

GRÖNA BILISTER

**The South in the Driving Seat - A global perspective on
biofuels and sustainability**

The Brazilian road



March 2014

Table of Content

Summary: The views of the Brazilian biofuel sector	3
Methodology for the interviews	4
Introduction	6
The current state of the biofuel sector in Brazil	7
Brazilian stakeholders	8
Producers and their Associations.....	8
Workers union	9
NGOs and other civil society organizations	10
Researchers.....	10
Governmental institutions	10
The sustainability of biofuels	11
Land use change	12
Food vs. Fuel	13
GHG emissions	14
Social impacts	14
Mechanization	17
Social Fuel Certificate for biodiesel.....	18
Economic aspects.....	19
EU RED and the proposal for its amendment	20
Conclusion	22
List of Participants	24
Annex 1 – Questionnaire used during the interviews (in Portuguese)	26

Edgard Dias Batista, M.Sc. in Sustainable Technologies at The Royal Institute of Technology (KTH), is a green tech Consultant at Greenelizer. His recent projects include an initiative at KTH to promote Sustainable Smart Grids in Brazil and a study for the think tank FORES on academic opinions about the sustainability of fuel ethanol. *All photos in this report were taken by the author in Brazil.*

This report is partially funded by SIDA, the Swedish International Development Cooperation Agency. SIDA does not necessarily share the views expressed in this report; the responsibility for the content lies fully with the author.

Summary: The views of the Brazilian biofuel sector

This report is part of the project “The South in the Driving Seat - A global perspective on biofuels and sustainability”. The aim of the project is to give voice to stakeholders from countries in the south with potential to produce biofuels and to learn about their views about the sustainability of biofuels. This report focuses on the opinions of Brazilian stakeholders. Besides questions related to sustainability, we also asked about their opinions on the proposal for amendment of the EU Renewable Energy Directive (EU RED).

For this report we use a broad definition of sustainable development and sustainability. In line with the definition from the United Nation’s Brundtland report, we understand that in order to be considered sustainable a biofuel must meet the energy “needs of the present without compromising the ability of future generations to meet their own needs”,¹ in its economic, social and environmental aspects. Therefore, in order to be sustainable a biofuel should:

- reduce GHG emissions when compared with fossil fuels;
- not be a threat to food production or to sensitive biomes, air and water;
- enhance the well-being of the workers in the biofuel industry;
- not cause health problems in the population;
- be economically viable with a positive cost-benefit relation;
- have positive energy balance, i.e. the energy delivered must be higher than the energy used for produce the biofuel;

All points above should be analysed in order to determine if a biofuel is sustainable, as well as any other aspect considered relevant in a given situation.

We made 15 interviews with producers, workers, governmental institutions and organizations of the civil society. Most of them agree that the biofuel industry is positive for the country and that it is the most sustainable way forward. The main conclusions from the Brazilian stakeholders in the biofuel sector are:

- **The sector goes in the same direction.** Most of local actors in the biofuel sector shares the same opinion about Brazilian biofuels;
- **Biofuel industry.** The Brazilian biofuel is a well-established industry and the concerns about its sustainability are in general well addressed;
- **Sustainable fuels for export.** The Brazilian biofuel, especially the sugarcane ethanol, is a sustainable fuel and therefore there should be no export restrictions against it. Brazilian

1 Brundtland G. H. (1987) Our Common Future. Report of the World Commission on Environment and Development, United Nations.

stakeholders in general are against the proposal for amendment of the EU Renewable Energy Directive;

- **Not all the same.** Biofuel from different edible crops has not the same sustainability performance and should be treated separately;
- **No competition with food.** Brazilian sugarcane ethanol and biodiesel from soya or fat meat do not compete with food production;
- **Users do not pay more for renewable.** Brazil has mandates for the use of ethanol in gasoline (E18 to E25) and biodiesel (B5) and the possibility for use only ethanol in its flex-fuel fleet. The price is the main drive in the decision between ethanol or gasoline and few users are willing to pay more to use a fuel because it is renewable;
- **Labour conditions still to be improved.** Workers in the sugarcane sector have a relatively better situation compared to other rural workers. Mechanized harvesting is also increasing in sugarcane areas. However, the sector has still problems with long working shifts and poor labour conditions in some regions;
- **Local legislation is good enough.** The Brazilian environmental legislation is stringent and should be valid in the EU, reducing the need for doubled certification;
- **Bad signal.** The cap for 1st generation ethanol proposed in the EU directive is considered a negative signal from EU to the international market and should be avoided;

Methodology for the interviews

We utilized a semi-structured questionnaire with general questions about sustainability of biofuels and specific questions about public policies and the EU RED. The questionnaire was used as a general guide during the interview. All 15 interviews were performed face to face in the Brazilian cities of Campinas, Cosmópolis, São Paulo and Brasília or via internet (Skype). The interviews took place during November and December 2013 and were digitally recorded.

The original questionnaire is in Portuguese (annex 1). The summarized translation is the following:

Questions related to the sustainability of biofuels

- Analyse LUC and ILUC related to biofuels;
- Analyse the conflict food versus biofuel;
- Biofuel reduces GHG emissions compared to fossil fuels? How much?
- Is the energy balance positive?
- Are biofuels a threat to sensitive biomes, water, air or biodiversity?
- Social aspects: comment the relation between mechanization and unemployment; conditions similar to slavery in biofuel industry; health impacts of biofuels;
- Economic aspects: Are biofuels economically feasible? Is there any subsidies? What is the potential of biofuel in the Brazilian energy mix?
- Comment the certifications; what is weight of it in the economic result of biofuels?

- Is the Brazilian consumer willing to pay a premium for biofuels?
- Is the communication between Brazilian stakeholders in the biofuel sector good?

Questions related to public policy and the EU RED

- Are public policies in Brazil adequate? Is the process participative?
- Should Brazil prioritize internal or external market? Should the biofuel policies focus on small or large scale?
- Are international policies adequate? Is there any Brazilian delegation participating in its formulation? Comment specifically EU RED, the current version and the proposal for its amendment.

