainability criteria.[61] RED requires that generate a GHG emissions savings of at least 35 percent.[62] This increases to 50 percent at the start of 2017 for all

---

[53] RANDY SCHNEPF & BRENT D. YACOBUCCI, CONG. RESEARCH SERV., R40155, RENEWABLE FUEL STANDARD (RFS): OVERVIEW AND ISSUES (2012).

[54] ENVIRONMENTAL PROTECTION AGENCY, LIFECYCLE ANALYSIS OF GHG EMISSIONS FROM RENEWABLE FUELS, EPA-420-F-10-006 (2010), *available at* http://www.epa.gov/oms/renewablefuels/420f10006.pdf

[55] *EC Report*, *supra* note 13, at 12.

[56] Laborde, *supra* note 16, at 9–11.

[57] Council Directive 2009/30, art. 7a, 2009 O.J. (L 140) 2(a) (EC).

[58] Les Levidow, Address at Interpretive Policy Analysis (IPA) Conference: EU ' Sustainable Biofuels' in Dispute: De/politicising an Environmental Market 6 (June 23–25, 2010), *available at* http://www.ipa-2011.cardiff.ac.uk/wp-content/uploads/file_uploads/38/38-Levidow.pdf.

[59] *See* Council Directive 2009/28, 2009 O.J. (L 140) 8 (EC).

[60] *See id.* at annex I. Countries targets vary from 10% in the case of Malta and 49% in the case of Sweden. *Id.*

[61] *See id.* at art. 17(1); *see also* Council Directive 2009/30, art. 7b, 2009 O.J. (L 140) 1 (EC). These two instruments lay down identical sustainability criteria.

[62] This requirement took effect on Dec. 5, 2010, Council Directive 2009/28, art. 27, 2009 O.J. (L 140) 1 (EC), except in relation to installations in operation on Jan. 23, 2008, which are exempt

installations, and to 60 percent at the start of 2018 for installations that start production on or after January 1, 2017.[63]

RED also contains land-use related criteria. For biofuels to be counted toward member states' renewable energy targets, or for members states to be eligible to receive financial support, their biofuels must not be made from feedstock obtained from land with high biodiversity value,[64] land with a high carbon stock,[65] or from land that was peat land (unless it is shown that the cultivation of the crops did not involve draining previously undrained soil).[66] Compliance with these criteria is not a precondition for access to the EU market, but compliance is necessary if transportation biofuels or bioliquids for other uses are to be taken into account for the renewable energy targets.[67] Compliance with the land-use standard will be assessed on the basis of company information, via voluntary certification schemes, or through bilateral and multilateral agreements.[68] At the time the RED was enacted, only Brazilian ethanol was project to fulfill the future 60 percent criteria for GHG savings in 2017.[69]

---

until 1 April 2013, *id.* at art. 17(2). This is compared with a baseline scenario of 83.8gCO_2eq/MJ laid down in the FQD. *See* Council Directive 2009/30, annex IV, 2009 O.J. (L 140) Part C (19) (EC). Also, see SEC (2011) 129 final concerning the mass balance verification method used for assessing compliance with the sustainability criteria in accordance with Article 18(2) of Council Directive 2009/28.

[63] Council Directive 2009/28, art. 17, 2009 O.J. (L 140) 2 (EC). 29gCO_2eq/MJ will be deducted for biofuels produced from severely degraded or heavily contaminated land that was not used for agriculture or any other activity in January 2008. Council Directive 2009/28, annex V, 2009 O.J. (L 140) 8–9 (EC).

[64] This includes land, which has or had this status on or after January 2008. This would include primary forest and highly biodiverse grassland. The concept of highly biodiverse grassland is defined in Article 17(3)(c) of Council Directive 2009/28 and the criteria and geographic ranges for identifying this are to be set out by the Commission. To this end, it conducted a public consultation on this theme. However, no Commission decision has yet been published. Land enjoying high biodiversity value also includes nature protection areas designated by the relevant competent authority. Subject to a Commission decision, new areas recognized by international agreement or by the IUCN can be taken into account. A number of exceptions apply and the European Committee on Standardization (CEN) is currently working on the kind of evidence that needs to be provided to rely upon these. *See* Council Directive 2009/28, art. 17, 2009 O.J. (L 140) 3(a), (c) (EC).

[65] This refers, for example, to land which was wetlands or continuously forested in January 2008 and which no longer has that status. *See* Council Directive 2009/28, art. 17, 2009 O.J. (L 140) 4(a)–(b) (EC).

[66] Council Directive 2009/28, art. 17, 2009 O.J. (L 140) 5 (EC).

[67] Joanne Scott & David Trubek, Presentation at the Project Ethanol Workshop, FGV-São Paulo: The EU Sustainability Criteria for Biofuels, A Working Paper 2 (May 16, 2011).

[68] Council Directive 2009/28, art. 21, 2009 O.J. (L 140) 2 (EC).

[69] Levidow, *supra* note 58, at 7.

In 2009, the EU's sustainability criteria did not include any measures regarding ILUC change.[70] To address ILUC issues, the EU commission deferred the discussion until December 2011, when the Commission would report on ways to calculate ILUC and ways to minimize its impact.[71] To fulfill this compromise, the Commission services hired experts to develop global models predicting the impact of biofuel consumption and the ILUC effects.[72] The commission held a public pre-consultation in 2009 to address ways of minimizing the impact of ILUC.[73]

In 2010, the Commission held a public consultation to fully address the policy options that might inform the EU renewable energy policy.[74] The public consultation addressed three main concerns. The first was about the legitimacy of the analytical work conducted as part of the Commission's analysis for determining the impact of ILUC resulting from the production of biofuels; the second, was about the significant differences between the categories of biofuels to be considered in the policy alternatives; and lastly was about the EU action needed to address ILUC and what course of action should be taken.[75] To date, there have been no further reports on the policy options to address ILUC's impact.

---

[70] *See* European Commission, *Indirect Land Use Change-Possible Elements of a Policy Approach-Preparatory Draft for Stakeholder/Expert Comments* (2009), *available at* http://ec.europa.eu/energy/renewables/consultations/doc/iluc_preparatory_consultation_doc.pdf [hereinafter *EC Possible Elements Draft*].

[71] Council Directive 2009/28, art. 19, 2009 O.J. (L 140) 6 (EC).

[72] The Commission launched a number of analytical exercises in order to better understand the magnitude of these impacts: i) Global trade and environmental impact study of the EU biofuels mandate, ii) Impacts of the EU biofuel target on agricultural markets and land use: a comparative modeling assessment, iii) The impact of land use change on greenhouse gas emissions from biofuels and bioliquids – literature review, iv) Indirect land use change from increased biofuels demand – comparison of models and results for marginal biofuels production from different feedstock. *Renewable Energy: Studies – Land Use Change*, EUROPEAN COMMISSION, *available at* http://ec.europa.eu/energy/renewables/studies/land_use_change_en.htm (last visited Nov. 15, 2012).

[73] *EC Possible Elements Draft*, *supra* note 70, at 1.

[74] *Renewable Energy: Public Consultation*, EUROPEAN COMMISSION, http://ec.europa.eu/energy/renewables/consultations/2010_10_31_iluc_and_biofuels_en.htm (last visited Nov. 16, 2012).