The participants were chosen according to their relevance in the Brazilian context. We tried to cover a broad spectrum of stakeholders related to the biofuel sector, including actors such as producers, producers associations, workers union, governmental institutions, researchers, NGOs and other civil society organizations. The representatives interviewed were from the following organizations:

- ABIOVE, the Brazilian Association of Vegetable Oil Industries, which has 12 members companies who are responsible for approximately 72 percent of the Brazilian soybean processing volume. Brazil is responsible for about 25 percent of the world's soybean production, with the estimated production of 81 million tonnes in the period 2012/13;²
- ECOA – *Ecologia e Ação* (Ecology and action), a Brazilian NGO based in the city of Campo Grande, at the state of Mato Grosso do Sul. The NGO focus its work in the Pantanal area and the Paraguay-Parana Wetland System;
- MDIC - Ministry of Development, Industry and Foreign Commerce, responsible for policies, rules and international negotiation related to foreign trade;
- MME - Ministry of Energy, responsible for national policies about renewable fuels;
- MRE - Ministry of Foreign Affairs (Division of Renewable Energy Sources), responsible for the Brazilian diplomacy and the relation with other countries;
- MST – *Movimento dos Sem Terra* (Landless Workers' Movement), a civil organization that claims land reform and social justice in the rural Brazil;
- Chief of Staff of the Presidency (*Ministério da Casa Civil*), responsible for the coordination of the Federal Biodiesel Program, an inter-ministerial executive commission about biodiesel;
- Raízen, a joint venture between Shell and Cosan, the Brazilian leading manufacturer of sugarcane ethanol producing about 2 billion litres of biofuel per year in 24 sugarcane plants;
- *Rede Social de Justiça e Direitos Humanos* (Social Network of Justice and Human Rights), NGO working with several impacts from the biofuel industry;
- *Repórter Brasil*, NGO with an extensive research in the biofuel sector and responsible for the Biofuel Watch Center;
- UNICA, the Brazilian Sugarcane Industry Association, which members answer for more than 50% of all ethanol produced in Brazil;
- UNICAMP, the Campinas State University (the Energy department of the Mechanic Engineer School). Two researchers from this university were interviewed;

² www.abiove.org.br

- Union of rural workers of the region of Cosmópolis, Arthur Nogueira, Paulínia and Campinas, at the São Paulo state, where workers in the Ester Sugarcane Plant are related;
- *Usina Ester* (Ester sugarcane plant), one of the oldest ethanol and sugar producers in activity in the state of São Paulo, dating back to 1898.

A complete list with names of all representatives and details about the participating institutions can be found in the end of this report.

Introduction

This report is part of the project “The South in the Driving Seat - A global perspective on biofuels and sustainability”, partially funded by Sida. The aim of the project is to give voice to stakeholders from countries in the south with potential to produce biofuels and to learn about their views about the sustainability of biofuels. This report focuses on the opinions of Brazilian stakeholders. Besides questions related to sustainability, we also asked about their opinions on the proposal for amendment of the EU Renewable Energy Directive (EU RED). We interviewed 15 Brazilian actors in the biofuel sector including producers, workers, governmental institutions and civil society organizations. The content of the report is based on their opinions.

Brazil has one of the most developed biofuel industries in the world, and both ethanol and biodiesel are part of the everyday lives of the population. In 2013 the number of flex fuel cars, vehicles able to use both gasoline and ethanol, in the country surpassed 20 million units. Even cars running exclusively on gasoline use up to 25% blended ethanol (E25). Biodiesel use is also increasing and the current mandatory blend is 5% (B5). Biodiesel in Brazil is for most parts made from soya beans and animal fat. Biofuels are important elements of the national energy policy. The Brazilian state promotes ethanol and biodiesel in the internal market and the government is also one of the most active voices promoting ethanol as an international commodity.

The history of sugarcane ethanol in Brazil goes back to the beginning of the last century³. During the petroleum crisis in the seventies the Brazilian government made an effort to promote the fuel from sugarcane by creating the Ethanol Program (*Pró-Alcool*), a strategy to reduce the dependence on fossil fuels and promote the sugar industry. After many years with a subsidized program, ethanol is now independent of subsidies, but the government can still influence the market through changes in the percentage of ethanol in the gasoline, in a range between E18 to E25. There is also a monthly tripartite roundtable at the Ministry of Energy (*Mesa tripartite*) where representatives from the government, producers and distributors meet and discuss questions of short-term supply and other strategic questions.

³ <http://www12.senado.gov.br/publicacoes/estudos-legislativos/tipos-de-estudos/textos-para-discussao/td-89-historia-e-economia-dos-biocombustiveis-no-brasil>

Biodiesel has been object for research in Brazil since the seventies⁴, but it was the national program (*Programa Nacional de Produção e uso do Biodiesel*) that made biodiesel part of the Brazilian energy mix. The law nº 11.097 from January 13, 2005, made it mandatory to blend diesel with some parts of biodiesel. In 2013 Brazil produced 18,5 million BOE (barrels of oil equivalent), more than two times the production from 2008, of 7,4 million BOE.⁵ An important goal of the biodiesel program is the incentive to small feedstock producers, which will be described further in this report. Currently, biodiesel in Brazil is produced mainly with soya beans (80%), animal fat (16%) and cotton (2%).

The current state of the biofuel sector in Brazil

Ethanol

The Brazilian ethanol sector is currently under pressure. Signals of a crisis can be found in the low level of investment in new ethanol plants and the approximately 15% of idle industrial capacity. Ethanol producers claim that the crisis in the sector is caused by the low price of gasoline which in turn is a result of the government's efforts to control the inflation, as mentioned by the producers interviewed in this report. However, researchers and governmental actors interviewed cited more factors involved, such as the increase in costs of production and in the prices of land, changes in ownership of production companies and the reduction of yields due to the adaptation to new agricultural practices such as mechanization. Marlon Leal, General Coordinator for the insertion of new renewable fuels at the Ministry of Energy (MME), states that the production costs of ethanol increased 120%, caused by a higher price of land, the investment in mechanization, the reduction in productivity caused by the mechanization, the increasing in salaries since 2007 and the rising of sugar prices in 2008. The cost to produce ethanol according to him is nowadays higher than the cost to produce gasoline. Arnaldo Walter, professor at UNICAMP, moreover argues that the crisis is caused by errors and the current disorganization in the ethanol sector, with a reduction in the production caused by the delay to adapt to new agricultural practices with the mechanization and consequent soil compression, the renovation of the plants in sugarcane fields with species already in use, which caused diseases, and changes in the control of companies caused by the financial crisis. According to him it will take some years before the sugarcane production recovers from the current retraction.

The export of ethanol reached a peak of 5.1 billion litres in 2008, but after that it has been reduced substantially, reaching 1.9 billion litres in 2010. Since then the situation has recovered somewhat, with 3.1 billion litres of ethanol being exported in 2012.⁶

Biodiesel

The importance of biodiesel in the Brazilian energy mix is increasing and it has a current blend of 5% (B5). Brazilian biodiesel is made mainly from soya bean oil or animal fat, but the Federal Biodiesel

4 <http://www.mme.gov.br/programas/biodiesel/menu/biodiesel/perguntas.html>

5 www.anp.gov.br

6 <http://www.epe.gov.br/Petroleo/Documents/Análise de conjuntura dos Biocombustíveis – boletins periódicos/Análise de Conjuntura dos Biocombustíveis Ano 2012.pdf>

Program also promotes other oilseeds such as sunflower in the Mato Grosso state and canola oil in the Rio Grande do Sul state, as winter crops. Daniel Amaral, from the Brazilian Association of Vegetable Oil Industries (ABIOVE) mentions Jatropha (*Pinhão manso*) and palm oil (*óleo de dendê*) as other crops with potential to increase. The law 7172-2010⁷ regulates the Agro-ecological Zoning of Palm Oil (*Zoneamento Agroecológico da Cultura da Palma de Óleo*), enabling the controlled cultivation of palms in areas already deforested in the Amazon region. Palm has a large potential, with a production of 3.5 to 4 tonnes of oil per hectare, since it is producing food and biodiesel without threatening the environment.

According to Rodrigo Rodrigues, coordinator of the Federal Biodiesel Program, biodiesel was exported for the first time in 2013, but he also explains that export is not a priority under the current market conditions.



Every car and bus in Brazil use some percentage of a renewable fuel

Brazilian stakeholders

This section presents the organisations and companies that participated in this report.

Producers and their Associations

Ethanol and biodiesel producers in Brazil are part of a large agricultural industry. Most of the sugarcane, soya and meat are cultivated by large producers and conglomerates such as the group Raízen. Because of the National Program of biodiesel from 2004, biodiesel also relies on the participation of small, family-owned producers. For this report we interviewed representatives from two producers, Ester plant (*Usina Ester*) and Raízen, and representatives from two associations of producers, UNICA and ABIOVE. Ester plant is a sugarcane company from Cosmópolis, São Paulo state. It is one of the oldest active sugarcane plants dating back to 1898, which in the period 2012/13 produced 69 million liters of ethanol. Raízen is a joint venture between the former sugarcane company Cosan and the multinational Shell, producing 2 billion liters of ethanol per year in its 24

⁷ http://www.planalto.gov.br/ccivil_03/_Ato2007-2010/2010/Decreto/D7172.htm

plants. UNICA, the Brazilian Sugarcane Industry Association, answers for more than 50% of the ethanol producers in Brazil. ABIOVE is the Brazilian Association of Vegetable Oil Industries, which members are responsible for approximately 72 percent of the Brazilian soybean processing volume.

Workers union

In order to get an opinion from one of the workers within the sector we interviewed César Lima, director of the rural workers union of the Cosmópolis region, in the São Paulo state. This union represents workers in the sugarcane sector, called sugarcane cutters (*cortadores de cana*), including those working in the Ester plant. The role of this type of work has changed because of the recent mechanization of the harvest, and the number of cutters has been drastically reduced. However, even with the machines there is still a need of cutting parts of the production manually, for example in areas with difficult access where the machine cannot reach.



Paulo César Lima, Director of the rural workers union of Cosmópolis



Edson Zorzanello de Brito, Human Resources at the Ester Sugarcane Plant



The Rural Worker's Union from Cosmópolis Region, São Paulo state



Headquarters of Raízen, a large sugarcane producer conglomerate, in São Paulo

NGOs and other civil society organizations

We interviewed representatives from three non-governmental organizations (NGOs), ECOA, *Repórter Brasil* and the Social Network for Justice and Human Rights, and a representative from the Landless Workers' Movement (*Movimento dos Trabalhadores Rurais Sem Terra - MST*). Not surprisingly, NGOs are the stakeholders with a more critical points of view towards biofuels in this report. The first two, ECOA and *Repórter Brasil*, have more moderate approaches aiming at improving the sector. *Rede Social* and MST have more radical positions against the capitalistic mode of production in general and the agro-industry in particular.

Researchers

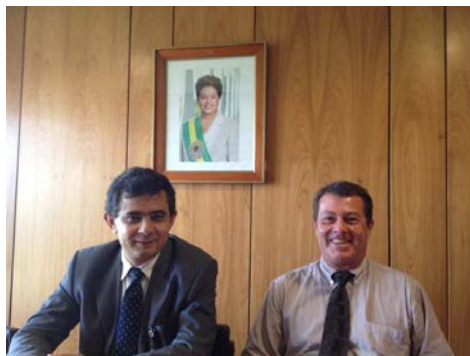
Brazil has been using biofuels since the beginning of the last century, and has a long tradition of research in the field, in particular when it comes to the issue of sustainability. Many studies are used by the biofuel sector as counter arguments to critics from European NGOs in issues such as land use change and the competition between food and fuel production. For this report we interviewed the researchers Arnaldo Walter and Joaquim Seabra, from the Energy department of the Mechanical Engineer School at the State University of Campinas, UNICAMP. Arnaldo Walter was also the former coordinator of the sustainability program at CTBE (Brazilian Bioethanol Science and Technology Laboratory). Both of which are distinguished researchers within their field of study.

Governmental institutions

We interviewed representatives from four governmental institutions working with biofuel, the Ministry of Energy (*Ministério das Minas e Energia*), Ministry of Development, Industry and Commerce (*Ministério do Desenvolvimento, Indústria e Comércio Exterior*), Ministry for Foreign Affairs (*Ministério das Relações Exteriores*) and the Coordinator of the Federal Biodiesel Program, a multi-stakeholder initiative coordinated by the Office of the Chief of Staff for the Presidency (*Ministério da Casa Civil*).



Marlon Arraes Jardim Leal, General Coordinator for the insertion of new renewable fuels - Ministry of Energy