[75] *Id.*

4. BRAZILIAN ETHANOL PROMOTION POLICIES: FROM ENERGY SECURITY TO SUSTAINABLE PRODUCTION

Brazil is the global leader in the production of sugarcane-based ethanol.[76] Over the last thirty years, ethanol has consolidated its role in the domestic energy matrix.[77] In 2009, ethanol met about 23 percent of its road transport fuel demand.[78] To reach this goal, Brazil took advantage of its natural resources, including its ideal location in the sub-tropical zone to produce sugarcane.[79] It has successfully taken the lead in the generation and implementation of modern, tropical agriculture technology and has developed a robust agro-industry with the conditions to be competitive internationally.[80] In addition its favorable conditions for biofuel production (including weather, rainfall, land availability, and working force), Brazil has taken advantage of its long-term experience with sugarcane production.[81] It has also promoted technological developments, productivity improvements, and an institutional capacity to support the development of the sugarcane and ethanol industry through the implementation of numerous public policies.

Sugarcane production and the ethanol industry have a long tradition in the Brazilian economy.[82] Brazil produces two types of sugar-based ethanol: hydrous and anhydrous.[83] The former is used to power vehicles equipped with pure ethanol or flex-fuel engines, while the latter is mixed with gasoline to reduce petroleum consumption.[84]

---

[76] CGEE & BNDES, BIOETANOL DE CANA-DE-AÇÚCAR ENERGÍA PRA O DESENVOLVIMENTO SUSTENTÁVEL, 234, *available at* http://www.bioetanoldecana.org/pt/download/bioetanol.pdf (2008).

[77] *See id.* at 42–44.

[78] *Topic Biofuels*, INTERNATIONAL ENERGY AGENCY, http://www.iea.org/topics/biofuels/ (last updated 2012).

[79] *See* CGEE & BNDES, *supra* note 76, at 72.

[80] MINISTRY OF AGRICULTURE, LIVESTOCK, & FOOD SUPPLY, BRAZILIAN AGROENERGY PLAN 2006–2011, at 3 (Suzanne del Carmen Capó de Tavares Sobral trans., Embrapa Publishing House, Brasília, DF 2006), *available at* http://www.embrapa.br/english/publications/agroenery_miolo.pdf [hereinafter BRAZILIAN AGROENERGY PLAN].

[81] *Id.* at 8.

[82] CGEE & BNDES, *supra* note 76, at 153–176.

[83] *Id.* at 41.

[84] UNICA – BRAZILIAN SUGARCANE INDUSTRY ASS'N & APEXBRASIL – BRAZILIAN TRADE AND INVESTMENT PROMOTION AGENCY, SUGARCANE INDUSTRY IN BRAZIL: ETHANOL SUGAR BIOELECTRICITY (2009), *available at* http://sugarcane.org/resource-library/books/UNICAs%20Institutional%20Folder.pdf [hereinafter UNICA & APEX].

The first policies affecting the development of the ethanol industry started in 1930s.[85] At that time, the main objective was to protect the domestic sugar industry and avoid the negative impact of sugar prices fluctuations.[86] Thus, in 1931, the Brazilian government launched a federal decree establishing mandatory blending of ethanol and gasoline and set guidelines for its transportation and commercialization.[87]

In the early 1970s, changes in external conditions created an opportunity for the ethanol industry's expansion in the Brazilian energy matrix.[88] Brazil, like many other net importers of oil in the world, faced the oil price shock, along with a substantial drop in sugar prices.[89] During this period, Brazilian President Ernesto Geisel decided to encourage the production of ethanol to ensure energy security and to control the macroeconomic impact of fluctuations of petroleum prices.[90] As a result, in 1975, the Brazilian government launched the National Alcohol Program ("PROALCOOL") and implemented policies to increase the production of ethanol to be mixed with gasoline and to be used as a commodity in the chemical industry.[91]

As part of the policy tools used, the state-owned oil company PETROBRAS maintained a stable demand and used strategic reserves to stabilize its supply of ethanol, managing a cross-subsidy between gasoline and ethanol to increase ethanol's attractiveness to consumers.[92] The Brazilian Development Bank ("BNDES") provided US$ 2.0 billion in low-interest loans to develop infrastructure for the distillation process.[93] In terms of trade policy, a production quota and export controls for sugar were established.[94] In a short period of time, the country built an extensive distribution network for hydrated alcohol and strengthened its public policies for the industry.

In 1979, during the second wave of the energy crisis, the Brazilian government raised the annual production target of ethanol

---

[85] Anil Hira & Luiz Guilherme de Oliveira, *No Substitute for Oil? How Brazil Developed its Ethanol Industry*, 37 ENERGY POL'Y 2450, 2451 (2009).

[86] *Id.*

[87] Jose R. Moreira & Jose Goldemberg, *The Alcohol Programme*, 27 ENERGY POL'Y 229, 231 (1999).

[88] Hira & de Oliveira, *supra* note 85, at 2451–52.

[89] *Id.* at 2451.

[90] *Id.* at 2451–52.

[91] CGEE, *supra* note 7, at 435.

[92] Moreira & Goldemberg, *supra* note 87, at 232.

[93] *Id.* at 232

[94] Hira & de Oliveira, *supra* note 85, at 2452.

production to produce about 15 billion liters of ethanol per year.[95] Most importantly, at that time, the government developed productive connections in the domestic economy.[96] The government and the automobile industry established a partnership to push for the technological development of vehicles fueled exclusively with sugarcane-based ethanol.[97] In 1980 and 1981, changes in international oil prices and a deficiency in price-planning led to the loss of competitiveness in ethanol production and created mismatch between supply and its growing demand.[98]

Throughout the 1990s, the ethanol market suffered from structural changes. Subsidies and regulation were gradually removed and new technological standards placed ethanol-exclusive cars at a disadvantage.[99] The ethanol market, in its different versions, was deregulated, and market-based prices became effective in 1999.[100] Gasoline prices were liberalized in 1998, and the 40 percent tariff quotas for sugar exports were eliminated.[101] In 1993, in order to prevent a collapse of the entire ethanol-production industry in the country, the government set a mandatory blend of 22 percent of anhydrous alcohol and gasoline.[102] The automobile industry concentrated its research on producing more economic gasoline vehicles, which accounted for 75 percent of sales in 1996, while ethanol-only automobile sales dropped down to less than 1 percent.[103]

In the 2000s, under the presidency of Lula Da Silva, the Brazilian government decided to reintroduce industrial policies and made ethanol production and exports a priority.[104] But it did so in a new context: with more demand for biofuels came increased concerns over

---

[95] *Id.* at 2453.

[96] Raquel Rodriguez de Souza, Panorama Oportunidades e Desafios para o Mercado Mundial de Álcool Automotivo 3 (Feb. 2006) (unpublished M.S. dissertation, Universidad Federal do Rio de Janeiro), *available at* http://www.agencia.cnptia.embrapa.br/Repositorio/souza_2006_dissertacao-1_000fjk96bn402wyiv80sq98yq18xekhe.pdf

[97] *Id.* at 8.

[98] Hira & de Oliveira, *supra* note 85, at 2453.

[99] *See* Moreira & Goldemberg, *supra* note 87, at 239.

[100] *See id.* at 240.

[101] Hira & de Oliveira, *supra* note 85, at 2454.

[102] *See* Moreira & Goldemberg, *supra* note 87, at 231.

[103] *See id.* at 239.