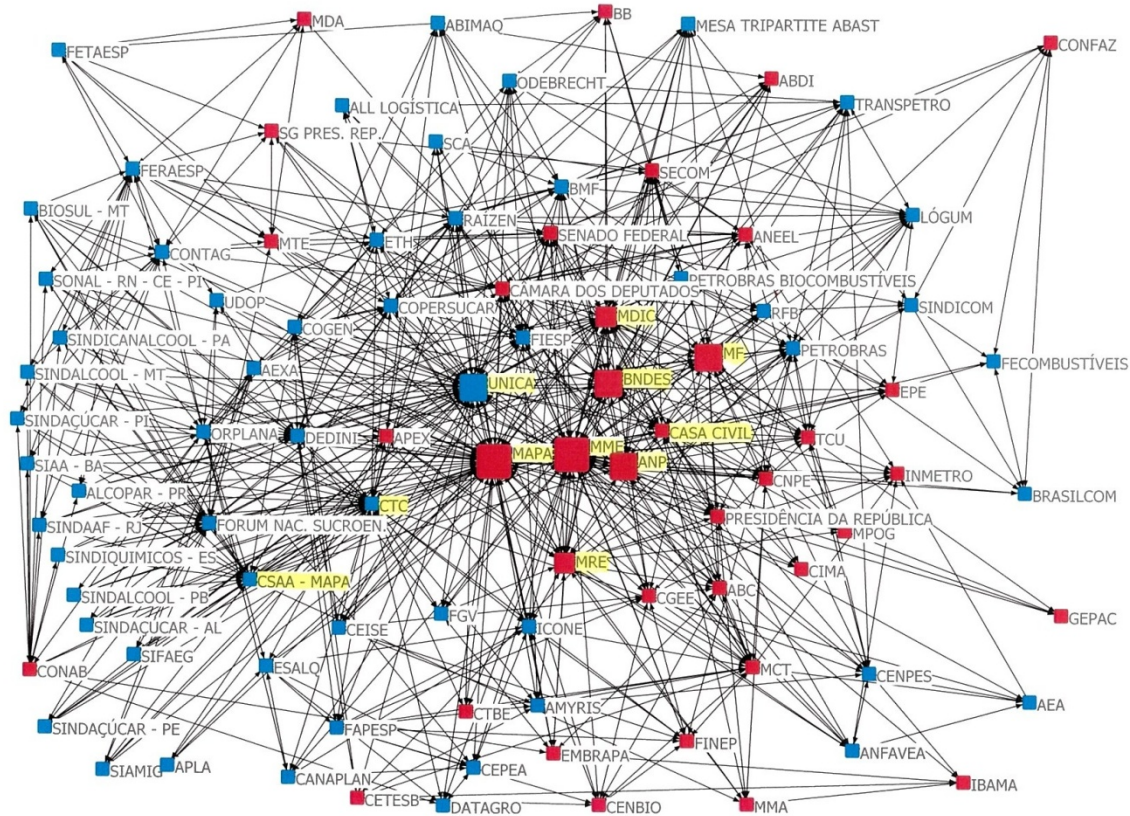


José Nilton and Rodrigo Rodrigues at the Office of the Chief of Staff for the Presidency



Luciano Cunha de Sousa, at the Ministry of Development, Industry and Commerce

The figure below is a subjective (qualitative) depiction of the network of relations between the various Brazilian stakeholders in the ethanol sector.



Network of relations between stakeholders in the ethanol sector. The red dots represent governmental institutions and the blue dots represent private players. Source: Marlon Leal, Ministry of Energy (MME)

The sustainability of biofuels

The interviews will be presented and discussed in the following sections. We will introduce the themes according to the questionnaire used for the interviews. The first section covers different aspects of the sustainability of biofuels, including land use change, food versus fuel, GHG emissions, social impacts, mechanization, the Social Fuel Certificate for biodiesel, economic aspects and certifications. In the final section we discuss the European Union Renewable Energy Directive (EU RED) and the proposal for its amendment.

The sustainability of biofuels has been questioned by various sources recently. The criticism is related to questions of for example land use changes and the influence of biofuel on food production. These questions are constantly debated in the academia and there are no straightforward answers. Many variables have to be taken into consideration to evaluate the sustainability of biofuels, such as the

type of land used for the production, the energy balance of determined crop, the use of bi-products like co-generation of electricity using bagasse, etc.

Most of the stakeholders interviewed for this report consider that the ethanol and biodiesel produced in Brazil is a sustainable option compared to fossil fuels. However, there are also many of them that argue that the biofuel production can be improved. Only the NGO Rede Social and the MST have a completely negative opinion of the biofuel sector and their criticism is based on ideological positions against the capitalism and its mode of production.

In Europe, the sugarcane ethanol from Brazil has been criticized mainly regarding questions related to deforestation, bad working conditions, slavery, etc. Geraldine Kutas (UNICA) states that six years ago this criticism was intense, but that the situation improved after years of work by the Brazilian Government and other biofuel actors to improve the reputation of biofuels. Nowadays the discussion on sugarcane ethanol has been replaced by a more heavy critique of biodiesel from palm oil and ethanol from corn. However, she adds this all does not matter now, since all food crops are receiving the same treatment in the new proposal for the EU directive.

Much of the criticism came from environmental and social NGOs. During the interviews a recurrent comment is that NGOs based in Europe are often more radical and against first generation (1G) biofuels compared to Brazilian NGOs that for most parts instead works for improvements of the biofuel sector. It happens sometimes that the local branches and the European offices of international organizations such as WWF and Greenpeace have antagonistic positions towards the sustainability of Brazilian 1G biofuels.

Land use change

Direct and indirect land use change (LUC, ILUC) is one of the most common arguments against biofuels. In this case, deforestation in order to open new areas for cultivation is the main problem. But even indirect changes caused by the migration of crops replaced by biofuel crops to other areas can influence GHG emissions of biofuels. There are two main arguments used by Brazilian stakeholders to defend local biofuels from criticism related to LUC and ILUC. One argument is that Brazil is a continental country with a lot of land still available for cultivation according to sustainable criteria. José Nilton, from the Brazilian Biodiesel Program, estimates that 8% to 9% of the Brazilian land area is still suitable for agricultural purposes without affecting sensitive biomes. The other argument is that the main changes occur in degraded pasture and areas that were already deforested, not adding more emissions in the biofuel GHG calculations. Geraldine Kutas (UNICA) argues that more than 70% of the increment of land for sugarcane in Brazil occurs in those old pasture and degraded land, which are areas that were not being used because of the currently more intensive cattle production. This position is also shared by the researcher Joaquim Seabra (UNICAMP). Luciano de Souza (MDIC) says that this can be traced back to the historic model of land occupation in Brazil which followed a pattern of deforestation for the use of logs and subsequent cattle raising activities. This meant that there was very low cattle productivity in large areas.

The program ABC⁸ is a federal program aiming for the mitigation and adaptation to climate change and consolidation of low carbon economy in Brazilian agriculture. One of its goals is to recover degraded pasture fields and implement good agricultural practices. The federal resources of the program are estimated to be about 70 billion euros. Another important initiative is the soya bean moratorium (*Moratória da soja*) cited by Rodrigo Rodrigues (Brazilian Biodiesel Program). This multi-stakeholder initiative is an agreement between leading retailers, producers, NGOs and the government to guarantee that the soya produced in the Amazon region will not be commercialized.

Alcides Faria (ECOA) argues that pasture works as a buffer for potential food production. When sugarcane production takes over pasture land it must be controlled. According to him, new sugarcane plants can be installed only after judicious analysis of social, environmental and economic impacts. One example he gives is the *pantanal*, one of the world's largest tropical wetland areas. The *pantanal* is a sensitive biome lying in a plain about 150 meters over the sea level, and it is surrounded by areas lying 600 meters over sea level. If ethanol was produced in those higher areas the water and pollutants from the production would drain to the lower sensitive areas, causing an ecological disaster. Today the Brazilian legislation prohibits the cultivation in areas of sensitive biomes.

Food vs. Fuel

The main feedstock for Brazilian biofuels is sugarcane and soya. Geraldine Kutas (UNICA) states that for sugarcane producers the sugar is the main product and ethanol is a surplus. Luciano de Souza, (MDIC) affirms this by stating that not even one single soya bean was planted aimed at the production of biodiesel.

Joaquim Seabra (UNICAMP) argues that there is a large potential for synergies between food and fuel production and this besides the production of electricity. This position is shared by Daniel Amaral (ABIOVE) and Rodrigo Rodrigues (Brazilian Biodiesel Program). This position is explained because the production of biodiesel is made from co-products and therefore there is no risk for food production. Biodiesel from soya uses the oil that is left after pressing the beans to produce food or feed. This oil has lower quality and is cheaper than other oils such as sunflower or corn oil. Biodiesel from animal fat is made with cheap leftovers from meat production.

Organic sugarcane

The San Francisco plant, in Sertãozinho, São Paulo state, was the first plant in Brazil to produce organic sugarcane, reaching levels of productivity around 100 tonnes per ha⁹. However, according to the researcher Joaquim Seabra (UNICAMP), it is not economically feasible to produce bio-energy with organic sugarcane, because costs are too high and scale is too low. This is because it is only possible to produce organic sugarcane in areas with extremely favourable soil and climate (edaphoclimatic) conditions.

On the other side, Frederico Daia (MST) argues that the extensive and intensive production of sugarcane and soya affects food security negatively. He exemplifies with the situation in his own city,

⁸ <http://www.agricultura.gov.br/desenvolvimento-sustentavel/plano-abc>

⁹ http://www.nativealimentos.com.br/media/padrao/arquivos/ResumoAgroenergia_2012_057.pdf

Ribeirão Preto in São Paulo state. The city calls itself “the Brazilian agribusiness capital” even though 70% of the food eaten in the city comes from other regions. The majority of crops produced in that city are monocultures targeted at the external market, either as feed or fuel. He argues that the main problem is that the agricultural sector aims profits instead of social wellbeing.

GHG emissions

The level of emissions of Greenhouse Gases (GHG) is another important indicator of the sustainability of a biofuel. The gases emitted when the biofuel is burned should be less than the emissions during its production. The calculation of the emissions uses a life cycle perspective and includes multiple factors such as land use changes and transportation. As an example, the whole transportation process of ethanol from Brazil to Europe, including land and sea transport, answers alone for about 25 to 30% of the emissions for this specific biofuel, according to Geraldine Kutas (UNICA).

The researcher Joaquim Seabra (UNICAMP) argues that biofuel from sugarcane reduces GHG emissions and that it brings real environmental gains. One important contribution to this reduction is the cogeneration of electricity that uses a by-product from sugarcane, the bagasse. The electricity can be used in the industrial processes of ethanol production or sold to the grid. As an example, Edson Zorzanello de Brito (Usina Ester) says that the electricity produced with the bagasse is used in the industrial process of the Ester plant and the surplus of electricity is sold to the local electricity company CPFL. Another important aspect of the electricity produced with sugarcane bagasse is that it is produced during the sugarcane harvesting time in the dry season and it compensates the lower hydroelectric production during this period.



Sugarcane bagasse used to produce electricity in the Ester plant (Usina Ester), Cosmópolis, São Paulo state



Usina Ester is a traditional and family-driven small ethanol and sugar plant

Social impacts

Other important aspects of the sustainability of biofuels that must be addressed are related to social impacts of the biofuel industry. The health impacts of the population, the labour conditions of the workers in this sector and the influence of the related agricultural activity on the local society are indicators of social sustainability that must be taken into consideration. A study comparing social indicators such as the Human Development Index, levels of alphabetization, mortality, access to basic

infrastructure (electricity, sanitation, water, etc.), between Brazilian cities with and without sugarcane activities, made by the researcher Arnaldo Walter (UNICAMP) concludes that the sugarcane industry does not have negative impacts on local communities. The sugarcane cities have higher results on all the social indicators included in the study. However, the study could not conclude that it was sugarcane that was the cause of this result.



Sugarcane fields in Cosmópolis, São Paulo state. The Ester plant is shown in the distance at the larger picture

One of the main areas of criticism of biofuel is the working conditions of the workers in the fields. In Brazil, the labour legislation is stringent. One example of this is the law NR31 (*Norma Regulamentadora 31*), which regulates safety and health labour conditions in agriculture. According to Marcel Gomes (*Repórter Brasil*), this law is much better than many international certifications. As an example, he cited a study conducted by his organization *Repórter Brasil* about the working conditions in the sugarcane production. This study shows a reduction of the number of lawsuits against sugarcane producers in Brazil between 2006 and 2012. The number of people released from conditions similar to slavery in sugarcane plantations also decreased in the same period.

Another problem in the sugarcane production is the system of payment of manual cutters according to their productivity (called champion system, or *sistema campeão*). This payment system is made by

sample, where a small portion of the area to be cut is weighed and that value is expanded to the whole area. The problem with this system is that the sugarcane is not homogenous, and sometimes the sample can contain smaller sugarcane plants than the average. In that case the salary paid for the workers will be smaller than the effective sugarcane cut. One single cutter can harvest up to 18 tonnes of sugarcane per day.

César Lima (worker's union at Cosmópolis) argues that the champion payment system is unfair and put a lot of pressure on the workers. For this reason, after years of negotiation with the local producer, the Ester plant, they introduced a new system called closed block (*quadra fechada*). In this system a representative of the union works at the gate of the sugarcane plant where the sugarcane trucks are weighed and the production values are controlled by the union. Cosmópolis's Union is the only union in Brazil with the *quadra fechada* system and with control of production. This system could improve the salaries for workers from other plants.

Labour health is other point of attention. Accidents were reduced among cutters when personal protection equipment such as gloves, shoes and protection for the legs were made a standard. However, César Lima states that there are still many problems related to repetitive stress injuries, in the spine, arms, tendons, etc. According to him, it is difficult to get health compensation from the employer in case of repetitive stress injuries. One solution would be to stop the payment system based on production. However the fixed salary must increase in that case, to be equivalent to the current salary which includes the extra money based on productivity. Nowadays the fixed salary is only about 300 euros per month.

César Lima adds that the sugarcane cutters should have a special retirement plan with less compulsory working years before retirement. Brazilian rural workers already have special plans, but he argues that sugarcane cutters need far fewer compulsory years. A sugarcane cutter is able to work no more than 15 seasons in average, which means that at 35 years he is not able to work in this sector anymore. The physical activity related to sugarcane cutting is similar to the one of a professional athlete, but without medical monitoring.