[104] *Lula é destaque no prêmio TOP Etanol*, INSTITUTO LULA (June 6, 2011), http://www.institutolula.org/2011/06/lula-e-destaque-no-premio-top-etanol/#.UI_T2I7LDjQ.

biofuels' environmental and social sustainability.[105] From 2000 onwards, international and domestic factors converged to boost the resurgence of the biofuel industry. In the international arena, rising oil prices and concerns about climate change and the impact of green house gas emissions spurred a renewed interest in biofuel as an alternative to substitute petroleum consumption for transport.[106]

Domestically, ethanol consumption remained steady after the crisis in the 1990s, due the compulsory addition of anhydrous ethanol with gasoline, ranging from 20 percent ("E20") to 25 percent ("E25") and the introduction of flex fuel cars in the domestic market.[107] Flex fuel vehicles were first released in March 2003, and approximately 850,000 flex fuel vehicles were circulating in Brazil by late 2005.[108] From 2003 to 2004, domestic demand for ethanol rose 259 percent, and to date, six automobile manufacturers in Brazil produce fifty-two different models.[109] Today, ethanol accounts for 40 percent of Brazil's transportation fuel,[110] and close to 90 percent of new cars sold in Brazil are flex-fuel.[111] It is estimated that flex-fuel vehicles will represent 26 percent of the fleet of light vehicles in 2008, and possibly 65 percent by 2015.[112]

5. POLICIES TO IMPROVE SUSTAINABILITY OF BRAZILIAN ETHANOL INDUSTRY

While in the 1970s and 1980s, the main requirement of the ethanol industry was to maintain a cost 70 percent that of gasoline to be competitive, today it is important not only to have low prices but also to guarantee the sustainability of the production process to maintain the social license to operate in the domestic market and to participate in the global biofuel market.[113]

---

[105] CGEE, *supra* note 7, at 28.

[106] *Id.*

[107] *See* Emerson Kloss, Transformação do Etanol em Commodity: Perspectivas para Uma Ação Diplomática Brasileira 59 (Feb. 2011) (unpublished thesis, Rio Branco Institute, Ministry of Foreign Affairs, Brasilia) (on file with author).

[108] Rodriguez de Souza, *supra* note 96, at 39.

[109] UNICA & APEX, *supra* note 84.

[110] *Id.*

[111] *Id.*

[112] *Id.*

[113] *See* UNICA – SUGARCANE INDUSTRY ASS'N, 2010 SUSTAINABILITY REPORT 32 (Apr. 14, 2011) [hereinafter UNICA SUSTAINABILITY REPORT].

Sustainability became a central component of the competitiveness of the ethanol industry in 2000.[114] Prompted by external pressure from developed countries, and from increasing domestic concern for economic growth and respect for the environment, sustainability became a must for the biofuel industry to remain competitive.[115] Social, economic, and environmental standards impacted both the local and international market, increasing the demand for better practices with higher levels of scrutiny and transparency.[116]

The Brazilian ethanol industry needed to integrate policies to support the environmental sustainability of sugarcane-based ethanol considering its lifetime GHG emissions.[117] In particular, Brazil needed to define a response to the potential impact on deforestation and biofuel production in sensitive zones.[118] Most of its responses to these concerns were shared between the state and the private sector, and the Brazilian ethanol industry benefited from domestic policies oriented to make the domestic economy greener.[119]

5.1. ETHANOL POLICIES TO INCREASE COMPETITIVENESS AND ENVIRONMENTAL SUSTAINABILITY

During the second term of President Lula Da Silva, ethanol policy was a strategic part of the Brazilian energy goals and a central topic in its foreign policy.[120] This focus was part of a broader understanding of the developmental goals and opportunities for the country, where the production of renewable resources of energy—and in particular, agro-energy—has become a central component of the national development plans.

Ethanol is recognized as an opportunity to strengthen the agricultural sector through the development of a growing agro-energy industry.[121] In terms of energy goals, ethanol production makes an important contribution to Brazilian energy security and autonomy by

---

[114] Interview with representative of UNICA, in São Paulo (Oct. 2011) (on file with author).

[115] *Id.*

[116] *Id.*

[117] *See* UNICA – SUGARCANE INDUSTRY ASS'N, *supra* note 113, at 33–34.

[118] *Id.* at 82.

[119] Interview with representative of the Secretary of Environment, in São Paulo State (Sept. 2011) (on file with author).

[120] INSTITUTO LULA, *supra* note 104.

[121] BRAZILIAN AGROENERGY PLAN, *supra* note 80, at 8.

reducing dependence on oil for transport fuels,[122] but it also makes an important contribution to Brazil's domestic GHG emission savings by partially replacing fossil fuels in both the transport sector and electricity sector thanks to co-generation.[123] These contributions facilitate the country's fulfillment of its commitments as part of the Brazilian climate change policy, and solidify Brazil's position as a global leader in the production and consumption of renewable energy.[124] Furthermore, the ethanol industry has been recognized as an important contributor to socio-economic development, given its higher labor intensity in comparison with the petrochemical industry[125] and the better conditions offered to workers in comparison with other industries in the agricultural sector.[126]

Even though sustainability issues remain,[127] the Brazilian government, together with the private sector, has made an important effort to demonstrate sustainability improvements in the industry in the international arena and the different policies that have created them.

5.1.1. Policies at the Global Level

At the global level, Brazil has worked toward having a voice in the definition of the international environmental agenda, supporting the introduction of renewable energy use targets in developed and developing countries.

In an attempt to build an international market for biofuels, the Brazilian government and its private sector, worked on defining an

---

[122] *Id.* at 7–8.

[123] Ministério da Ciência e Tecnologia, Brasília, *Comunicação Nacional Inicial do Brasil à Convenção—Quadro das Nações Unidas sobre Mudança do Clima*, 97 (novembro 2004), *available at* http://www.mct.gov.br/upd_blob/0205/205854.pdf, *translated in* Ministry for Science and Technology, Brazil's Initial National Communication to the United Nations Framework Convention on Climate Change, Brasilia, 99 (Nov. 2004), *available at* http://unfccc.int/resource/docs/natc/brazilnc1e.pdf.

[124] *Decreto n˚ 6.263 de 21 de Novembro de 2007: Plano Nacional sobre Mudança do Clima – Versão para Consulta Pública*, GOVERNO FEDERAL COMITÊ INTERMINISTERIAL SOBRE MUDANÇA DO CLIMA, at 28, 44 (Sept. 2008), *available at* http://www.mma.gov.br/estruturas/169/_arquivos/169_29092008073244.pdf.

[125] Michelle Ratton Sanchez Badin & Daniela Helena Godoy, Regulatory Challenges of International Trade for Brazil and Some Lessons from the Promotion of Ethanol (Sept. 2010) (unpublished manuscript) (on file with author).

[126] Walter et al., *supra* note 28, at 5713.

[127] The Brazilian government keeps promoting policies to improve the sustainability of the ethanol industry. It is under discussion that the Forest Code might have an important impact on Sugarcane producers among others.

international standard for the intrinsic quality of ethanol. In 2007, Brazil initiated the Tripartite Task Force on Biofuel Standards (which included Brazil, the European Union, and the United States) and the International Biofuels Forum, which works toward harmonizing the standards and codes for the biofuels industry.[128] This effort was complemented by negotiations between the International Organization for Standardization, the Global Bioenergy Partnership, and the World Trade Organization.[129] In addition, during 2007, the European Commission and the European Committee for Standardization—in conjunction with the United States' National Institute of Standards and Technology and Brazil's National Institute of Metrology, Standardization, and Industrial Quality—worked toward finding compatibility for biofuel-related standards in their respective regions.[130]

In response to arguments from environmental organizations about the potential negative environmental impact of biofuels, the Brazilian government, in conjunction with the private sector (represented by the Brazilian Sugarcane Industry Association (UNICA)), assumed a twofold strategy. It adopted a defensive position against the risks associated with the introduction of environmental criteria regarding the technical barriers to trade, and it also introduced policies in the domestic realm to increase the sustainability of the production processes.

Brazil had support claims that sustainability criteria might create technical barriers to trade, based on the protected domestic biofuel producers in other developed countries that have grown under heavy state support and displayed serious difficulties competing without subsidies.[131] The Brazilian response to the EPA and RED's sustainability criteria was to emphasize the country's efforts at the international level to influence the definition of "sustainability criteria" that might affect their biofuel production and the prospect of building an international biofuel market.

---

[128] Tripartite Task Force Brazil, European Union & United States of America, White Paper on Internationally Compatible Biofuel Standards 5 (Dec. 31, 2007), *available at* http://ec.europa.eu/energy/renewables/biofuels/doc/standard/2007_white_paper_icbs.pdf.

[129] Kloss, *supra* note 107, at 47.

[130] INMETRO, *Programa Brasileiro de Certificação em Biocombustíveis*, http://www.inmetro.gov.br/painelsetorial/biocombustiveis/index.asp (last visited June 1, 2012).

[131] INSTITUTO LULA, *supra* note 104.

5.1.2. The Brazilian Response to the EPA Sustainability Criteria

When the EPA began discussing sustainability criteria, the Brazilian Embassy in Washington DC expressed concern from the Brazilian government. The main issues Brazil had was the methodology proposed for calculating the GHG emissions of biofuels, as there was no consensus in the international scientific community about how to calculate the indirect land-use change.[132] The Brazilian government requested that the EPA bring together expert scientists from both countries, under part of the scientific cooperation component of the Memorandum of Understanding signed by both countries in 2007.[133] Brazilian experts from both the private and public sector actively participated in these consultations conducted by the EPA, focusing particularly on the effects of ILUC.[134]

In 2010, in response to the EPA proposal to classify biofuels regarding their lifetime GHG emission savings, Brazilian researchers developed a model called the Brazilian Land-Use Model ("BLUM"), which would be integrated with the EPA model.[135] The BLUM adjusted the calculations made by the EPA (calling for a 44 percent reduction in emissions of GHG emission) to meet the reality of Brazilian production, so that the balance of emission would be as accurate as possible.[136] As a result, the final model found that the GHG emission savings of Brazilian sugarcane-based ethanol was 61 percent, which led to the classification of sugarcane-based ethanol as "advanced" for the purposes of the Renewable Fuel Standard two (RFS-2) and increased the percentage of ethanol that could be exported to the American market.[137]

---

[132] Kloss, *supra* note 107, at 99.

[133] *Id.*

[134] *Id.* at 100.

[135] *Brief Description for the Brazilian Land Use Model – BLUM*, INST. FOR INT'L TRADE NEGOTIATIONS [ICONE], http://www.iconebrasil.org.br/en/?actA=1&areaID=37&secaoID=140&conteudoID=42 (last visited July 1, 2012).

[136] *Id.*

[137] Kloss, *supra* note 107, at 101.

5.1.3. Brazilian Response to the European Union's Renewable Energy Directive

To address the discussion about ILUC and the implication of the RED, the Brazilian government exerted its influence through multilateral and bilateral bodies. Together with other developing countries interested in exporting biofuels to the EU markets, Brazil created the Brussels Group, [138] which worked with the EU Parliament and the EU Commission to discuss the group's concerns about the implementation of measures to address ILUC effects based on controversial scientific evidence. The group also voiced its concerns about the trade implications of imposing sustainability criteria that might become technical barriers to trade.[139]

Additionally, the Brazilian Mission in the European Union followed the progress of the discussions and articulated the submission of comments to the public consultations from the Commission.[140] In 2009, as part of the bilateral strategy to address the RED, the director of the Department of Energy in the Ministry of Foreign Affairs, André Corrêa do Lago, held meetings with representatives from Directorate General for Transport and Energy (DG-TREN) and the Director of International affairs from Directorate General Environment.[141] The Brazilian government maintained its commitment to improving the sustainability of ethanol production and demanded a discussion about the methodology used to measure GHG emission savings.[142]

Consistent with the method used in the EPA sustainability criteria, the Brazilian researchers were mobilized to provide sound data to support the differentiation of sugarcane-based ethanol from other biofuels.[143] Most Brazilian efforts to strengthen the domestic and international market for biofuels have been built upon a strong research effort to differentiate Brazilian ethanol from other biofuels to address the doubts that have been raised about the actual benefits of biofuels regarding the mitigation of GHG emissions.[144]

---

[138] The Brussels group is conformed by Argentina, Brazil, Colombia, Indonesia, Malasya, Maurice Island, Mozambique, Sierra Leone and Sudan. *Id.* at 108.

[139] *See id.*

[140] *Id.* at 109.

[141] *Id.*

[142] *Id.* at 110.

[143] Interview with a policy maker from the Brazilian Ministry of Foreign Affairs, in Brasilia (Sept. 2011) (on file with author).

[144] *Id.*

Many domestic universities in Brazil and research centers that specialize in ethanol production have deployed time and energy to support a research-based lobby to argue the comparative benefits of Brazilian ethanol, to provide their estimates for GHG emissions, and to introduce a detailed analysis of production processes to calculate the net GHG emission saving.[145] Most universities in the country, such as the University of Campinas, University of São Paulo, and Federal University of Rio de Janeiro, have developed research centers specialized in agro-energy, especially in sugar-based energy.[146] Their efforts have been directed at generating information to discuss if the ethanol industry can fulfill the requirements of different international sustainability criteria for biofuels, focusing their analyses on the effect of land use change, including the direct and indirect impacts, socio-economics benefits, and the impacts of ethanol production analysis at a regional level.[147] Among these effects, it is important to understand the potential impacts on water availability and quality, the impacts of fertilizers and agro-chemical use alongside biomass production, soil impacts, and the effect of biofuel expansion and loss of biodiversity.[148]

Part of the concern is that to produce biofuels there are a variety of raw materials, agricultural techniques, production methods, and technologies applied that directly influence the energy balance, and consequently, the balance of the greenhouse gas emission that need to be taken into account to address in the sustainability criteria for the biofuels market.[149]

5.1.3.1. Brazilian Responses to the Commission Public Consultations

In the pre-consultation held by the Commission, the Brazilian government contested the introduction of policies to address ILUC impacts as part of the REDD, arguing there is no agreed scientifically

---

[145] Interview with a researcher from The University of São Paulo, in São Paulo (Sept. 2011) (on file with author).

[146] *Agronegócios: Bioenergía*, AGENCIA PAULISTA DE PROMOÇÃO DE INVESTIVEMENTOS E COMPETITIVIDADES, http://www.investe.sp.gov.br/setores/bioenergia.

[147] For further information about research projects in agroenergy and ethanol production in Brazilian research centers, see *Projetos Cenbio*, CENTRO NACIONAL DE REFERÊNCIA EM BIOMASSA, http://cenbio.iee.usp.br/projetos.htm#cana (last visited July 1, 2012); *IAC Relatórios*, INSTITUTO AGRONÔMICO [IAC], http://iac.impulsahost.com.br/publicacoes/relatorio_ativ_iac/; *Projetos e Publicações*, NÚCLEO INTERDISCIPLINAR DE PLANEJAMENTO ENERGÉTICO [NIPE], http://www.nipeunicamp.org.br/site/home.php?pagina=nipeemfoco.php?codigo_pasta=14.

[148] Walter et al., *supra* note 28, at 5703, 5715.