Fabio Pitta (*Rede Social*) says that the working conditions of machine operators can also be difficult, including shifts of 70 hours per week without proper place to eat or toilet. Occasionally, workers need even to sleep inside the tractor. According to him, with the mechanization the work inspections were in general reduced, which deteriorates working conditions.

Another social issue still found in Brazil is working conditions similar to slavery. Brazil has a national plan for eradication of slavery (*Plano nacional para erradicação do trabalho escravo*)¹⁰. Marcel Gomes (*Repórter Brasil*) cites reports from 2004 conducted by his organisation showing that working conditions similar to slavery were found inside large production chains in different sectors, including

Rural Athletes

An example of ex-sugarcane cutter that became a successful athlete is the runner Maria Zeferina Baldaia, which used to work in a sugar plant Sertãozinho, São Paulo state. In 2001 she won the 77th edition of the international São Silvestre marathon in São Paulo.

10 http://www.oit.org.br/sites/all/forced_labour/brasil/iniciativas/plano_nacional.pdf

the biofuel sector. According to him, the national plan helped to reduce this kind of problem in the production chain related to large companies.

César Lima (Worker's Union of Cosmópolis) states that forced labour in the São Paulo state disappeared due to strong inspection from authorities. However, the authorities still reports bad working conditions and unfair payment. According to him, some large producers in the São Paulo state such as the plants Furlan and Lorenzetti, relocated their land to third-parties to avoid legal responsibility for the cutters.

The National Commitment to Improve Working Conditions in Sugarcane Industry (*Compromisso Nacional para Aperfeiçoar as Condições de Trabalho na Cana-de-Açúcar*) is an initiative by actors in this sector concerning labour conditions.¹¹ This initiative was the result of negotiations between companies, workers and the federal government and it covers questions such as employment contract, health and safety, transparency in measurement of the production, housing, transportation, migration, education, relocation, working hours, child and forced labour, etc.

The number of workers in the soya production is much smaller than in the sugarcane sector since the production in the former is mechanized to a large extent. However, Marcel Gomes (*Repórter Brasil*) argues that there are still some cases to be found with working conditions similar to slavery. However, the problem is much smaller than in other agricultural sectors, such as the wood sector, for example. The worst social problem in the soya production according to him is that the production of this crop does not create enough jobs.

Mechanization

The mechanized harvesting is reducing the number of manual sugarcane cutters. Nowadays, most of the cutters are permanent employees of the sugarcane plants. The unemployment increased mainly among seasonal workers, which are in general from other regions. The seasonal workers that lose their jobs are partially absorbed by the construction sector, but many return to their original regions.

According to Edson Zorzanello de Brito, the harvesting process at the Ester plant has being mechanized and currently the plant has ten machines. The company still has 530 cutters, of which 380 have permanent positions and 150 are seasonal workers. Some of the manual cutters are being trained to work with the machines. In 2012, twenty workers did this.

César Lima (workers union of Cosmópolis) said that the number of cutters at Usina Ester before the mechanizations was about 2000. Every year a new machine is bought which means that 50 cutters lose their jobs. However, it is difficult for the industry to become 100% mechanized because they need to plant in areas where the machine cannot reach. The union has still bargain power because the workers in the machines are also part of this union, and in case of a strike they can stop the production.

11 <http://www.secretariageral.gov.br/arquivos/publicacaocanadeacucar.pdf>

The Brazilian Sugarcane Industry Association UNICA has a project of relocation for manual cutters, called Renovation (*Projeto Renovação*)¹². Marcel Gomes (*Repórter Brasil*) argues that this project is of low relevance since it is not reaching a significant number of the cutters that lose their jobs due to the mechanization in the sugarcane sector. César Lima from the Cosmópolis workers union shares this opinion.



Machinery used to harvest sugarcane. The machines have to pause their work when it's raining

Social Fuel Certificate for biodiesel

The national biodiesel program from 2004 introduced a Social Fuel Certificate (*Selo Combustível Social*) to stimulate the participation of small producers in the biodiesel sector. The biodiesel must include a percentage of crops produced by small producers in order to obtain the certificate. The biodiesel with this certificate has special conditions in the bidding market of the ANP (National Petroleum and biofuel agency). Daniel Amaral (ABIOVE) argues that this initiative is positive since it has made possible for about 100 000 families to be a part of the biodiesel production and these families produce about 26% of the biodiesel in Brazil¹³. Marcel Gomes (*Repórter Brasil*) also considers this program interesting. However, he states that it needs improvements since the biodiesel sector still runs the risk of large producers taking control such as in the ethanol sector. Large companies such as Cargill and Bunge are dominating the market and he argues that small producers should get more financing and technical assistance to increase their participation.

In the beginning of the program, one of its main goals were to give incentive for small producers in poor regions, especially in the northeast, to cultivate alternative crops such as castor oil (*mamona*) and sunflower, but according to Arnaldo Walter (UNICAMP) this goal failed. He described a project in the Rio Grande do Norte state as an example of this failure. One of the main barriers here was cultural, he argues, because the local small producers were not used to large-scale production. The project promoted the production of castor oil and sunflower, but the local producers were lacking

12 <http://www.unica.com.br/projeto-renovacao>

13 http://www.ppe.ufri.br/ppp/production/tesis/patricia_turano.pdf

knowledge needed for production and machinery for harvesting. Nowadays the small producers are concentrated in the more developed states in the Brazilian south region, and the main feedstock produced is soya.

Frederico Daia (MST) argues that the current structure of the Brazilian agriculture expels the small producer from rural areas. According to him, even the Social Fuel Certificate is not beneficial because it subjects the small farms to the logic of agribusiness. On the other hand, Luciano de Souza (MDIC) states that the program for small producers is an efficient way for the families to stay in the countryside.

Economic aspects

A biofuel must be economically sound in order to be sustainable. Many factors affect the economical sustainability of a biofuel, such as agricultural costs (fertilizer, labour, machinery, etc.), production costs, transportation, etc.

The cost for certifications is also reflected in the final economic result. International certifications are instruments to verify the sustainability of biofuels and are required in the external market. The main certification used in Brazil is the Bonsucro. Davi Araújo (Raízen) states that this certification is one of the central points of the sustainability strategy of the Raízen group, with 33% of the plants already certified. However, Marcel Gomes (*Repórter Brasil*) considers Bonsucro a weak certification.

Another discussion is the potential of biofuels to be a driver for economic development in a region. Alcides Faria (ECOA) states that an industrial ethanol plant brings positive changes in areas with previous cattle industry. He sees the cattle industry as the biggest economic, environmental and social problem in Brazil. Cattle uses 25% of land, causes soil compaction, erosion, deforestation and generates only one job for each 500 hectares. According to Marlon Leal (MME), the biofuel industry, on the other hand, brings a clear social and economic development to rural regions, including the well-being induced by the access to electricity co-produced with sugarcane bagasse.