[149] Guardabassi, *supra* note 19, at 18.

based methodology to calculate GHG emissions from indirect land-use changes caused by any activity, including the production of biofuel feedstock.[150][151] [152]

To address the potential effects of ILUC, the Brazilian government and UNICA stand in favor of a multilateral response.[153] For them, the best alternative was the definition of guidelines and policy alternatives in the frame of the United Nations Framework Convention for Climate Change (UNFCCC) to deal with the issue of greenhouse gas emissions due to indirect land-use change through the promotion of sustainable management practices in carbon-rich habitats, particularly in developing countries, through the promotion of positive incentives for Reducing Emissions from Deforestation and Degradation ("REDD") and the implementation of national policies that would have an impact on land-use strategies of any given country.[154]

As part of its policy alternatives, Brazil emphasized the need to provide developing countries with financial support, technology, and the building capacity to enhance these countries' ability to reliably estimate changes in forest cover and the associated changes in carbon stock.[155] In addition, UNICA also called on the European Union to recognize the efforts made in some countries, such as Brazil, to establish sound land use management practices and encourage the use of land which is both available and suitable for crops for biofuels without displacing other crops and sensitive areas.[156]

An alternative to addressing ILUC effects though a multilateral response might benefit developing countries. First, because a multilateral response allows participation in the choice of criteria and methodologies that will measure the impact of ILUC, it reduces the risk of the adoption

---

[150] *Possible Elements of a Policy Approach – Comments from Brazil*, EU COMMISSION (2009) [hereinafter *Comments from Brazil*].

[151] *Comments by the Brazilian Sugarcane Industry Association to European Commission's Pre-Consultation on Policy Options to Address Indirect Land Use Change*, UNICA (Oct. 29, 2009), *available at* http://sugarcane.org/resource-library/unica-materials/UNICA%20Comments%20ILUC%20-%2028%20Out%202010.pdf [hereinafter *UNICA Pre-Consultation*].

[152] José Goldemberg & Suani Coelho, Renewable Energy Directive – Indirect land use changes – Possible Elements of a Policy Approach: Comments from José Goldemberg and Suani Coelho – CENBIO University of São Paulo, Brazil (July 16, 2009) (unpublished correspondence) (on file with author).

[153] *UNICA Pre-Consultation*, *supra* note 151, at 3.

[154] *Comments from Brazil*, *supra* note 150, at 3.

[155] *Id.*

[156] *UNICA Pre-Consultation*, *supra* note 151, at 8.

of unjustified or discriminatory measures and prevent the proliferation of standards and procedures to be followed to meet the sustainability requirements required by importing countries. The higher the harmonization of requirements, the lower the transaction costs for economic agents and the greater the possibility that biofuels will reach the condition of international commodities.[157] Second, the possibility of addressing sustainability criteria in multilateral forums could potentially facilitate the definition of international standards oriented to achieve a better balance between the environmental, social, and economic dimensions of development. This would allow developing countries to manage their resources in favor of their domestic interests.[158]

5.1.4. Bilateral Agreements and South-South Technical Cooperation to Promote a Sustainable Biofuel Production

Part of Brazil's international agenda is to demonstrate that there is a possibility to produce biofuels in a sustainable way in the global south.[159] To this end, Brazil has signed numerous agreements for technical cooperation with other developing countries with the aim of increasing the production of biofuels globally, but also to use their biofuels production experience as a tool for south-south cooperation for development.[160] Most agreements have included research into alternative raw material for the production of biofuels, as well as academic and scientific exchange.[161] To date, the Department of International Acts of the Ministry of Foreign Affairs ("MRE-DAI") has evidence of more than twenty-two bilateral or multilateral agreements in the energy sector between 2004 and 2008.[162] Specifically, in 2007, at the India-Brazil-South Africa Dialogue (IBSA) Summit, Brazil, South Africa, and India committed themselves to facilitating technology transfer and to promote the production and consumption of renewable fuels with the goal of

---

[157] Kloss, *supra* note 107, at 111.

[158] Interview with a policy maker from the Ministry of Agriculture, Livestock and Food, in Brasilia (Sept. 2011) (on file with author).

[159] Interview with a policy maker from the Brazilian Agency of Cooperation, in Brasilia (Sept. 2011) (on file with author).

[160] *Id.*

[161] Interview with a policy maker from EMBRAPA Agroenergy, in Brasilia (Sept. 2011) (on file with author).

[162] Erika Cruz Johnson, O Etanol Como Alternativa Energética e Sua Consolidação na Política Extrena Brasileira no Governo Lula 57–58 (2010) (unpublished thesis, University of Brasilia), *available at* http://bdm.bce.unb.br/bitstream/10483/1036/1/2010_ErikaCruzJohnson.pdf.

establishing a global market for biofuels, particularly ethanol.[163] Additionally, in 2007, the United States and Brazil signed a Memorandum of Understanding, which included technical cooperation with countries in the Caribbean to evaluate the feasibility of biofuel production.[164] As part of this objective, the Brazilian National Agricultural and Livestock Research Organization ("Embrapa") opened offices in African countries and participated in technical cooperation through projects established by the Brazilian Agency of Cooperation ("ABC") and also supported and participated in various activities and negotiations of international cooperation in science and development promoted by the Ministry of Science and Technology.[165]

As part of the Memorandum of Understanding with United States, the Getulio Vargas Foundation ("FGV") was commissioned to carry out feasibility studies for biofuel production in El Salvador, Haiti, and the Dominican Republic.[166] The study corresponding to Saint Kitts and Nevis was the responsibility of the Organization of American States (OAS), which was later supplemented by a new study from FGV.[167] The studies were carried out by Brazilian experts in agro-energy in subtropical zones and took into account a complete survey of the physical, social, economic, and regulatory infrastructure that may impact the opportunities for bioenergy production, including economic, social, and environmental criteria.[168] Upon completion of the initial phase of activities with the first group of countries, Brazil and the United States decided to expand the scope of cooperation to include five new countries, three from Central America and the Caribbean (Guatemala, Honduras, and Jamaica) and two from Africa (Guinea Bissau and Senegal).[169]

For each country, the studies considered detailed information about the conditions and requirements for the government and private actors in each country to produce biofuels.[170] In the second stage, the

---

[163] *Id.* at 57.

[164] Kloss, *supra* note 107, at 12.

[165] Aline Fernandez, A Cooperação Científica e Tecnológica no Âmbito Da Cooperação Sul-sul Um Olhar na Perspectiva da Inserção Internacional Brasileira (2011) (unpublished thesis, Universidades de Brasilia), *available at* http://bdm.bce.unb.br/bitstream/10483/2420/1/2011_AlineReginaFernandes.pdf.

[166] GETULIO VARGAS FOUNDATION, FEASIBILITY ANALYSIS FOR BIOFUEL PRODUCTION AND INVESTMENT RECOMMENDATION 5–7 (2009), *available at* http://fgvprojetos.fgv.br/sites/fgvprojetos.fgv.br/files/328.pdf.

[167] Kloss, *supra* note 107, at 77.

[168] GETULIO VARGAS FOUNDATION, *supra* note 166, at 8.

[169] Kloss, *supra* note 107, at 78.

[170] *See* GETULIO VARGAS FOUNDATION, *supra* note 166, at 16.

studies assumed that government should, based on the recommendations made, elect one or more priority projects so that they could work with multilateral organizations to promote resources for the next phase or articulate efforts with private investments.[171] In Africa, studies are being conducted in partnership with the United Nations Environment Program[172] In Senegal, the first African country included in the study, the team of analysts from the FGV identified projects to be implemented in the country, with high profitability and good prospects for replication.[173]

Most of the technical cooperation projects included a component of institutional capacity development to help carry out basic research activities to support the industry[174] These projects also include a technical capacity component to manage environmental sustainability policies, through, for example, transfer of technology to develop agro-ecological zonings to rationalize agricultural activities.[175]

5.2. ETHANOL POLICIES IN THE DOMESTIC REALM

The most important Brazilian plan for the ethanol industry was the National Agro Energy Plan ("PNA," 2006–2011), which had the purpose to organize and develop a program oriented to guarantee the sustainability and competitiveness of the agro-energy supply chain.[176] Embrapa, a well-respected Brazilian research institution with international renown, launched Embrapa Agro energy, which acted to coordinate, execute, and integrate national and international research networks, involving managers and researchers from thirty-seven other units.[177] It also included investment in facilities like laboratories and funding for pilot projects in cooperation with the private sector with the aim of facilitating technological transfer to the different stages of the bioenergy supply chain.[178] Embrapa Agro energy pursues energy, environmental, and socioeconomic objectives. On the one hand, it has to

---

[171] *Id.*

[172] Kloss, *supra* note 107, at 79.

[173] Interview with a researcher from the Getulio Vargas Foundation, in São Paulo (Oct. 2011) (on file with author).

[174] Interview with a representative from EMBRAPA Agroenergy, in São Paulo (Oct. 2011) (on file with author).

[175] Interview with a researcher from the Getulio Vargas Foundation, in São Paulo (Oct. 2011) (on file with author).

[176] *See* BRAZILIAN AGROENERGY PLAN, *supra* note 80, at 8.

[177] *See id.* at 32–33.

[178] *See id.* at 20–21, 33.

contribute to increase the participation of renewable energy in the national energy balance, while on the other hand the program operates in compliance with the Brazilian environmental policy to support the sustainability of the industry.[179] In particular, it is expected that more sustainable production of ethanol can facilitate the fulfillment of the Brazilian commitment to the Kyoto Protocol and take advantage of the opportunities in the frame of the Clean Development Mechanism to obtain carbon credits.[180] Additionally, it is expected that Agro energy could contribute to create opportunities for the expansion of employment and income generation within the scope of agribusiness, with increased participation of small farmers.[181]

5.2.1. Productivity Improvements

It is widely recognized that the best alternatives to manage the energy balance of biofuels requires efficiency gains in feedstock production and manufacturing processes.[182] In particular, productivity improvements might diminish biofuel expansion to fulfill a growing demand, and the introduction of renewable energy in the production process could positively affect their energy balance after considering the net impact in their lifecycle production process.[183]

In the case of Brazil, due to the technological developments achieved both on the agricultural and industrial sides, average production yields have grown from 3,000 litres/ha[184]/year (67 GJ/ha/yr) in the early 1980s to 6,500 litres/ha/year (145 GJ/ha/yr) in 2005.[185]

The growth of sugarcane yields has been mostly due to the development of cane varieties, an effort that also aims to increase the sugar content in the sugarcane (expressed by the total reducing sugars index, or TRS).[186] To give an idea of the evolution of sugarcane in the past twenty-five years, the TRS almost doubled and the best practice

---

[179] *See id.* at 32.

[180] *See id.* at 8–10.

[181] *Id.* at 9.

[182] INT'L ENERGY AGENCY [IEA], *supra* note 22, at 12.

[183] *See generally* UNICA SUSTAINABILITY REPORT, *supra* note 133, at *passim*.

[184] Hectare (Ha) is a metric unit of area defined as 10,000 square metres (100 m by 100 m), and primarily used in the measurement of land.

[185] ARNALDO WALTER ET AL., A SUSTAINABILITY ANALYSIS OF THE BRAZILIAN ETHANOL 22 (2008).

[186] *Id.*

figures are close to 15 percent of TRS.[187] In terms of production costs, the largest share of the total feedstock cost reduction was due to the development of new varieties of sugarcane with indirect impacts on the costs of soil preparation, planting, stock maintenance, and land rents.[188] The area cultivated in 2008–09 for the sugarcane harvest was 7.8 million ha, which represents 0.9 percent of the national territory.[189] It is expected that the expansion of sugarcane production for 2017 will be 6.7 million ha, equivalent to an additional 0.8 percent increase to the national territory.[190]

Cogeneration is an important opportunity for sugarcane and ethanol producers, to the extent that it contributes to the autonomy in energy consumption in mills and distilleries and significantly reduces the carbon footprint of ethanol production.[191] Bagasse from the crushing operation can be burned in the mills' boilers, which make the mills self-sufficient in energy and lowers their consumption of diesel in the production process.[192] Additionally, it is a potential opportunity to supply electricity produced by biomass to the general electric system, making a global contribution to GHG emission savings in the country.[193] In many cases, the mills have energy surpluses, which can be sold to the general system of electricity.[194] In fact, in 2004, total power generated was more than 4 GWh during the harvest, or approximately 3 percent of the country's annual power generation capability.[195] In addition, cogeneration from sugarcane bagasse has been identified as a possibility for selling carbon credits in the framework of the Clean Development Mechanism (CDM) as part of the Kyoto Protocol.[196] Since the methodology to demonstrate GHG emission savings with this procedure has already been

---

[187] *Id.*

[188] *Id.* at 24.

[189] UNICA, MINISTRY OF AGRICULTURE, SUGARCANE AGROECOLOGICAL ZONING TO EXPAND PRODUCTION, PRESERVE LIFE, AND ENSURE A FUTURE 6 (2009), *available at* http://www.unica.com.br/downloads/sugarcane-agroecological-zoning.pdf [hereinafter SUGARCANE AGROECOLOGICAL ZONING].

[190] *Id.*

[191] *See* BRAZILIAN AGROENERGY PLAN, *supra* note 80, at 67, 107–08.

[192] José Goldemberg et al., *The Sustainability of Ethanol Production from Sugarcane*, 36 ENERGY POL'Y. 2086, 2087 (2008).

[193] *See* BRAZILIAN AGROENERGY PLAN, *supra* note 80, at 67, 107–08.

[194] Goldemberg et al., *supra* note 192, at 2087.

[195] BRAZILIAN AGROENERGY PLAN, *supra* note 80, at 67.

[196] Eduardo Leão de Sousa, *The Sugar-Energy Industry and the Challenges of the Carbon Market*, OPINIÕES MAG., July 2009, *available at* http://english.unica.com.br/opiniao/show.asp?msgCode={3DEE814E-A2A1-40B6-97A9-8A0452491CB5}.

approved, many projects will probably be submitted and many more initiatives will arise, such as those using rice straw and wood industry residues, among others.[197]

Additionally, bio-electricity from sugarcane is a particularly interesting option for Brazil because it is a natural complement to hydro power, the main energy resource for electricity generation in the country. The sugarcane harvesting period, when most biomass is available, coincides with the dry season when hydro-electric power stations are affected by lower levels of water in their reservoirs.[198]

In 2002, to promote cogeneration and the use of sugarcane bagasse as a renewable energy source for electricity, the government launched the National Program of Incentives for Alternative Electricity Sources ("PROINFA").[199] This initiative posits a set of incentives to increase the participation of renewable sources in electricity generation, emphasizing the contribution of biomass, wind, and micro-hydropower.[200] Additionally, the Brazilian National Development Bank ("BNDES") has special financing available for these renewable projects as well as up to 70 percent of capital costs, excluding site acquisition and imported goods and services at the basic national interest rates plus 2 percent of basic spread and up to 1.5 percent of risk spread, although no interest is charged during construction.[201]

5.2.2. Changes in the Domestic Environmental Regulations

The Brazilian environmental legal framework is deeply rooted in a series of laws, statutes, and environmental management systems generally considered to be quite advanced and relatively strict compared to most other developing countries.[202] Unfortunately, many of these ambitious policies on paper are very difficult to enforce in practice.[203]

---

[197] UNICA & APEX, *supra* note 84.