Biofuel for Aviation

The aviation industry is highly dependent on liquid fuels based on fossil sources. The use of renewable biofuels has a potential to increase the sustainability of the sector and are being investigated by Brazilian companies.

In 2004 the Brazilian aircraft company Embraer got the certification for the first serial-produced airplane in the world, the Embraer EMB 202 Ipanema.

A consortium led by Embraer is developing an aviation biofuel based on hydrocarbons from sugarcane, with the participation of Boeing, Amyris and the state University of Campinas, among others.^{14, 15}

14

http://www.iconebrasil.com.br/datafiles/biblioteca/documentos/2012/projeto_sustentabilidade_do_querosen_e_renovavel_derivado_da_cana_de_acucar_ciclo_de_vida_das_emissoes_de_gee_e_referencias_para_os_mai_ores_padroes_de_sustentabilidade_1906.pdf

15 <http://www.fapesp.br/publicacoes/flightpath-to-aviation-biofuels-in-brazil-action-plan.pdf>

However, Frederico Daia (MST) states that biodiesel does not bring endogenous development. In his opinion the Brazilian biofuel industry keeps an unfair social structure and over-exploits workers and ecological resources.



With the introduction of flex cars the Brazilian consumer can choose between ethanol and gasoline.

A current economic problem told by Fabio Pitta (*Rede Social*) is the speculation of land in Brazil with the consequent increase of land prices. He argues that the holding company Radar, from the Raízen group, is one of those responsible for the problem. He considers that this is a real estate bubble ready to burst. Radar buys land with support from international finance capital such as the pension fund TIAA-CREF in which Swedish AP2 is an investor. The Swedish watchdog Swedwatch has criticised the low transparency of this transaction and the lack of monitoring of the conditions in the farms that were bought¹⁶.

EU RED and the proposal for its amendment

The Renewable Energy Directive from the European Union (EU RED) is a directive from 2008 aiming the promotion of renewable sources of energy, including mandatory targets for the member states such as a 10% share of renewable in the transport sector to be achieved until 2020. Daniel Amaral, (ABIOVE) says that the directive was important to support biofuels as an alternative to fossil fuels, since biofuels can promote a chain reaction of social improvements. However, he is now disappointed with the directive since it created market barriers. An example he gave is that is necessary four hours to certify a farm in Europe, while in Brazil it takes three days. This difference increases the costs of biofuel from outside of Europe, and it happens because the legal system in Europe is accepted as a base to the certification (cross-compliance), while the Brazilian legal system is not accepted. A solution could be the signature of an agreement between EU and Brazil that is already planned in the directive, and that would facilitate the certification process in Brazil. According to Emerson Kloss (MRE), this issue was part of the official document from the last summit

¹⁶ <http://www.swedwatch.org/sv/rapporter/investering-utan-insyn>

between Brazil and European Union, signed by presidents Dilma Rousseff and Durão Barroso in the beginning of 2013 in Brasilia.



The national congress and the presidential office (Palácio do Planalto), in the Brazilian capital Brasilia.

A proposal for the amendment of the directive was introduced in October 2012¹⁷. The main points of this proposal are a cap of 5% for food-based (1G) biofuels, increment of the GHG savings threshold for new installations, special conditions for second generation biofuels and mandatory report of ILUC related emissions. Emerson Kloss, Head of Division of Renewable Energy Sources at the Brazilian Ministry of Foreign Affairs, states that the position of the Brazilian government is against the cap for 1st generation biofuel and the definition of an ILUC factor. According to him, the cap would be a negative signal to the international biofuel market, and there is a coordination of countries that produce 1G biofuels trying to influence the decision in the European Commission about the directive. Those countries include Brazil, USA, Argentina, Canada, Indonesia, Malaysia and Colombia. He states that the European Directive should not introduce a barrier including all 1G biofuels, since fuels from different crops and regions have different sustainability performance.

Geraldine Kutas (UNICA) states that the share that 1G biofuels have in the transport fuel market in Europe already reaches the 5% cap. According to her, “the problem with the proposal is that all feedstock for ethanol of 1st generation received the same treatment. The consequences in the European market will be terrible if the limit of 5% is approved. Nowadays, 80% of the European market is biodiesel and the other 20% is ethanol. The mandate of 7% for biodiesel (B7) corresponds to 14 million tonnes of oil equivalent, which is already about the 5% proposed as a limit”. According to her, if the new proposal is approved ethanol will almost disappear in Europe. Besides that, the 2nd generation biofuels will not be able to fulfil the other 5% of the target. She adds that UNICA questioned the compatibility of the amendment proposal with the international commerce rules. The proposal could be discriminatory and therefore subject to be questioned at the World Trade Organization. Luciano de Souza (MDIC) also considers the cap a trade barrier.

Arnaldo Walter (UNICAMP) states that the proposal for amendment of the EU directive is a result of the lobby by environmental and social NGOs in the EU parliament. Joaquim Seabra (UNICAMP) states

17 http://ec.europa.eu/clima/policies/transport/fuel/docs/com_2012_595_en.pdf

that the proposal ignores the benefits from the co-products of ethanol. According to him the calculations of the directive do not take into consideration the case of the electricity produced with bagasse in Brazil. He also considers that the methodology used for iLUC in the directive is not clear. He does not consider that the precautionary cap over 1G biofuels is necessary.

The development of biofuels of second generation in Brazil is linked to the first generation biofuel already being produced. One of the best promises for 2G is the fuel made from co-products from sugarcane, such as bagasse. Luciano de Souza (MDIC) cites the call for proposals from the Brazilian Development Bank (BNDES) and the Brazilian Innovation Office (FINEP), for innovative projects in the sugarcane sector, which includes 2G biofuels. The plan is called Action Plan for Support Technological Innovation of Sugarcane Industrial Sectors, PAISS (*Plano de Apoio à Inovação Tecnológica Industrial dos Setores Sucreenergético e Sucrequímico*)¹⁸. He adds that the companies Raízen and GranBio are planning two new plants that will produce 2G biofuel from sugarcane bagasse in 2014.

Conclusion

Brazil has a well-established biofuel industry and concerns about its sustainability are in general well addressed. The Brazilian environmental and labour legislation are stringent and should be considered in the processes for certification of the local biofuel, reducing doubled certification. Sensitive biomes such as the Amazon and *Pantanal* region are protected by law. Most of the sugarcane plantations are far away from those areas and the law is reinforced by initiatives such as the Soya Moratorium. Moreover, the work from local NGOs help to keep biofuel crops away from those areas.