[198] *Id.*

[199] *See* PROGRAMA DE INCENTIVO AS FONTES ALTERNATIVAS DE ENERGIA ELÉTRICA [PROINFA], http://www.mme.gov.br/programas/proinfa (last visited Feb. 1, 2012).

[200] *Id.*

[201] SUGARCANE AGROECOLOGICAL ZONING, *supra* note 189.

[202] Renata Teixeira de Andrade & Andrew Miccolis. *Policies and Institutional and Legal Frameworks in the Expansion of Brazilian Biofuels* 14 (Center for Int'l Forestry Res., Working Paper No. 71, 2011), *available at* http://www.cifor.org/publications/pdf_files/WPapers/WP71CIFOR.pdf (2011).

[203] *See id.*

As part of the legal framework to improve environmental sustainability of sugarcane and ethanol production, the Sugarcane Agro-ecological Zoning Decree and the Green Protocol from the state of São Paulo are remarkable for their direct impact on ethanol production processes.

5.2.2.1. The Sugarcane Agro-ecological zoning

The Ministry of Agriculture and Embrapa, in collaboration with the ethanol production sector, developed the Sugarcane Agro-ecological Zoning Project. This project seeks to provide a framework to rationalize the expansion of sugarcane plantations and foster the production of green ethanol.[204] The project consisted of a thorough study of the Brazilian regions' weather and soil that took into account environmental, economic, and social aspects to guide the sustainable expansion of the sugarcane production and investments.[205] The orientations provided by the study led to a proposed statute, which the government submitted to the Brazillian congress for discussion on September 17, 2009.[206]

The Sugarcane Agro-ecological Zoning Decree provides incentives for the private sector to foster an environmentally and socially sustainable production process.[207] It seeks to protect natural reserves and forestry through prohibition of the construction or expansion of sugarcane farms and production plants in any area of native vegetation, or in the Amazon, Pantanal (containing the Brazilian wetlands), or the Upper Paraguay River Basin.[208] It also offers plantations the alternative to expand to zones with natural conditions for more sustainable production and more efficient irrigation practices. These zones could facilitate mechanized harvesting instead of cane burning and the reutilization of eroded land for new projects.[209] Considering the criteria applied in the decree, the current extension of sugarcane plantations, equivalent to 1.5 percent of the Brazilian territory, could be expanded to 7.5 percent, equivalent to 64.7 million hectares.[210]

---

[204] *See* SUGARCANE AGROECOLOGICAL ZONING, *supra* note 189, at 2.

[205] *Id.* at 3.

[206] *See* SUGARCANE AGROECOLOGICAL ZONING, *supra* note 189, at 6.

[207] *Id.* at 2.

[208] *Id.* at 4.

[209] *Id.* at 5, 10.

[210] LUIZ DO AMARAL, UNICA, MERCADO EXTERNO & SUSTENTABILIDADE: GERENTE DE SUSTENTABILIDADE 31–32 (2010).

Although the plan is still a decree and has not yet been passed by the Brazilian Parliament, based on information gathered through interviews with policy makers, the Agro-ecological zoning has shown a high level of efficiency in controlling the investment in protected zones.[211] The main factor explaining this effectiveness is that the financial sector has included compliance with the zoning to condition granting of credits for production expansion.[212] The National Monetary Council has enforced that decision affecting the private banks, and the Brazilian National Development Bank has pursued the same policy.[213] Additionally, limiting expansion to protected zones has worked by denying environmental permits in these regions.[214]

The legislative process to convert the Agro-ecological zoning into law has been conditioned upon a reform discussion about the Brazilian Forest Code, which states that all rural properties must set aside a percentage of land as "legal reserves," where the native vegetation must be preserved under the Forest Code. [215] This law also determined that the banks of all water bodies (such as rivers, lakes, streams, and springs), as well as steep hillsides and ridges, must also be preserved in Permanent Preservation Areas.[216] The distance from either side of riverbanks that must be left intact, which varies according to the width of the river, ranges from 30 to 500 meters.[217] Currently, the percentage of legal reserve required varies per eco-region in Brazil, from 80 percent in the Amazon, 35 percent in stretches of the Cerrado (within the "Legal Amazon," and 20 percent throughout the rest of the country.[218] Upon receiving a new land title, landowners are obliged to map and commit to preserving—and recovering in the case of degraded lands—these two parts of their land.[219] While these legal provisions are extremely difficult to enforce in vast swathes of hard-to-reach lands, especially in the

---

[211] Sanchez Badin & Godoy, *supra* note 125, at 5.

[212] *Id.* at 2.

[213] Interview with a representative from the Ministry of Agriculture, Livestock and Food, in Brasilia (Oct. 2011) (on file with author).

[214] Renata Marson Teixeira de Andrade and Andrew Miccolis, *The Expansion of Sugarcane Ethanol in Brazil and Controversies Surrounding Human Rights*, *in* CONTROVERSIES IN SCIENCE & TECHNOLOGY. VOLUME 3: FROM EVOLUTION TO ENERGY 214, 214–16 (Daniel Lee Kleinman et al. eds., 2010).

[215] Goldemberg et al., *supra* note 192, at 2091.

[216] Lei Nº 12.651, 25 de Maio de 2012, DIÁRIO OFICIAL DA UNIÃO [D.O.U.] de 28.5.2012 (Braz.), *available at* http://www.planalto.gov.br/ccivil_03/_Ato2011-2014/2012/Lei/L12651.htm#art83.

[217] *Id.*

[218] *Id.*

[219] *Id.*

Amazon, they do act as substantial constraints on expanding biofuels in the northern and parts of midwesteren Brazil, where the Legal Amazon' is located.[220]

According to an assessment by the Luiz de Queiroz College of Agriculture Environmental Program at the University of São Paulo, the average legal reserve in São Paulo cane mills ranges from 8 to 12 percent, which is only half of the 20 percent required by the environmental code for the southeast.[221] The Luiz de Queiroz College of Agriculture in association with UNICA and the Organization of Sugarcane Planters of the State of São Paulo ("ORPLANA") have been working on a project to install reforestation projects in 1.8 million hectares in São Paulo, which includes lands associated with thirty-three mills.[222] Moreover, UNICA and ORPLANA are lobbying the federal government to prevent Decree 6.686/2008 from coming into effect.[223] The Decree of 6.686/2008 amends and includes provisions in Decree 6514 of 22 July 2008, which regulates for offenses and administrative penalties to the environment and establishes the federal administrative process for investigating these offenses.[224] This law instituted a 120-day deadline for landowners to register legal reserves occupying 20 percent of their properties or else face fines.[225]

Changes to the forest code are currently a matter of political discussion in Brazil. Recently, President Dilma Rouseff vetoed a reform proposed by transversal representatives of landowners in the parliament, which offered amnesty to landowners who violated the standards of biomass preservation set in 1989 and deforested thirty meters of Permanent Preservation Areas on the banks of rivers up to ten feet wide.[226]

---

[220] de Andrade & Miccolis, *supra* note 202, at 18.

[221] *Id.* at 19.

[222] *Id.*

[223] *Id.*

[224] Decreto Nº 6.686, de 10 de Dezembro de 2008, DIÁRIO OFICIAL DA UNIÃO [D.O.U.], nº 241: 10–12 de 11.12.2008 (Braz.), *available at* http://www.mma.gov.br/port/conama/legiabre.cfm?codlegi=595.

[225] de Andrade & Miccolis, *supra* note 202, at 19.

[226] Presidência da República, Mensagem Nº 212, de 25 de Maio de 2012 (Braz.), *available at* http://www.planalto.gov.br/ccivil_03/_Ato2011-2014/2012/Msg/VEP-212.htm.

5.2.3. Agro-environmental Protocol in the State of São Paulo

Close to 60 percent of the total production of ethanol takes place in the state of São Paulo, one of the most active states in the country in pursuing sustainability criteria to regulate its economic activity and development.[227] Environmental objectives for sugarcane ethanol production in São Paulo include the accelerated phase-out of sugarcane crop-burning practices; water conservation and the protection of water bodies; protection of the remaining forests; recovery of riparian areas and biodiversity corridors; minimization of emissions to air, water, and soil; prevention of soil erosion; adequate management of agrochemical use; the enforcement of fair labor practices; and the encouragement of environmental education and public awareness.[228] Legislation enacted in 2002 (Law 11,241) regulated agricultural burning practices and restricted burning to 25 percent of mechanized and 13.35 percent of non-mechanized areas (Decree 45,689).[229] Using 2008 as a reference year, the restriction of burning in areas suitable for mechanical harvesting could allow for a reduction in GHG emissions in a volume equivalent to six million tons of carbon dioxide.[230] This means that Brazil would avoid annual carbon dioxide emissions equivalent to the emissions from 2.2 million light vehicles.[231]

In 2007, the State of São Paulo, in conjunction with the Sugarcane Business Association UNICA, launched the Agro-environmental Protocol of the State, also called the Green Ethanol Protocol.[232] The text of the protocol stipulates a set of measures to be followed, accelerating the legal deadlines for the elimination of sugarcane harvest burning and immediately halting burning practices in any sugarcane harvests located in expansion areas.[233] It further targets the protection and recovery of riparian forests and water springs in sugarcane

---

[227] SUGARCANE AGROECOLOGICAL ZONING, *supra* note 189, at 10.

[228] Guardabassi, *supra* note 19, at 85–86.

[229] Lei Nº 11.241, de 19 de Setembro de 2002 de Sáo Paulo (Braz.), *available at* http://www.iea.sp.gov.br/out/bioenergia/legislacao/2002_Lei_Est_11241.pdf (establishing a progressive reduction of burning practices).

[230] SUGARCANE AGROECOLOGICAL ZONING, *supra* note 189, at 10.

[231] *Id.*

[232] Press Release, UNICA, Unica Divulga Comunicado Sobre Protocolo Agroambiental (Oct. 30, 2007), *available at* http://www.unica.com.br/noticias/show.asp?nwsCode={23231EDC-4EF2-41C8-BAD6-1A547CB6F9C8}.

[233] São Paulo State & UNICA, Green Ethanol Protocol (June 4, 2007), *available at* http://www.unica.com.br/userFiles/Protocolo_Assinado_Agroambiental.pdf.

farms, controls erosion and content water runoffs, implements water conservation plans, stipulates the proper management of agrochemicals, and encourages reduction in air pollution and solid wastes from industrial processes.[234]

This protocol is a voluntary agreement that specifies a gradual substitution of cane burning by mechanized processes with the aim of contributing to reduce greenhouse gas emission. By 2031, producers should reach the protocol's target of eliminating 100 percent of the cane burning and introduce mechanized harvest.[235] A few non-adherent plants are being targeted by environmental inspections and satellite surveillance helping to focus public efforts in control and inspection.[236] From 2000 to 2005, mechanized harvest increased from 25 percent to 35 percent of total production.[237] In São Paulo, 146 out of 196 ethanol mills have adhered to the protocol, representing 89 percent of the sugarcane currently processed, and the number of sugarcane suppliers that have adhered the protocol is estimated as 13,000.[238]

The program has demonstrated a high level of participation from the private sector achieving positive results.[239] Giving its adhesion rates, it is expected that the due date for phasing out sugarcane burning previous to harvest in areas where it is easier to introduce mechanical process with declivity lower than 12 percent will change from 2021 to 2014.[240] The percentage of harvesting without sugarcane burning in these areas should increase from 30 percent to 70 percent by 2010.[241] In turn, in areas that posit more difficulties to stop sugarcane burning with declivity higher than 12 percent, the due date will change from 2031 to 2017, and unburned sugarcane in these areas will be 30 percent rather than 10 percent in 2010.[242] In addition to the control of sugarcane burning, the protocol includes mandates for soil conservation, including erosion control and contention of water runoff and the implementation of a

---

[234] *Id.* at 2.

[235] *See* Guardabassi, *supra* note 19, at 59.

[236] OSWALDO LUCON, WP4: SUSTAINABILITY OF BIOFUELS PRODUCTION IN LATIN AMERICA 17 (2008), *available at* http://www.ambiente.sp.gov.br/wp-content/uploads/publicacoes/etanol/BioTopWP4.pdf.

[237] UNICA, PROTOCOLO ASSINADO AGROAMBIENTAL, *available at* http://www.unica.com.br/userFiles/Protocolo_Assinado_Agroambiental.pdf (last visited Oct. 30, 2012).

[238] Guardabassi, *supra* note 19, at 86; LUCON, *supra* note 238, at 17–18.

[239] *See* LUCON, *supra* note 236, at 5–6.

[240] *Id.* at 15.

[241] *Id.*

[242] *Id.*

technical plan aimed at water resources conservation.[243] This includes reusing action and a water quality program, the adoption of good practices for packaging agrochemicals waste, and the adoption of good practices aimed at minimize air pollution and optimize recycle of solid wastes.[244]

6. CONCLUSION

With the aim of building a sustainable alternative for fossil fuels, developed countries have imposed sustainability criteria. The main objectives was to generate the right signals to improve biofuel production systems by creating incentives to bring more and better technology to the market while ensuring that biofuels production is not carried out in areas rich in biodiversity.[245]

Since the 2000s, the private and public sector have identified environmental sustainability as a central part of the ethanol comparative and as a aspect that needs to be improved over time to maintain Brazil's competitiveness at the national and international market. Thus, Brazil has pursued a path toward a more sustainable ethanol production by adopting a series of policies to improve the performance of the industry, even when most of its production is currently oriented to the domestic realm.[246] The main factors driving these efforts are the recognition by the government and the private sector of the economic and political benefits of including sustainability as a central component in Brazil's ethanol competitiveness strategy. Sustainability has been identified as a way to contribute to efficiency gains, to increase participation in carbon credit markets, to have a social license to operate with legitimacy in domestic and international markets, and finally, to improve conditions to respond to potential technical barriers to trade that might adopt the form of sustainability criteria.

In institutional terms, Brazil has built a strong policy capacity to carry out initiatives in different realms. The country adapted its Ministry of Foreign Affairs to increase their participation on energy and sustainability topics. Additionally, Brazil strengthened its research capacity to support the differentiation of the Brazilian industry and

---

[243] Guardabassi, *supra* note 19, at 86.

[244] LUCON, *supra* note 236, at 15.

[245] Council Directive 2009/28/EC, *supra* note 5, at 20–24.

[246] *See UNICA Pre-Consultation*, *supra* note 151, at 1.

improvements in productivity together with the enforcement of regulatory frameworks and voluntary schemes to define the rules of the game for the expansion of ethanol production. All of these policies have been developed under the definition of a national plan, which situated ethanol in a strategic role for economic and social development and energy goals for the country.

The Brazilian experience demonstrates the complexities of building a more sustainable practice in biofuel production and the demand for institutional capacity to really achieve a better alternative for fossil fuels. Although sustainability criteria imposed from developed countries might generate the right incentives for producers in the global south, the real capacity to achieve the standards might demand close cooperation between the state and the private sector for the development of a set of institutional arrangements needed to implement the right policies to support an environmentally and socially friendly biofuel production industry.