The labour condition of workers in biofuel industry is the main point to be improved. The harvesting of soya is usually mechanized and workers in the sugarcane sector have a relatively better situation compared to other rural workers. However, the biofuel sector has still problems that must to be addressed, such as long working hours and poor labour conditions in some regions.

During the interviews we noticed that most of the opinions of local stakeholders converge to the same direction. Even NGOs, which are the most critic actors, are not against the biofuel industry and works helping to improve labour conditions and to protect local environment. Only two of the fifteen participants in this report are against the biofuel industry and have a strong position against the capitalistic mode of production as a whole. The other NGOs, researchers, producers, workers union and governmental institutions interviewed agree that the biofuel industry contributes to Brazilian sustainable development. Brazilian sugarcane ethanol, in special, has a distinguished sustainability performance and there should be no export restrictions against it. Therefore, Brazilian stakeholders are in general against the proposal for amendment of the EU Renewable Energy Directive.

Even if the proposal for the amendment of the European Renewable Energy Directive would not have any impact on the current Brazilian exporting figures, it would influence the international biofuel market. Countries with a potential capacity to produce 1G biofuels, such as many African countries,

18 http://www.bndes.gov.br/SiteBNDES/bndes/bndes_pt/Areas_de_Atacao/Inovacao/paiss/

would also be affected. The cap would send a symbolic message from EU against 1G biofuels. The use of Brazilian biofuels is a sustainable option for Europe in order to reach its target in the Renewable Energy Directive and this is the main message from the majority of the Brazilian stakeholders included in this report.

List of Participants

Organization	Main contact	Targeting
ABIOVE	Daniel Furlan Amaral, Economy manager	Brazilian Association of Vegetable Oil Industries (www.abiove.com.br)
ECOIA – Ecologia e ação	Alcides Faria, Institutional director	NGO (www.riosvivos.org.br);
MDIC	Luciano Cunha de Sousa, Foreign commerce analyst	Ministry of Development, Industry and Foreign Commerce (www.mdic.gov.br)
MME	Marlon Arraes Jardim Leal, General Coordinator for the insertion of new renewable fuels	Ministry of Energy (www.mme.gov.br)
MRE	Emerson Coraiola Kloss, Head of Division of Renewable Energy Sources	Ministry of Foreign Affairs (www.itamaraty.gov.br)
MST (Movimento dos Sem Terra)	Frederico Daia, local representative, Ribeirão Preto region	Civil organization that claims land reform and social justice in the rural Brazil (www.mst.org.br)
Ministério da Casa Civil	Rodrigo Augusto Rodrigues, Coordinator of the Federal Biodiesel Program	Inter-ministerial executive commission on biodiesel (www.presidencia.gov.br)
National Biodiesel Program	José Nilton, Governmental Policy analyst (interviewed together with Rodrigo Rodrigues)	(www.presidencia.gov.br)
Raízen	Davi Araujo, Sustainable Development manager	Biofuel producer, a joint venture Shell / Cosan (www.raizen.com)
Rede Social de Justiça e Direitos Humanos	Fabio Pitta, researcher	NGO (www.social.org.br)
Repórter Brasil	Marcel Gomes, coordinator of the Biofuel Watch Center	NGO Repórter Brasil (reporterbrasil.org.br)
UNICA	Geraldine Kutas, Senior Advisor for International Affairs and Acting Head of UNICA's European Union representation office at Brussels	Brazilian Sugarcane Industry Association (www.unica.com.br)
UNICAMP	Joaquim Seabra, Professor at the Energy department of the Mechanic Engineer School	Campinas State University – UNICAMP (www.unicamp.br)
UNICAMP and CTBE	Arnaldo Walter, Professor at the Energy department of the Mechanic Engineer School	UNICAMP, he was also the former coordinator of the sustainability program at CTBE (Brazilian

		Bioethanol Science and Technology Laboratory) (www.unicamp.br , www.bioetanol.org.br)
Union of rural workers of the region of Cosmópolis, Arthur Nogueira, Paulínia and Campinas	Paulo César Lima, Director	Union responsible for the workers from Usina Ester. Address: R. Artur Nogueira, 87, Cosmópolis, SP phone: +55-19-38724006
Usina Ester (Ester plant)	Edson Zorzanello de Brito, Human Resources	Ethanol and sugar producer (www.usinaester.com.br)



Annex 1 – Questionnaire used during the interviews (in Portuguese)

Questões – relatório SIDA - a voz dos atores dos países do sul sobre biocombustíveis

Sustentabilidade

- Mudanças no uso da terra - analise LUC e iLUC dos biocombustíveis.
- Food vs. Fuel – analise o conflito com produção alimentar.
- GHG – os biocombustíveis reduzem GHG em relação aos combustíveis fósseis? Quanto?
- Balanço energético – é positivo?
- Aspectos ambientais - biocombustíveis ameaçam ecossistemas sensíveis (amazônia, cerrado, etc.)? Quais ameaças à água, ar, biodiversidade, etc.?
- Aspectos Sociais – o compromisso nacional para aperfeiçoar as condições de trabalho funciona? Comente mecanização e desemprego; Qual o impacto do projeto Renovação (UNICA)?; Qual a realidade de trabalho em condições análogas à escravidão nesta área?; Quais impactos na saúde da população (com a queima, produção do combustível, uso nos veículos, etc.)?
- Aspectos econômicos – biocombustíveis são economicamente viáveis? Quanto subsídio direto ou indireto é usado? Qual a fatia dos biocombustíveis na matriz energética nacional e internacional, e qual o potencial?
- Certificações – Funcionam? Qual o peso do custo de certificação no resultado econômico final do biocombustível? Existe disposição para pagar um valor premium para o biocombustível no Brasil? E no exterior?
- Comunicação e informação – existe boa comunicação entre os diferentes atores? O discurso de autoridades, produtores, trabalhadores e ONGs são coerentes ou existe discrepância? Se sim, onde?

- **Políticas Públicas:**
- Qual deveria ser a prioridade no uso: local ou externo? Pequena escala ou larga escala?
- Políticas públicas nacionais são adequadas? O Processo é participativo?
- Políticas públicas internacionais são adequadas? Existe participação brasileira? Comentar especificamente EU RED (Renewable Energy Directive)
- Comente EU RED – atual / pontos principais: 10% de energia renovável nos transportes até 2020; redução de GHG de 35%/50%/60%: Fuel Quality Directive (FQD), com redução de 6% de GHG para os fornecedores
- Comente EU RED – proposta de alteração / pontos principais: culturas alimentares limitadas a 5%; Culturas 4x: algas, estrume, esgoto, bagaço, etc. Culturas 2x: óleo de cozinha, lignocelulósicos, etc. Redução de 60% de GHG para novas usinas já a partir de 2014; Exigência que os produtores reportem iLUC.